

## Article

# Passengers' Expectations on Airlines' Services: Design of a Stated Preference Survey and Preliminary Outcomes

Maria Grazia Bellizzi <sup>1,\*</sup> , Luigi dell'Olio <sup>2</sup> , Laura Eboli <sup>1</sup>, Carmen Forciniti <sup>1</sup>  and Gabriella Mazzulla <sup>1</sup> 

<sup>1</sup> Department of Civil Engineering, University of Calabria, Via P. Bucci Cubo 46/B, 87036 Rende, Italy; laura.eboli@unical.it (L.E.); carmen.forciniti@unical.it (C.F.); gabriella.mazzulla@unical.it (G.M.)

<sup>2</sup> Department of Transportation and Projects and Processes Technology, University of Cantabria, Avda. de los Castros 44, 39005 Santander, Spain; luigi.dellolio@unican.es

\* Correspondence: mariagrazia.bellizzi@unical.it

Received: 13 May 2020; Accepted: 2 June 2020; Published: 9 June 2020



**Abstract:** As the competition between airlines grows, their customer-centered strategies are becoming increasingly popular. In this context, the marketing strategies are the result of investigations carried out directly on users, usually through the Customer Satisfaction Surveys. Investigating on airline passengers' preferences represents a useful action to pursue the most convenient strategy for increasing their satisfaction and improving the provided service. With this aim, we propose the design of a Stated Preference survey and the preliminary outcomes obtained from the analysis and modelling of the collected data. A deep study of the literature review drove us to consider the land services separately from the air ones. Even if the travel experience of an airline passenger starts at the airport, only the services provided by the airlines are the object of this study. The Stated Preference survey was designed with the aim to capture the passengers' desires on airlines' services by proposing hypothetical scenarios to them. The survey was addressed to the whole population of the University of Calabria (Italy). A sample of 1907 survey responses was obtained. For analyzing the collected data, discrete choice models have been calibrated to obtain the weights assigned by users to each service quality aspect included in the experiment.

**Keywords:** expected service quality; stated preference survey; airline services; discrete choice models

## 1. Introduction

As for the other transportation systems, the assessment of service quality in Air Transport industry starts from the passengers' opinions collected through the well-known Customer Satisfaction Surveys (CSS). The passenger' subjective evaluations of the service can be expressed in terms of perceptions and/or expectations. Perceived quality relates to what customers received from the service, and consequently, it is often measured by satisfaction levels or ratings [1,2]. Revealed Preference (RP) surveys are the most common tool for collecting this kind of data. On the other hand, expected quality is something more complex to define. Expectations can be viewed as customers' desires or wants, i.e., what they feel a service provider should offer rather than would offer [3]. For this reason, customers' expectations received several treatments in service quality literature. However, a convenient way to capture customer expectations is through the Stated Preferences (SP) surveys, which allow us to indirectly capture which service attributes are important to customers [4].

In addition, for the air transport sector, from a study of the literature, it emerged that few studies investigate on service quality through SP surveys, as the major part of the works focus on data collected by RP surveys. We also verified that land services have been generally considered separately from the air ones, being two very different categories of services, and managed by different kinds of companies. Specifically, land services are managed by the companies administering airports, while airlines manage air services [5].

Starting from the analysis of studies related to quality of services provided by the airlines, this paper wants to give a contribution in terms of investigation on the travelers' expected quality. We retain that if the investigation is oriented only to the perceived quality, airlines can know only customers' opinions about the offered services. On the contrary, if the investigation is also oriented to the expected quality, the companies can also capture the preferences of the users, and consequently they can develop more convenient policies. For this purpose, two SP experiments were designed with an efficient design through Ngene software [6] based on the variables identified in the literature review. One experiment takes into account travel experience before and after the flight, and the other one the experience during the flight. A pilot survey was necessary to obtain more accurate and precise prior parameters for the design of the large-scale survey. Finally, the definitive survey was launched and addressed to the whole population of the University of Calabria.

In SP survey, individuals can have limitations in their capacity to process information and evaluate alternatives; therefore, in order to ensure realism and reduce hypothetical bias, analysts may need to build rather complex survey tasks that respondents are asked to process in a short time. Other problems can be found when contacting respondents are not the right persons to interview, or the context is not precisely defined, or attributes are not measured correctly. One of the most popular ways to elicit SP from individuals is the discrete choice experiment method. In a discrete choice experiment, the alternatives are described as sets of attributes varying on different levels. Specifically, different choice sets, consisting in some alternatives defined by different levels of the same attributes, are presented to the respondents; for each choice set, the individual must select the most preferred option or choose none of those proposed [7]. By following this approach, the collected data were used as input to calibrate Multinomial Logit (MNL) models through NLogit software [8], which serves as a tool to propose policy recommendations.

In the rest of the paper, we propose a literature review of the studies investigating several service aspects by also proposing a differentiation of the studies adopting RP data from the ones using SP data. Then, we report the methodological section regarding the design of the SP survey, from the literature review to the launch of the large-scale survey. Moreover, a brief characterization of the sample is included. After that, we introduce experimental sections concerning the preliminary outcomes obtained by estimating MNL models. Finally, a conclusive section about the work is reported.

## 2. Literature Review

While literature regarding the evaluation of road and rail public transport service quality has been well established for many years [9–11], literature concerning air transport service quality is relatively recent. Air transport services are characterized by many attributes, as there are several characteristics concerning land side and as many regarding air side. In Table 1, a list of the main service attributes investigated in the literature review is reported, including both land side and air side aspects.

**Table 1.** Main service attributes from literature review.

| Attribute  | Studies Analyzing the Service Attribute                 |
|--|---|
| Flight booking   | [12–30]   |
| Seat reservation   | [14–17,21,25–28,31–33]                                  |
| Airline’s website  | [13,22,33]  |
| Check-in   | [14–16,19–21,23–25,27,29,30,33–39]                      |
| Frequency and Scheduling   | [12,14–17,22,23,25–31,33–37,40–45]                      |
| Non-stop flights   | [13–17,22,26,29,31,35]                                  |
| Waiting lounges  | [17,25–27,35,39,45]                                     |
| Boarding   | [19,20,25,29,30,32]                                     |
| Punctuality  | [12–18,21–29,31,33–40,43–47]                            |
| Airline staff/Cabin crew   | [12–40,43–45,47–51]                                     |
| Cabin announcements  | [19,20,25,38,47,48]                                     |
| Seat comfort/Space available   | [13–24,26–30,32,34,36–39,41,42,45,47,48,51,52]          |
| Acoustic comfort   | [23,34,47]  |
| Temperature  | [13,28,47]  |
| Cleanliness  | [12,13,17–24,26,30–35,38,40,43,45,46,48]                |
| Toilets  | [17,23,26,28,30,46]                                     |
| Food and drinks  | [12–17,21,22,24,25,27–30,32–42,44–48,52]                |
| Entertainment  | [12–17,19,20,22,24–27,29,30,33–35,38–40,44,45,47,51,52] |
| Internet/Phone   | [13,31,33,35,38,45,47]                                  |
| Equipment  | [24,28,44,48]   |
| Safety   | [12,14–21,23,25–27,29,34,35,38–40,43–45,47–50]          |
| Security   | [18,23,34,38,44]  |
| Shopping   | [13,25,27]  |
| Disembarking   | [30]  |
| Baggage delivery   | [13–16,18–20,22,25,27,29,30,32,40,43,44]                |
| Baggage care   | [39,46]   |
| Handling (customer complaints, flight delay, luggage loss or damage) | [12,14–16,18–21,24–26,31–35,38,40–46,50]                |
| Frequent flyer/mileage programs                                      | [13,14,22,27,33,35,40,42,43,49]                         |
| Special services   | [25]  |
| Image  | [15,16,28,29,31,33,43,50]                               |
| Pricing (value)  | [13,15,16,21,22,28–30,36,37,39,41,51,52]                |

The major part of the studies focuses on data collected by RP surveys addressed to departing passengers [45,53,54]. In a respectable number of studies, in addition to the perceptions about service aspects, passengers are requested to express what they expect from the service and therefore to provide a rate of importance on each analyzed service aspect [55]. An example is the study conducted by Chen and Chang [48].

Unlike the other transport modes, in air transport literature there are not many studies that address the investigation on service quality by analyzing data collected through SP surveys. Most of them are not finalized to the analysis of air transport services for proposing quality improvement policies. As an example, Hensher et al. [56], through an application on airline choice, analyzed the effect of numbers of choice sets in designed choice experiments. Bliemer and Rose [57] made a comparison between the efficient design and the orthogonal one by proposing different discrete choice experiments to air travelers. In Hess et al. [58] the potentiality of SP data in the analysis of air travel choice behavior is illustrated. Hess [59] treated the problem of potentially biased results obtained by including a current trip as one of the travel options. Finally, in Shaheen et al. [60] SP are also used for capturing participants’ preferences for urban air mobility travel as innovative transportation mode in big urban areas [61]. However, some studies are similar to our work in terms of objective. As an example, Espino et al. [41] and Martín et al. [42] analyzed users’ preferences by considering the Gran Canaria-Madrid route as specific case study. Instead, in Balcombe et al. [52], the focus is on the in-flight services provided by charter airlines on a flight of 4.5–5.5 h.

Our study wants to represent a useful contribution that demonstrates the convenience of adopting SP methods for collecting data regarding air transport service quality.

### 3. Materials and Methods

#### 3.1. SP Survey Design

SP survey was designed with the aim of finding out what users of air transport look for in the services provided by the airlines, and what they would like to receive when they travel by air. In other words, this study aims at investigating on the quality that passengers expect. The design of the SP survey was organized in the following three stages: (1) The analysis of the literature, conducted for establishing the service attributes to be adopted in the choice experiments; (2) the pilot survey, carried out for testing the survey structure and the validity of the experimental design; (3) the refining of the questionnaire before the launch of the large-scale survey. We decided to analyze the existing literature on airlines' service quality to identify the attributes that are most influential for a flight traveler. Findings from literature review served as the basis for designing the preliminary version of the questionnaire. The services provided by the airlines include the whole travel experience and not only the time spent in flight. As reported in Table 1, there are many attributes that can be taken into account. Therefore, we decided to design two different unlabeled choice experiments, one related to experience "before/after the flight", and the other one "during the flight". The scenarios of each choice experiment are characterized by two choice alternatives described by six attributes. The number of attributes and their levels of variations were chosen by taking into account that the more attributes and levels there are in a choice experiment design, the less likely that dominant alternatives will exist [62]; otherwise, the interviewees should not be asked to compare too many variables, to avoid the lack of their concentration in making their choice [63–65]. The alternatives of a "before/after the flight" scenario are described by the following variables: Waiting time at check-in, time spent for boarding operations, terminal-aircraft transfer mode, delay of flight departure, time spent for luggage delivery, and cost of the ticket. Instead, the variables chosen for a "during the flight" scenario are: Space available on board, temperature on board, cleanliness on board, courtesy of cabin crew, services on board, and cost of the ticket. The levels of variation of these attributes have been chosen for proposing to the interviewees as realistic as possible choice alternatives [66]. In Tables 2 and 3, the levels of variations of each attribute are reported. As regards the "before/after the flight" attributes, only the cost of the ticket presents six values, while the other ones vary on three levels. Moreover, four numerical variables relate to time, one to cost, and one is a nominal variable representing the transfer mode from terminal to aircraft.

**Table 2.** Attributes' levels of variations in "before/after the flight" experiments.

| Attribute (Unit)                         | Levels of Variations                        |
|--|---|
| Waiting time at check-in (min)           | 0 (online check-in); 5; 20                  |
| Time spent for boarding operations (min) | 15; 60; 120                                 |
| Terminal-Aircraft transfer mode          | by external path; by jet bridge; by shuttle |
| Delay of flight departure (min)          | 0 (in time); 20; 60                         |
| Time spent for luggage delivery (min)    | 0; 10; 30                                   |
| Cost of the ticket (€)                   | 20; 60; 180; 360; 720; 1440                 |

Instead, among the "during the flight" attributes, only the cost of the ticket is a numerical variable, and it presents the same six levels of variations chosen for "before/after the flight" experiments. The other variables are qualitative and varying on three levels. We retained as more appropriate using only two levels of variations for "cleanliness on board" and "courtesy of cabin crew".

**Table 3.** Attributes' levels of variations in “during the flight” experiments.

| Attribute (Unit)         | Levels of Variations                         |
|--------------------------|--|
| Space available on board | not fully adequate; adequate; fully adequate |
| Temperature on board     | too warm; adequate; too cold                 |
| Cleanliness on board     | clean enough; quite dirty                    |
| Courtesy of cabin crew   | kind enough; quite rude                      |
| Services on board        | not fully adequate; adequate; fully adequate |
| Cost of the ticket (€)   | 20; 60; 180; 360; 720; 1440                  |

After choosing the attributes and their levels of variation, a panel of experts was contacted for collecting suggestions. Specifically, the panel was composed by 30 experts including academics, researchers, and employees in transport companies. In general, the feedback from the panel of experts was positive.

On the basis of the selected attributes and their levels of variations, we designed the pilot survey through the Ngene software. Specifically, we followed the methodology proposed by Rose et al. [67] that uses the D-error to create an efficient design and define the scenarios taking the data collected in the pilot survey as a basis. By using the efficient design, MNL models were estimated by using as prior parameters values coming from our knowledge and considerations from the literature. Tables 4 and 5 show the values of the first prior parameters and the levels of attributes considered for each experiment. Moreover, in the design, a restriction related to cost of the ticket was applied for avoiding Ngene to generate scenarios with unbalanced choice alternatives, and to compare feasible scenarios that consider separately short, medium, and long-haul flight. We assumed that the possible scenarios can be only those where:

- A ticket cost equal to 20 € is compared to a ticket cost equal to 20 € or 60 € (short-haul flight);
- a ticket cost equal to 180 € is compared to a ticket cost equal to 180 € or 360 € (medium-haul flight);
- a ticket cost equal to 720 € is compared to a ticket cost equal to 720 € or 1440 € (long-haul flight).

The iterative process of Ngene generated, as a result, 12 scenarios for “before/after the flight” experiment and 12 for “during the flight” one. The number of generated scenarios is a multiple of the attribute level of variations. Each scenario comprehends two choice alternatives, with a total of 24 for each experiment.

Once the design of the scenarios has been completed, the pilot survey was conducted. The pilot survey represented the basis for designing the large-scale survey. We decided to send to the pilot survey participants a questionnaire composed by both the complete experiments. The minimum number of required surveys was established at 10, corresponding to the rounded-up maximum value of S-estimate parameter obtained for all the attributes considered for both the designed experiments (S-estimate obtained for “before/after the flight” experiment was equal to 6.51; S-estimate obtained for “during the flight” experiment was equal to 9.29). The questionnaire of the pilot survey was reported in a digital format to send as an email attachment. Pilot survey participants had to complete the questionnaire and also provide us the difficulties they eventually encountered in compiling. Participants were chosen by convenience sampling, a non-probability technique where subjects are selected because of their convenient accessibility and proximity to the researchers. In this manner, we were confident to acquire more accurate answers and additional information as an in-depth interview. Definitively, 41 completed questionnaires were collected. Since all 24 scenarios were presented to each interviewee, we obtained 984 observations. This number was sufficiently representative to estimate the preliminary MNL models whose coefficients become the prior parameters for designing the large-scale survey (Tables 4 and 5). In addition to the new prior parameters, the level of variations related to “Time spent for boarding operations” have also been modified from those reported in Table 2 (i.e., 10, 20, and 40 min). All the other settings (number of attributes, number of alternatives, number of scenarios, and so on) remained unchanged in the large-scale survey design.

**Table 4.** Attribute levels considered and prior parameters as input of Ngene for “before/after the flight” experiment.

| Utility Function   |         | Coeff. | Prior Parameters | Attributes                                  | Levels                      |
|--------------------|---------|--------|------------------|---|-----------------------------|
| Pilot survey       | U(Alt.) | WTC    | −0.090           | Waiting time at check-in (min.)             | 0; 5; 20                    |
|                    |         | TBO    | −0.030           | Time spent for boarding operations (min)    | 15; 60; 120                 |
|                    |         | TM-EP  | −1.000           | Terminal-Aircraft transfer by external path | 1 (yes); 0 (no)             |
|                    |         | TM-S   | 0.000 (fixed)    | Terminal-Aircraft transfer by shuttle       | 1 (yes); 0 (no)             |
|                    |         | TM-JB  | 1.000            | Terminal-Aircraft transfer by jet bridge    | 1 (yes); 0 (no)             |
|                    |         | DFD    | −0.050           | Delay of flight departure (min.)            | 0; 20; 60                   |
|                    |         | TLD    | −0.050           | Time spent for luggage delivery (min.)      | 0; 10; 30                   |
|                    |         | CT     | −0.020           | Cost of the ticket (€)                      | 20; 60; 180; 360; 720; 1440 |
| Large-scale survey | U(Alt.) | WTC    | −0.857           | Waiting time at check-in (min.)             | 0; 5; 20                    |
|                    |         | TBO    | −0.060           | Time spent for boarding operations (min.)   | 10; 20; 40                  |
|                    |         | TM-EP  | −1.112           | Terminal-Aircraft transfer by external path | 1 (yes); 0 (no)             |
|                    |         | TM-S   | 0.000 (fixed)    | Terminal-Aircraft transfer by shuttle       | 1 (yes); 0 (no)             |
|                    |         | TM-JB  | 0.710            | Terminal-Aircraft transfer by jet bridge    | 1 (yes); 0 (no)             |
|                    |         | DFD    | −0.008           | Delay of flight departure (min.)            | 0; 20; 60                   |
|                    |         | TLD    | −0.431           | Time spent for luggage delivery (min.)      | 0; 10; 30                   |
|                    |         | CT     | −0.002           | Cost of the ticket (€)                      | 20; 60; 180; 360; 720; 1440 |

**Table 5.** Attribute levels considered and prior parameters as input of Ngene for “during the flight” experiment.

| Utility Function   |         | Coeff. | Prior Parameters | Attributes                              | Levels                          |
|--------------------|---------|--------|------------------|---|---------------------------------|
| Pilot survey       | U(Alt.) | SOB-FA | 1.100            | Space available on board fully adequate | 1 (yes); 0 (no)                 |
|                    |         | SOB-A  | 0.000 (fixed)    | Space available on board adequate       | 1 (yes); 0 (no)                 |
|                    |         | SOB-NA | −1.000           | Space available on board not adequate   | 1 (yes); 0 (no)                 |
|                    |         | TOB-A  | 1.000            | Temperature on board adequate           | 1 (yes); 0 (no)                 |
|                    |         | TOB-C  | 0.000 (fixed)    | Temperature on board too cold           | 1 (yes); 0 (no)                 |
|                    |         | TOB-W  | −1.100           | Temperature on board too warm           | 1 (yes); 0 (no)                 |
|                    |         | COB    | 1.000            | Cleanliness on board                    | 1(clean enough); 0(quite dirty) |
|                    |         | CCC    | 1.100            | Courtesy of cabin crew                  | 1(kind enough); 0(quite rude)   |
|                    |         | SB-FA  | 1.000            | Services on board fully adequate        | 1 (yes); 0 (no)                 |
|                    |         | SB-A   | 0.000 (fixed)    | Services on board adequate              | 1 (yes); 0 (no)                 |
|                    |         | SB-NA  | −1.100           | Services on board not adequate          | 1 (yes); 0 (no)                 |
|                    |         | CT     | −0.020           | Cost of the ticket (€)                  | 20; 60; 180; 360; 720; 1440     |
| Large-scale survey | U(Alt.) | SOB-FA | 0.354            | Space available on board fully adequate | 1 (yes); 0 (no)                 |
|                    |         | SOB-A  | 0.000 (fixed)    | Space available on board adequate       | 1 (yes); 0 (no)                 |
|                    |         | SOB-NA | −0.906           | Space available on board not adequate   | 1 (yes); 0 (no)                 |
|                    |         | TOB-A  | 0.496            | Temperature on board adequate           | 1 (yes); 0 (no)                 |
|                    |         | TOB-C  | 0.000 (fixed)    | Temperature on board too cold           | 1 (yes); 0 (no)                 |
|                    |         | TOB-W  | −0.741           | Temperature on board too warm           | 1 (yes); 0 (no)                 |
|                    |         | COB    | 3.133            | Cleanliness on board                    | 1(clean enough); 0(quite dirty) |
|                    |         | CCC    | 0.261            | Courtesy of cabin crew                  | 1(kind enough); 0(quite rude)   |
|                    |         | SB-FA  | 0.250            | Services on board fully adequate        | 1 (yes); 0 (no)                 |
|                    |         | SB-A   | 0.000 (fixed)    | Services on board adequate              | 1 (yes); 0 (no)                 |
|                    |         | SB-NA  | −0.902           | Services on board not adequate          | 1 (yes); 0 (no)                 |
|                    |         | CT     | −0.018           | Cost of the ticket (€)                  | 20; 60; 180; 360; 720; 1440     |

Once the efficient design of the large-scale SP had been completed, the questionnaire was digitally reported in “Google Forms”, the free survey administration app included in Google Drive office suite. Figure 1 shows an example of a “before/after the flight” choice scenario, and Figure 2 an example of a “during the flight” situation.

H1.1 If you had to travel on a SHORT-HAUL flight (LESS THAN 2 HOURS), which of these alternatives would you choose?

|                                    | Alternative A<br><input type="radio"/> | Alternative B<br><input type="radio"/> |
|------------------------------------|--|--|
| Waiting time at check-in           | 0 minutes (online check-in)            | 5 minutes                              |
| Time spent for boarding operations | 40 minutes                             | 10 minutes                             |
| Terminal-Aircraft transfer mode    | by external path                       | by jet-way                             |
| Delay of flight departure          | 60 minutes                             | 0 minutes (in time)                    |
| Time spent for luggage delivery    | 10 minutes                             | 10 minutes                             |
| Cost of the ticket                 | 20 €                                   | 20 €                                   |

**Figure 1.** Example of a “before/after the flight” choice scenario.

H4.3 If you had to travel on a LONG-HAUL flight (MORE THAN 6 HOURS), which of these alternatives would you choose?

|                          | Alternative A<br><input type="radio"/> | Alternative B<br><input type="radio"/> |
|--------------------------|--|--|
| Space available on board | adequate                               | not fully adequate                     |
| Temperature on board     | adequate                               | too warm                               |
| Cleanliness on board     | clean enough                           | quite dirty                            |
| Cabin crew               | kind enough                            | quite rude                             |
| Services on board        | adequate                               | not fully adequate                     |
| Cost of the ticket       | 1440 €                                 | 720 €                                  |

**Figure 2.** Example of a “during the flight” choice scenario.

### 3.2. Characterization of Collected Data

The launch of the large-scale survey occurred by sending the link to the questionnaire by email. The interviewees were contacted through their institutional email, supplied by the University of Calabria. To better introduce them to the survey, the email message also had an exhaustive description of the research project, including a presentation of the research team, and scope and objectives of the survey. Finally, the anonymity and compliance with privacy rules were guaranteed. The data collection period began on 25 March 2019 and ended on 30 July. During those months, a reminder was sent 40 days after the start date. The mailing list contained about 29,000 contacts, including professors, researchers, administrative and technical staff, and students. At the end of the collection period, the completed questionnaires were 1907. This number greatly exceeds the sample size estimated in the



survey design phase through the S-estimate parameter. The descriptive socio-demographic distribution of the sample is presented in Table 6.

**Table 6.** Descriptive statistics of population and sample.

| Category   | Sub-Category                       | Sample   |       |
|------------|------------------------------------|----------|-------|
|            |                                    | <i>n</i> | %     |
| Gender     | Male                               | 738      | 38.7  |
|            | Female                             | 1144     | 60.0  |
|            | No answer                          | 25       | 1.3   |
|            | Total                              | 1907     | 100.0 |
| Age        | Between 18 and 25                  | 1148     | 60.2  |
|            | Between 26 and 30                  | 333      | 17.5  |
|            | Between 31 and 40                  | 127      | 6.7   |
|            | Between 41 and 50                  | 137      | 7.2   |
|            | Between 51 and 60                  | 115      | 6.0   |
|            | More than 60                       | 47       | 2.5   |
|            | Total                              | 1907     | 100.0 |
| Occupation | Technical and administrative staff | 168      | 8.8   |
|            | Professors and researchers         | 206      | 10.8  |
|            | Students                           | 1533     | 80.4  |
|            | Total                              | 1907     | 100.0 |

By observing the distributions of gender sub-categories, there is a prevalence of females over males. The highest percentage of respondents (60.2%) is between 18 and 25 years old, followed by those between 26 and 30 years old (17.5%). As regards occupation, the major part of the sample is composed of students (80.4 %), followed by professors and researchers (10.8%), and then by technical and administrative staff (8.8%).

#### 4. Results

The data collected through the large-scale survey were used as input to calibrate MNL models through NLogit software. The models were used for merely estimating the effect of each variable on the expected service quality in a before and after the flight situation (Table 7) and during the flight as well (Table 8). MNL models, which are the simplest among the Logit models, were estimated with the aim to have a reference for more complex models, which will be the object of future works. The estimation process considered all the variables and almost all of them resulted with the correct sign and with a high statistical significance. By observing the results reported in Table 7, the negative signs relate to those attributes whose increase reduces the utility of the choice alternative. Specifically, among them, those with the highest weights are “waiting time at check-in” and “time spent for luggage delivery”. This result is interesting because it identifies one temporal attribute belonging to “before the flight” experience and one belonging to “after the flight” experience as crucial for the traveler. As regards the Terminal-Aircraft transfer mode, those by external path were considered as the reference value and equal to 0. Instead, the transfers by jet bridge and by shuttle present positive signs and very high values. So, a more comfortable transfer mode from the terminal to the aircraft (before the flight) and vice versa (after the flight) resulted as a key factor for a traveler.

Interesting findings emerged for the travel experience during the flight (Table 8) as well.

Even in this case, the coefficient related to the cost has a correctly negative sign. The space available on board reduces the utility of the alternative when it is not fully adequate. The adequate temperature on board is the attribute with the highest positive value. Finally, a kinder cabin crew, cleanliness, and adequate provided services on board increase the utility of the alternative.

**Table 7.** Multinomial logit considering “before/after the flight” attributes.

| Variable                                 | Coefficient ( $\beta$ ) | z        | p [ $ z  > Z^*$ ] |
|--|-------------------------|----------|-------------------|
| Waiting time at check-in                 | −0.278                  | −17.15   | 0.000             |
| Time spent for boarding operations       | −0.043                  | −33.24   | 0.000             |
| Terminal-Aircraft transfer by jet bridge | 1.747                   | 30.34    | 0.000             |
| Terminal-Aircraft transfer by shuttle    | 1.670                   | 30.30    | 0.000             |
| Delay of flight departure                | −0.031                  | −44.23   | 0.000             |
| Time spent for luggage delivery          | −0.139                  | −16.08   | 0.000             |
| Cost of the ticket                       | −0.006                  | −43.42   | 0.000             |
| Log-likelihood function                  |                         | −7045.21 |                   |

**Table 8.** Multinomial logit considering “during the flight” attributes.

| Variable                                    | Coefficient ( $\beta$ ) | z        | p [ $ z  > Z^*$ ] |
|---|-------------------------|----------|-------------------|
| Space available on board not fully adequate | −0.600                  | −16.71   | 0.000             |
| Space available on board adequate           | −0.098                  | −3.85    | 0.000             |
| Temperature on board adequate               | 0.921                   | 33.61    | 0.000             |
| Cleanliness on board                        | 0.200                   | 1.97     | 0.048             |
| Courtesy of cabin crew                      | 0.287                   | 15.01    | 0.000             |
| Services on board adequate                  | 0.086                   | 2.68     | 0.007             |
| Cost of the ticket                          | −0.002                  | −7.17    | 0.000             |
| Log-likelihood function                     |                         | −9567.79 |                   |

## 5. Discussion and Conclusions

The aim of this paper was to investigate on airline passengers’ preferences to pursue the most convenient strategy for increasing their satisfaction and improving the provided service. We proposed the design of an SP survey and the preliminary outcomes obtained from the analysis of the collected data. After a preliminary analysis of the literature review, a pilot SP survey was conducted, and through an efficient design, the final version of the questionnaire was obtained. The whole population of University of Calabria was involved for the large-scale survey. From the calibration of MNL models we had the possibility to observe the effects of each service attribute on expected quality.

Interesting findings emerge from the analysis of the results. By considering the travel experience before and after the flight, it emerges that air travelers give more importance to the transfer mode connecting the terminal and aircraft, and to the waiting times. Specifically, the highest positive coefficient resulted for transfer by jet-bridge suggests that a direct and protect path from the terminal to the aircraft and vice versa is highly appreciated by the air travelers. Moreover, the highest negative weights obtained by the waiting time at check-in before the flight and by the luggage delivery after the flight suggest that people suffer for time lost for ground operations. These lost times are peculiar of the air transport mode; in fact, air passengers experience travel stages that passengers of other public transport modes, such as road and rail transit systems, do not know. On the contrary, the delay of flight departure has the lowest weight, maybe because the traveler has a different definition of “time lost” once she/he gets on board. If we compare this situation with the other transit systems, we have to recognize that the service attributes linked to the delay, such as punctuality of the runs, are among the most important attributes for the passengers [68,69]. As regards the travel experience during the flight, the most important service aspects are those related to comfort, like the space available on board and the temperature. Additionally, cleanliness on board and courtesy of cabin crew are essential. Regarding comfort, we can affirm that comfort on board can be surely considered as a very important service aspect affecting transit service quality in general, from the bus to the airplane [70]. In both models, the cost of the ticket assumes minor relevance, maybe thanks to the low-cost companies. Anyway, in general, ticket cost is not considered as the most relevant service attribute for the passengers of transit systems, who considered as fundamental several other aspects that characterize a transit service.

One of the potential limitations of the work could regard the generalizability of the findings to a broader general population, being that the survey was addressed to a sample of university staff and students. Although there was an attempt to insert other categories of people (e.g., professors), 94% of the sample is composed of students, who represent a particular category of subjects, with certain preferences and tastes. A future development of the research could regard an extension of the survey to other groups of people, who could be easily reached through social networks such as Facebook.

In fact, this work and its preliminary outcomes want to be just the beginning of more in-depth research. Based on the results obtained right now, thanks to the use of an SP survey and from the resulting data, it was possible to identify the variables most highly valued by air travelers. Knowledge of these variables can help the airlines to adopt smart strategies for improving their services.

**Author Contributions:** M.G.B.: Formal analysis, data curation, writing—original draft, writing—review & editing. L.d.: Conceptualization, methodology, writing—original draft, writing—review & editing, supervision. L.E.: Methodology, formal analysis, writing—original draft, writing—review & editing, supervision. C.F.: Formal analysis, data curation, writing—original draft, writing—review & editing. G.M.: Methodology, formal analysis, writing—original draft, writing—review & editing, supervision. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Acknowledgments:** The authors would like to give special thanks to the participants to the panel of experts and the pilot survey for their valuable contribution.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- Alonso, B.; Barreda, R.; Dell'Olio, L.; Ibeas, A. Modelling user perception of taxi service quality. *Transp. Policy* **2018**, *63*, 157–164. [\[CrossRef\]](#)
- Rojo, M.; Dell'Olio, L.; Gonzalo-Orden, H.; Ibeas, Á. Interurban bus service quality from the users' viewpoint. *Transp. Plan. Technol.* **2013**, *36*, 599–616. [\[CrossRef\]](#)
- Parasuraman, A.; Zeithaml, V.; Berry, L. SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality. *J. Retail.* **1988**, *64*, 12–40.
- Bellizzi, M.G.; dell'Olio, L.; Eboli, L.; Mazzulla, G. Heterogeneity in desired bus service quality from users' and potential users' perspective. *Transp. Res. Part A Policy Pract.* **2020**, *132*, 365–377. [\[CrossRef\]](#)
- Airport Cooperative Research Program. *ACRP Report 157 Improving the Airport Customer Experience*; Transportation Research Board: Washington, DC, USA, 2016.
- Choicemetrics. *Ngene 1.2 User Manual & Reference Guide*; Australia, 2018. Available online: <http://www.choice-metrics.com/NgeneManual120.pdf> (accessed on 4 June 2020).
- Louviere, J.J.; Hensher, D.A.; Swait, J.D. *Stated Choice Methods. Analysis and Application*; Cambridge University Press: Cambridge, UK, 2000.
- Greene, W.H. *Nlogit Reference Guide: Version 6.0*; Econometric Software Inc.: Plainview, NY, USA, 2016.
- Allen, J.; Eboli, L.; Forciniti, C.; Mazzulla, G.; de Ortúzar, J.D. The role of critical incidents and involvement in transit satisfaction and loyalty. *Transp. Policy* **2019**, *75*, 57–69. [\[CrossRef\]](#)
- Dell'olio, L.; Ibeas, Á.; de Oña López, J.; de Oña López, R. (Eds.) *Public Transportation Quality of Service: Factors, Models, and Applications*, 1st ed.; Elsevier: Amsterdam, The Netherlands, 2018.
- Eboli, L.; Forciniti, C.; Mazzulla, G. Spatial variation of the perceived transit service quality at rail stations. *Transp. Res. Part A Policy Pract.* **2018**, *114*, 67–83. [\[CrossRef\]](#)
- Tsaur, S.H.; Chang, T.Y.; Yen, C.H. The evaluation of airline service quality by fuzzy MCDM. *Tour Manag.* **2002**, *23*, 107–115. [\[CrossRef\]](#)
- Aksoy, S.; Atilgan, E.; Akinci, S. Airline services marketing by domestic and foreign firms: Differences from the customers' viewpoint. *J. Air Transp. Manag.* **2003**, *9*, 345–351. [\[CrossRef\]](#)
- Park, J.W.; Robertson, R.; Wu, C.L. The effect of airline service quality on passengers' behavioural intentions: A Korean case study. *J. Air Transp. Manag.* **2004**, *10*, 435–439. [\[CrossRef\]](#)
- Park, J.W.; Robertson, R.; Wu, C.L. The Effects of Individual Dimensions of Airline Service Quality: Findings from Australian Domestic Air Passengers. *J. Hosp. Tour. Manag.* **2006**, *13*, 161–176. [\[CrossRef\]](#)

16. Park, J.W. Passenger perceptions of service quality: Korean and Australian case studies. *J. Air Transp. Manag.* **2007**, *13*, 238–242. [[CrossRef](#)]
17. Chou, C.C.; Liu, L.J.; Huang, S.F.; Yih, J.M.; Han, T.C. An evaluation of airline service quality using the fuzzy weighted SERVQUAL method. *Appl. Soft Comput.* **2011**, *11*, 2117–2128. [[CrossRef](#)]
18. Kuo, M.S. A novel interval-valued fuzzy MCDM method for improving airlines' service quality in Chinese cross-strait airlines. *Transp. Res. Part E* **2011**, *47*, 1177–1193. [[CrossRef](#)]
19. Liou, J.J.H.; Hsu, C.C.; Yeh, W.C.; Lin, R.H. Using a modified grey relation method for improving airline service quality. *Tour Manag.* **2011**, *32*, 1381–1388. [[CrossRef](#)]
20. Liou, J.J.H.; Tsai, C.Y.; Lin, R.H.; Tzeng, G.H. A modified VIKOR multiple-criteria decision method for improving domestic airlines service quality. *J. Air Transp. Manag.* **2011**, *17*, 57–61. [[CrossRef](#)]
21. Wang, R.; Hsu, S.L.; Lin, Y.H.; Tseng, M.L. Evaluation of customer perceptions on airline service quality in uncertainty. *Procedia Soc. Behav. Sci.* **2011**, *25*, 419–437. [[CrossRef](#)]
22. De Jager, J.W.; Van Zyl, D.; Toriola, A.L. Airline service quality in South Africa and Italy. *J. Air Transp. Manag.* **2012**, *25*, 19–21. [[CrossRef](#)]
23. Wu, H.C.; Cheng, C.C. A hierarchical model of service quality in the airline industry. *J. Hosp. Tour. Manag.* **2013**, *20*, 13–22. [[CrossRef](#)]
24. Hu, K.C.; Hsiao, M.W. Quality risk assessment model for airline services concerning Taiwanese airlines. *J. Air Transp. Manag.* **2016**, *53*, 177–185. [[CrossRef](#)]
25. Jiang, H.; Zhang, Y. An assessment of passenger experience at Melbourne Airport. *J. Air Transp. Manag.* **2016**, *54*, 88–92. [[CrossRef](#)]
26. Ghorabae, M.K.; Amiri, M.; Zavadskas, E.K.; Turskis, Z.; Antucheviciene, J. A new hybrid simulation-based assignment approach for evaluating airlines with multiple service quality criteria. *J. Air Transp. Manag.* **2017**, *63*, 45–60. [[CrossRef](#)]
27. Lim, S.S.; Tkaczynski, A. Origin and money matter: The airline service quality expectations of international students. *J. Hosp. Tour. Manag.* **2017**, *31*, 244–252. [[CrossRef](#)]
28. Farooq, M.S.; Salam, M.; Fayolle, A.; Jaafar, N.; Ayupp, K. Impact of service quality on customer satisfaction in Malaysia airlines: A PLS-SEM approach. *J. Air Transp. Manag.* **2018**, *67*, 169–180. [[CrossRef](#)]
29. Medina-Muñoz, D.R.; Medina-Muñoz, R.D.; Suárez-Cabrera, M.A. Determining important attributes for assessing the attractiveness of airlines. *J. Air Transp. Manag.* **2018**, *70*, 45–56. [[CrossRef](#)]
30. Tsafarakis, S.; Kokotas, T.; Pantouvakis, A. A multiple criteria approach for airline passenger satisfaction measurement and service quality improvement. *J. Air Transp. Manag.* **2018**, *68*, 61–75. [[CrossRef](#)]
31. Pakdil, F.; Aydın, O. Expectations and perceptions in airline services: An analysis using weighted SERVQUAL scores. *J. Air Transp. Manag.* **2007**, *13*, 229–237. [[CrossRef](#)]
32. Wong, J.Y.; Chung, P.H. Managing valuable Taiwanese airline passengers using knowledge discovery in database techniques. *J. Air Transp. Manag.* **2007**, *13*, 362–370. [[CrossRef](#)]
33. Chen, C.F. Investigating structural relationships between service quality, perceived value, satisfaction, and behavioural intentions for air passengers: Evidence from Taiwan. *Transp. Res. Part A Policy Pract.* **2008**, *42*, 709–717. [[CrossRef](#)]
34. Chang, Y.H.; Yeh, C.H. A survey analysis of service quality for domestic airlines. *Eur. J. Oper. Res.* **2002**, *139*, 166–177. [[CrossRef](#)]
35. Gilbert, D.; Wong, R.K.C. Passenger expectations and airline services: A Hong Kong based study. *Tour Manag.* **2003**, *24*, 519–532. [[CrossRef](#)]
36. Wen, C.H.; Lai, S.C. Latent class models of international air carrier choice Chieh-Hua. *Transp. Res. Part E* **2010**, *46*, 211–221. [[CrossRef](#)]
37. Wen, C.H.; Chen, T.N.; Fu, C. A factor-analytic generalized nested logit model for determining market position of airlines. *Transp. Res. Part A Policy Pract.* **2014**, *62*, 71–80. [[CrossRef](#)]
38. Hussain, R.; Al Nasser, A.; Hussain, Y.K. Service quality and customer satisfaction of a UAE-based airline: An empirical investigation. *J. Air Transp. Manag.* **2015**, *42*, 167–175. [[CrossRef](#)]
39. Lucini, F.R.; Tonetto, L.M.; Fogliatto, F.S.; Anzanello, M.J. Text mining approach to explore dimensions of airline customer satisfaction using online customer reviews. *J. Air Transp. Manag.* **2020**, *83*. [[CrossRef](#)]
40. Liou, J.J.H.; Tzeng, G.H. A non-additive model for evaluating airline service quality. *J. Air Transp. Manag.* **2007**, *13*, 131–138. [[CrossRef](#)]

41. Espino, R.; Martin, J.C.; Roman, C. Analyzing the effect of preference heterogeneity on willingness to pay for improving service quality in an airline choice context. *Transp. Res. Part E* **2008**, *44*, 593–606. [CrossRef]
42. Martin, R.; Roman, C.; Espino, R. Evaluating frequent flyer programs from the air passengers' perspective. *J. Air Transp. Manag.* **2011**, *17*, 364–368. [CrossRef]
43. Basfirinci, C.; Mitra, A. A cross cultural investigation of airlines service quality through integration of SERVQUAL and the Kano model. *J. Air Transp. Manag.* **2015**, *42*, 239–248. [CrossRef]
44. Leong, L.Y.; Hew, T.S.; Lee, V.H.; Ooi, K.B. An SEM-artificial-neural-network analysis of the relationships between SERVPERF, customer satisfaction and loyalty among low-cost and full-service airline. *Expert Syst. Appl.* **2015**, *42*, 6620–6634. [CrossRef]
45. Tahanisaz, S.; Shokuhyar, S. Evaluation of passenger satisfaction with service quality: A consecutive method applied to the airline industry. *J. Air Transp. Manag.* **2020**, *83*, 101764. [CrossRef]
46. Suki, N.M. Passenger satisfaction with airline service quality in Malaysia: A structural equation modeling approach. *Res. Transp. Bus. Manag.* **2014**, *10*, 26–32. [CrossRef]
47. Li, W.; Yu, S.; Pei, H.; Zhao, C.; Tian, B. A hybrid approach based on fuzzy AHP and 2-tuple fuzzy linguistic method for evaluation in-flight service quality. *J. Air Transp. Manag.* **2017**, *60*, 49–64. [CrossRef]
48. Chen, F.Y.; Chang, Y.H. Examining airline service quality from a process perspective. *J. Air Transp. Manag.* **2005**, *11*, 79–87. [CrossRef]
49. Lu, J.L.; Ling, F.I. Cross-cultural perspectives regarding service quality and satisfaction in Chinese cross-strait airlines. *J. Air Transp. Manag.* **2008**, *14*, 16–19. [CrossRef]
50. Erdil, S.T.; Yıldız, O. Measuring service quality and a comparative analysis in the passenger carriage of airline industry. *Procedia Soc. Behav. Sci.* **2011**, *24*, 1232–1242. [CrossRef]
51. Kos Koklic, M.; Kukar-Kinney, M.; Vegelj, S. An investigation of customer satisfaction with low-cost and full-service airline companies. *J. Bus. Res.* **2017**, *80*, 188–196. [CrossRef]
52. Balcombe, K.; Fraser, I.; Harris, L. Consumer willingness to pay for in-flight service and comfort levels: A choice experiment. *J. Air Transp. Manag.* **2009**, *15*, 221–226. [CrossRef]
53. Prentice, C.; Kadan, M. The role of airport service quality in airport and destination choice. *J. Retail. Consum. Serv.* **2019**, *47*, 40–48. [CrossRef]
54. Allen, J.; Bellizzi, M.G.; Eboli, L.; Forciniti, C.; Mazzulla, G. Service quality in a mid-sized air terminal: A SEM-MIMIC ordinal probit accounting for travel, sociodemographic, and user-type heterogeneity. *J. Air Transp. Manag.* **2020**, *84*, 101780. [CrossRef]
55. Bellizzi, M.G.; Eboli, L.; Mazzulla, G. Air Transport Service Quality Factors: A Systematic Literature Review. *Transp. Res. Proc.* **2020**, *45*, 218–225. [CrossRef]
56. Hensher, D.A.; Stopher, P.R.; Louviere, J.J. An exploratory analysis of the effect of numbers of choice sets in designed choice experiments: An airline choice application. *J. Air Transp. Manag.* **2001**, *7*, 373–379. [CrossRef]
57. Bliemer, M.C.J.; Rose, J.M. Experimental design influences on stated choice outputs: An empirical study in air travel choice. *Transp. Res. Part A Policy Pract.* **2011**, *45*, 63–79. [CrossRef]
58. Hess, S.; Adler, T.; Polak, J.W. Modelling airport and airline choice behaviour with the use of stated preference survey data. *Transp. Res. Part E* **2007**, *43*, 221–233. [CrossRef]
59. Hess, S. Treatment of reference alternatives in stated choice surveys for air travel choice behaviour. *J. Air Transp. Manag.* **2008**, *14*, 275–279. [CrossRef]
60. Shaheen, S.; Cohen, A.; Farrar, E. *The Potential Societal Barriers of Urban Air Mobility (UAM)*; Transportation Sustainability Research Center: Berkeley, CA, USA, 2018; Available online: <https://escholarship.org/uc/item/7p69d2bg> (accessed on 25 May 2020).
61. Reiche, C.; Goyal, R.; Cohen, A.; Serrao, J.; Kimmel, S.; Fernando, C.; Shaheen, S. *Urban Air Mobility Market Study*; Transportation Sustainability Research Center: Berkeley, CA, USA, 2018; Available online: <https://escholarship.org/uc/item/0fz0x1s2> (accessed on 25 May 2020). [CrossRef]
62. Cherchi, E.; Hensher, D. Workshop synthesis: Stated preference surveys and experimental design, an audit of the journey so far and future research perspectives. *Transp. Res. Proc.* **2015**, *11*, 154–164. [CrossRef]
63. Dell'olio, L.; Ibeas, A.; Cecin, P. The quality of service desired by public transport users. *Transp. Policy* **2011**, *18*, 217–227. [CrossRef]
64. Echaniz, E.; Ho, C.Q.; Rodriguez, A.; dell'Olio, L. Comparing best-worst and ordered logit approaches for user satisfaction in transit services. *Transp. Res. Part A Policy Pract.* **2019**, *130*, 752–769. [CrossRef]

65. Echaniz, E.; Ho, C.; Rodriguez, A.; dell'Olio, L. Modelling user satisfaction in public transport systems considering missing information. Available online: <https://link.springer.com/article/10.1007/s11116-019-09996-4> (accessed on 25 May 2020).
66. Cascajo, R.; Garcia-Martinez, A.; Monzon, A. Stated preference survey for estimating passenger transfer penalties: Design and application to Madrid. *Eur. Transp. Res. Rev.* **2017**, *9*, 42. [[CrossRef](#)]
67. Rose, J.M.; Bliemer, M.; Hensher, D.; Collins, A. Designing efficient stated choice experiments in the presence of reference alternatives. *Transp. Res. Part B Methodol.* **2008**, *42*, 395–406. [[CrossRef](#)]
68. Allen, J.; Eboli, L.; Mazzulla, G.; de Ortúzar, J.D. Effect of critical incidents on public transport satisfaction and loyalty: An ordinal Probit SEM-MIMIC approach. *Transportation* **2020**, *47*, 827–863. [[CrossRef](#)]
69. Eboli, L.; Forciniti, C.; Mazzulla, G. Formative and reflective measurement models for analyzing transit service. *Public Transp. Plan. Oper.* **2018**, *10*, 107–127. [[CrossRef](#)]
70. Eboli, L.; Mazzulla, G.; Pungillo, G. Measuring Bus Comfort Levels by using Acceleration Instantaneous Values. *Transp. Res. Proc.* **2016**, *18*, 27–34. [[CrossRef](#)]



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).