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## SERVICE QUALITY INDEX FOR BENCHMARKING AIRPORT PASSENGER TERMINALS


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## ABSTRACT

This paper proposes the concept of benchmarking for airport terminal facilities using an overall service quality index. A stated preference survey method is proposed to develop the overall service quality index. This concept underlines the fact that airports around the world have a wide variation in the level of facilities provided for passenger services and are interested to determine what facilities and configuration are required to reach a higher level of quality. A benchmarking index for terminal facilities can be used to objectively gauge the relative level in facility provision based on the variation in facilities among a comparable set of airports. This paper looks at the current state of the art and state of practice for benchmarking of airport terminals. Several limitations are identified with the current state of practice. A conceptual framework for a facility benchmarking index is proposed as a pragmatic approach to passenger terminal benchmarking. The conceptual framework is based on research still in progress.

*Keywords Benchmarking, Overall service quality, Passenger terminals, Contingent rating, Hierarchical information integration.*

## INTRODUCTION

Evaluating the current and proposed airport systems is a fundamental requirement for key stakeholders of airports. In particular airlines and passengers are given the ability to make choices than they previously did due to the trend of deregulation of the aviation industry. Therefore airport operators have started to feel the pressures of market competition and as a result they are increasingly in need of performance or quality assessment tools (Rhoades et al., 2000). Furthermore airport regulators also need to have specific measures to gauge the level of services and infrastructure provided at airports in order to apply better regulatory processes. Other stakeholders such as airlines would also be interested to assess the service standards of the airport in terms of airside congestion, turnaround delays and other financial performance indicators for decision making (Lemer, 1992). Airlines also are interested in the quality of service offered at the terminal building for their passengers and crew as it will complement the service standards maintained by the airline. Air passengers, are clearly the largest consumer of airport services. Passengers as stake holders of the airport would always prefer to have hassle free check in, comfortable waiting areas, ease of circulation and a variety of activities available at the airport. However the degree of choice they can make based on the performance of the airport for their travel options may be very limited. According to Graham (2008) key factors affecting the choice of airport for a passenger are about the nature of air services on offer in terms of fares, destinations and schedules. Nevertheless airport operators are becoming increasingly aware of the commercial and competitive advantages derived from managing service standards. Also they are motivated to maintain higher standards of service towards passengers in particular and other stakeholders in general due to its rise in importance as an effective marketing tool in a very competitive industry.

Benchmarking terminal facilities encourages managers to adopt better techniques focusing on passenger convenience as passengers demand higher standards of service and, where they have a choice, will choose the airports which give the best quality of service. Therefore this paper is proposing a new approach to developing an overall index for benchmarking airport passenger terminal service quality. This research is in progress, thus the intension of the paper is to discusses the applicability of a new methodology using contingent rating and hierarchical information integration (HII) as a practical approach for overall service quality evaluation and benchmarking of airport passenger terminals. Therefore the remainder of the paper is structured as follows: First we highlight the need for an overall index for benchmarking passenger terminal service quality. Then we review the state of the art in passenger terminal benchmarking and service quality evaluation techniques and the critical limitations. Afterwards we describe the proposed methodology and its implementation for solving the specific problem. Finally the advantages and the possible limitations of the new approach are discussed.

# THE NEED FOR AN OVERALL SERVICE QUALITY INDEX FOR BENCHMARKING

Benchmarking the relative provision of facilities is important for airports because it identifies priorities for improving the physical design of airports, world class standards for facilities, and provides basic data otherwise difficult to obtain (de Neufville, 1998). According to Francis et al. (2002) benchmarking has the potential to play an increasingly important role in performance management and improvement at airports given the pressures coming from changing ownership patterns, increased commercial focus, regulation, rapid passenger growth globalization of airport ownership, increased concern for the natural environment and technical innovation.

Overall measures would be very useful for planning (e.g., evaluation of building alternatives, regulation of privatized airports), management (planning improvements, goal setting and maintain adequate facilities) and benchmarking purposes (Correia and Wirasinghe, 2004). Further, operators are found to be using objective and subjective measurements to assess the performance of individual components such as entertainment facilities, baggage delivery, baggage trolleys, availability of disabled accessibility/assistance, availability of lifts/escalators/moving walkways/conveyors/stairs, etc (ACI, 2000). An overall facility index can aggregate all the individual evaluations to produce a single value that will give an overall assessment of the passenger terminal. Furthermore an unbiased index can be used to benchmark the overall passenger terminal. Also a good rating system can be used enhance the airport brand internationally and locally, which can be beneficial to the airport in terms of marketing and also to the local industries such as tourism.

As a result of growth in the airline industry there is an increase in hub formation by airlines in home airports as well as abroad. This trend gives passengers having a journey involving a transfer more control over their choice on airports when routing their journey. Since most hub airports operate close to 50% transfer traffic of their total passenger volume, choice for transit is ever more important for the airport operators who wish to capitalize on non aeronautical revenue. Transfer traffic accounted for close to 30% of total annual passenger traffic in the United States (RITA, 2011). Therefore a considerable number of passengers are there whose choice can be influenced provided they have correct information to compare airports based on the facilities offered. However there is a certain amount of speculation about the degree of choice passengers have when deciding their travel itinerary. Nevertheless today's air travelers have more meaningful choices among airports, and frequent flyers are knowledgeable about what is offered and what is lacking, and consequently there's an increasing urgency among airport marketers to differentiate themselves from the opposition (Fodness and Murray, 2005).

# SATE OF THE ART OF SERVICE QUALITY EVALUATION AND BENCHMARKING OF AIRPORTS

A survey done by Francis et al. (2001) using 58 airports revealed that 46% of the airports are using best practice benchmarking as a quality management technique. However the attention given to benchmarking service quality indicators is not comprehensive. Currently there are a few airport service quality surveys that rank airports based on passenger perception of service. The AETRA customer satisfaction survey (formally known as IATA Global Airport Monitor) measures passenger satisfaction across a wide range of service attributes derived from 50,000 interviews at 35 participating airports (ACI, 2004). Skytrax performs a web based customer survey of airport service quality based on past experience on overall airport experience and detail audits that will be ultimately used to give airports an overall star rank in a scale of one to five (Skytrax, 2012). J.D. Power and Associates perform a North American Airport Satisfaction Study based on passenger perception inputs for 27 attributes of six factors affecting overall passenger satisfaction(JD Power and Associates, 2010). Passenger feedback is important to gauge the effectiveness of the facility design from the customer perspective. However this information is of little use to airport planners and managers for specifically identifying the relevant level of facility provision required for different standards of service. The main limitation of the above approaches is the non existence of a formal model to relate facility provision to passenger perceived service quality. Therefore it is impossible to use the results of those evaluations to predict the expected improvement in service quality from an improvement strategy. Furthermore using post experience service quality ratings for benchmarking is questionable due to the fact that judgements made by the respondents are not based on a well defined range between a best and a worst level of the service (Oppewal and Marco, 2000). They are also not based on an explicit trade off between facilities as attributes of service quality. Therefore passengers and airlines as key stakeholders of airport terminal facilities require a more standard approach to benchmark service standards of terminals.

In addition to the above attempts to benchmark service quality at airport terminals, researchers and industry practitioners have done a considerable amount of work in terms of measuring various aspects of service quality. An extensive review of that work can be found else ware (Correia and Wirasinghe, 2004; Correia and Wirasinghe, 2010; de Barros et al., 2007; Zidarova and Zografos, 2011). Table 1 provides a list of previous work on measuring service quality at airport passenger terminals. According to Table 1, the scale of evaluation of service quality range from single facilities to overall terminal service quality. The state of the art provides valuable insight for understanding the dimensionality of the passenger perceived service quality, their relative importance and the structure of overall service quality perception. However most of the above methods evaluate the operational measurements (density, waiting time and walking distance) of individual terminal components (Check-in, holding areas, lounges and circulation) or integrated groups of them. Any efforts to encompass a global set of facilities are limited. Correia et al. (2008a) developed a global index for estimating level of service at airport passenger terminals. Passenger satisfaction level at individual components was correlated to the overall satisfaction level using a multiple linear regression model. Final variables that entered the model were curbside, check-in, lounge, orientation and purpose of travel. Rhoades et al. (2000) surveyed a group of airport operators and consultants on the relative importance of different terminal elements for determining the service qulity. This study gives an indication of relative importance of facilities, however they neither present a formal methodology to evaluate the quality of different attributes nor a model to represent overall service quality. Seitaro et al. (2012) studied airport passenger flow lines inside international terminal facilities and develops a flow line evaluation index that considers some physical characteristics of terminal facilities. They collected data on physical indices in restricted areas from 13 departure and 12 arrival terminals. Weightings were obtained for a set of passenger terminal evaluations items based on expert opinion. The sum of weighted evaluation items was defined as the total score. This methodology has the capability to compare the availability of facilities along flow lines of passenger terminals; however they have not defined service qulity standards based on the value of index. As it was pointed out previously, respondent's judgment not being based on full range of service and the response not based on explicit trade off are limitations for directly using above methods for benchmarking.

Table 1: Literature review summary

| **Title** | **Authors (year)** | **Type of metrics used to assess** | **Terminal elements covered** |
|---|---|---|---|
| Criteria for Evaluating Quality of Service in Air Terminals | Senevirathne and Martel (1994) | seat availability, walking distance, crowding density, waiting time, sight lines | waiting areas, circulation, Processing, way finding |
| Airport Passenger Terminal Planning and Design | TRB (2010). ACRP Report 25 | Density (level of service standards) | Check-in queue area , Waiting area, circulation, Hold rooms, baggage claim, government inspection |
| Development of a new orientation index for airport terminals | Dada and Wirasinghe (1999) | Walking distance, sightlines, level changes, decision points | Circulation, way finding |
| Quantifying and validating measures of airport terminal wayfinding. | Churchill et al. (2008) | Comparison of VI and VI(New) | Circulation, way finding |
| Analysis of Factors Influencing Quality of Service in Passenger Terminal Buildings | Martel and Senevirathne (1990) | Passenger perception/ ranking | Processing, circulation , waiting |
| Evaluation of level of service for transfer passengers at airports. | de Barros et al. (2007) | Passenger perception /quality rating | Circulation, information display, security , waiting areas, other amenities |
| A global index for level of service evaluation at airport passenger terminals | Correia et al. (2008a) | Passenger perception /quality rating | curbside, check-in, lounge, orientation |
| Degree of Importance of Airport Passenger Terminal Components and their Attributes | Correia et al. (2007) | Passenger perception /quality rating | Parking, departure hall, concessions, check-in, departure lunge |
| Developing a quality index for US airports | Rhoades et al. (2000) | Perception of importance from consultants and experts | Passenger service facilities, airport access, Intra-terminal transportation, airline-airport interface |
| Passengers' expectations of airport service quality | Fodness and Murray (2005) | Passenger perception indicators of frequent fliers | Multiple areas of passenger terminal service delivery |
| Evaluation of transportation level of service using fuzzy sets | Ndoh and Ashford (1994) | Passenger perception of quality attribute | Security inspection, check-in counter, passport control |

| **Title** | **Authors (year)** | **Type of metrics used to assess** | **Terminal elements covered** |
|---|---|---|---|
| A framework for evaluating level of service for airport terminals | Müller and Gosling (1991) | Waiting time, crowding (density) and passenger perception | Check-in counter |
| Development of level of service standards for airport facilities:Application to Sa˜o Paulo International Airport | Correia and Wirasinghe (2007) | Waiting time, processing time, crowding (density), passenger perception | Check-in counter |
| Analysis of Level of Service at Airport Departure Lounges: User Perception Approach | Correia and Wirasinghe (2008) | Availability of seats, crowding , passenger perception | Departure lounge |
| Level of service analysis for airport baggage claim with a case study of the Calgary International Airport. | Correia and Wirasinghe (2010) | Crowding, waiting time, passenger perception | Baggage claim |
| Overall level of service measures for airport passenger terminals | Correia et al. (2008b) | walking distance, total service time and two orientation measures, passenger perception | Circulation, processing,, way finding |
| Measuring the Level of Services at Airport Passenger Terminals: Comparison of Perceived and Observed Time | Yen et al. (2001) | Actual and perceived waiting time.<br>Actual and perceived processing time | Multiple processing functions |
| Effects of Spatial Congestion on the Level of Service at Airport Passenger Terminals | Yen and Teng (2003) | Actual and perceived space availability | Waiting areas |
| Level of Service Design Concept for Airport Passenger Terminals: A European View | Ashford (1988) | Waiting time | Check-in, baggage claim |
| Efficient use of airport capacity | Fernandes and Pacheco (2002) | Space provided, Number of parking slots, number of check-in counters | curb front, departure lounge, baggage claim area and apron area |
| Evaluating passenger services of Asia-Pacific international airports | Yeh and Kuo (2003) | Passenger perception | comfort, processing time, convenience, courtesy of staff, information visibility, security |

This study has identified the following gaps in the state of the art for benchmarking passenger terminal service quality:

1. Lack of specific classification of airports: This deficiency leads to comparison of airports that are incomparable in terms of overall facility configuration and size.
2. Lack of a properly defined criterion to rate different types and configurations of terminal facilities: None of the current ranking/rating indices provide direct relationships to index value and level of facility provision. Therefore the index cannot be used to predict any expected outcome in order to determine an appropriate improvement strategy.
3. Lack of an overall benchmarking index: An overall index has to consider the set of the most important primary and secondary facilities in all functional areas (holding, circulation and processing) of the passenger terminal. Lack of an overall index has lead to benchmarking being unattractive to passengers and the general community.

The attention of this paper is to develop an overall index that overcomes some of the limitations found in current methods for benchmarking service quality of terminals. A stated preference method with hierarchical information integration (HII) design is proposed to establish a user preference model base on a set of service quality attributes. It is the strong belief of this research that this overall index will close the knowledge gap and also push forward the state of the art in passenger terminal service quality evaluation.

# PROPOSED METHODOLOGY

For larger airports, the arrangement of facilities is very complicated. In order to provide an overall index for service quality evaluation, it is necessary to specify the type of movement in question (Correia et al., 2008a). Each of these groups will have a different set of needs and wishes and, in many cases, will even make use of different facilities. For example, departing passengers will not make use of the baggage claim facilities, whereas arriving passengers will not use the enplaning curbside or the check-in lobby. Therefore, each movement type will have a quality of service of service index which is global in the sense that it encompasses the passenger's full airport experience. Therefore this research study will consider each passenger type separately. Considering each passenger type, terminal facilities will be categorized into functional groups. Table 2 show the functional categories identified under each passenger type.

## Stated preference survey

A contingent rating exercise will be designed to obtain the relative importance weights of different facility attributes and to establish a relationship between the level of facility attributes and an overall service quality ranking. In a contingent rating exercise respondents are presented with a number of scenarios one at a time and are asked to rate each one individually on a semantic or numeric scale (Bateman, 2002). Each scenario is varied by changing the attribute levels or in other words the service quality delivered by different facilities considered for the survey. Use of a rating scale is an advantage compared to the choice experiments and contingent ranking methods given the objective of the experiment is to obtain an index of service quality.

Table 2: Functional categories of terminal facilities

| Passenger type | Facility functional categories |
|---|---|
| Arriving passengers | 1. Passenger circulation within the terminal building<br>2. Baggage claim<br>3. Common amenities within the terminal building<br>4. Curb front facilities for vehicle circulation<br>5. Curb front facilities for passenger circulation |
| Departing passengers | 1. Curb front vehicle and passenger facilities<br>2. Passenger circulation at curb<br>3. Ticketing/check in area<br>4. Primary security check<br>5. Gate lounge and common lounge<br>6. Common Amenities<br>7. Circulation within flight interface |
| Transfer passengers | 1. Gate lounge and common lounge<br>2. Common Amenities<br>3. Circulation in Flight interface |

Airports generally contain a large number of facilities for serving various needs of an air traveler. Even after selecting the most important set of facilities for overall service quality, the list can be considerably large. An important practical limitation of stated preference applications is that as the number of attributes and attribute levels increases, the size and complexity of the experimental task increases exponentially (Hensher, 1990; Louviere, 1984; Molin and Timmermans, 2009). The implication of increased size of the experimental task is that respondents have to evaluate more hypothetical profiles and more attributes per alternative with possible information overload (Louviere, 1984; Molin and Timmermans, 2009; Ramirez and Manuel, 2010). To overcome this problem Louviere (1984) proposed the Hierarchical Information Integration (HII) method. HII assumes that when decision makers have to evaluate complex decision alternatives involving many influencing attributes, they first classify the attributes into a set of higher order constructs (categories). These higher order decision constructs are made up of individual attributes (elemental attributes). Then the decision maker would make impressions of the higher order categories using the level of attributes before integrating these impressions into an overall preference. Figure 1 shows the hierarchical structure assumed under HII for modeling the overall quality response of a respondent by taking Arriving passengers as an example.

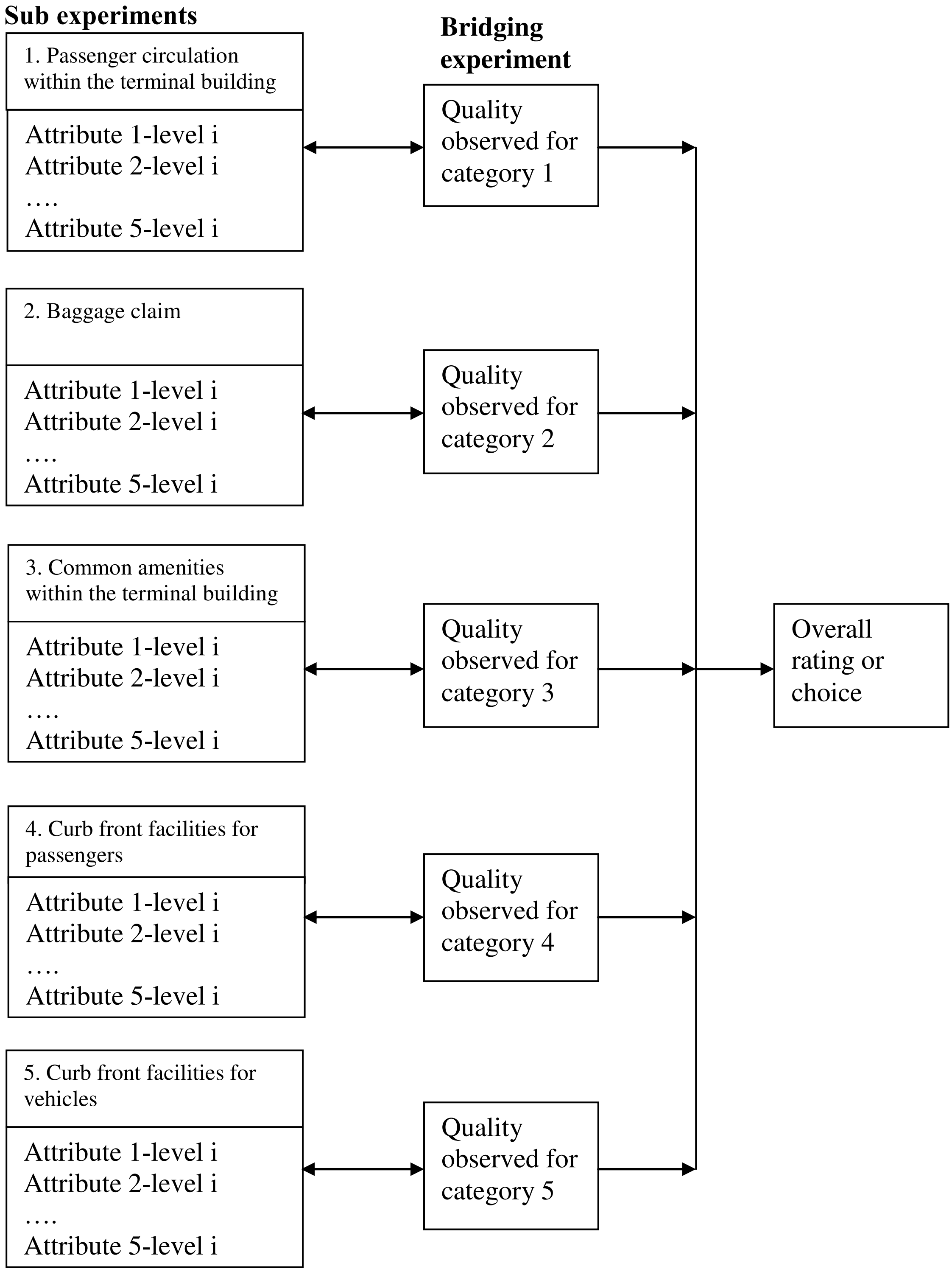


Figure 1 – Structure of the HII experiment for the overall service quality of arriving passengers , Source: Molin and Timmermans (2009)

Hensher (1990) used this approach to develop a bus preference model for public bus services in New South Wales, Australia. His experimental design contained four decision constructs with up to five elemental attributes in each. Hensher's model was capable of retrieving the current satisfaction rating as well as predicting any satisfaction rating for expected future improvements, hence provided directions for future improvements to increase customer satisfaction for public bus services. Hensher used ordered Probit models to develop models for decision constructs as well as the bridging experiment. He questioned the used of ordinary least squire regression for analyzing the categorical response data, due to the implicit assumption of cardinality associated with the analysis.

Chiang et al. (2003) used hierarchical information integrated (HII) stated preference experiments to model the effect of destination attributes on intercity travelers' mode choice behaviors. They used four decision constructs such as service quality, transfer quality, information quality and environmental quality. The total number of attributes evaluated was 17 with up to six attributes per decision construct. However they used a choice exercise for the bridging experiment rather than using rating method. They used multiple regression analysis to describe the rating data from the four sub-experiments as a function of the attributes. Binary logit model was used to model the choice data from the overall design. Cornelia and Stephan (2011) used the HII approach to model the influences of service quality on mode choice between a regional train and a bus services. They used an ordered logit model to analyze the sub-experiment ratings as well as the choice experiment data. Further examples of using the HII approach and it variants can be found in Ramirez and Manuel (2010) and Molin and Timmermans (2009).

There is resent literature where an integrated HII approach has been used instead of the conventional HII approach (Oppewal et al., 2006; Oppewal and Marco, 2000; Ramirez and Manuel, 2010). As oppose to conventional method Integrated HII approach allows choice experiments and avoids the need for separate bridging experiment. However the integrated HII increases the number of attributes per experiment due to the inclusion of additional design constructs. This is a critical drawback considering the already high number of service quality attributes involved in this study. Therefore the conventional HII is more suitable for this analysis.

## Implementation of the HII approach in the development of the benchmarking index

Overall service quality is evaluated separately based on the context of originating passengers, terminating passengers and transfer passengers. An extensive literature review was used to identify the most important facilities relevant for each type of passenger flow. Then the facilities are categorized in to groups (decision constructs) based on functional similarities. It is important to select the number of elemental attributes and their levels carefully in order to make the experiment realistic and at the same time avoid information over load for respondents. According to the literature on stated preference exercises a maximum of five attributes are suggested having up to three levels (Bateman, 2002; Chiang et al., 2003; Hensher, 1990).

The implementation of conventional HII models requires the construction of two different experimental designs. First, a sub experiment for each construct is required to measure the trade-off between the attributes defining that construct. Next, a bridging experiment is required to measure the trade-off between the decision construct evaluations to examine how the evaluations of the decision constructs are integrated into an overall evaluation. The HII approach involves the following steps.

1. Attributes are clustered into *I* sets based on logic, theory or empirical evidence

2. Separate experimental designs are constructed for each of the sets identified in step (1), to create alternative descriptions defined by the various combinations of levels of the variables (elemental attributes) that define the decision constructs represented by each set. Individuals evaluate combinations of the attribute levels on a category rating scale.
3. The response data obtained in step (2) are analyzed separately for each set to develop a statistical model that describes how the different attributes combine to define response given to each decision construct.

Let $X_1$ and $X_2$ be the observed evaluation of two separate decision-constructs (categories/sub-experiment) and $A_1^{'}, A_2^{'} \,\&\, A_1^{''}, A_2^{''}$ are the variables representing the elemental attributes of the decision alternative. Then it is assumed that the evaluation for each decision construct is obtained by the multivariate linear models given by:

$$X_1 = \beta_0 + \beta_1 A_1^{'} + \beta_2 A_2^{'} + \varepsilon_1 \qquad (1)$$

$$X_2 = \gamma_0 + \gamma_1 A_1^{''} + \gamma_2 A_2^{''} + \varepsilon_2 . \qquad (2)$$

where $\beta_0, \beta_1, \beta_2, \gamma_0, \gamma_1, \gamma_2$ are the parameters to be estimated using the data observed in various experimental steps and $\varepsilon_1, \varepsilon_2$ are the error terms whose expectations are assumed to be zero.

4. Each higher order decision construct (Attribute categories) is then treated as a factor whose levels are the numerical categories of the ratings scales used to define the constructs in Step (2). Individuals are told that the ratings reflect those that they gave to each decision construct in Step (2). In the HII literature, this is called a bridging experiment. An individual's task in the bridging experiment is to evaluate the combinations of decision construct ratings by rating them on a new and different ratings scale (or choose the best alternative if it was choice experiment).

Let $R_j$ be the observed overall evaluation of the decision alternative *j* based on the factorially manipulated levels ($\hat{X}_1 \,\&\, \hat{X}_2$) of the higher order constructs of $X_1$ and $X_2$. If all functions are assumed to be additive and linear, the overall evaluation is obtained by the multivariate linear model given by:

$$R_j = \alpha_0 + \alpha_1 \hat{X}_1 + \alpha_2 \hat{X}_2 + \varepsilon_r \tag{3}$$

where $\alpha_0, \alpha_1, \alpha_2$ are the parameters to be estimated using the data observed and $\varepsilon_r$ is the error term whose expectation is assumed to be zero.

5. The response data from Step (4) is then treated as the respondent's evaluation of the overall utility of the decision alternative. Data can be analyzed to develop statistical model that describes how the different levels of higher order constructs define the overall evaluation.
6. The separate statistical models estimated in Steps (3) and (5) can be integrated if one assumes that each decision process has a separate error distribution with expectation of zero, which is not correlated with the error distribution of the other decision processes.

Then, by substituting for $\hat{X}_1 \& \hat{X}_2$ in equation (3) by equation (1) and (2) we derive:

$$R_j = \alpha_0 + \alpha_1(\beta_0 + \beta_1 A_1^{'} + \beta_2 A_2^{'}) + \alpha_2(\gamma_0 + \gamma_1 A_1^{''} + \gamma_2 A_2^{''}) \tag{4}$$

As shown above it is possible to develop an expression of overall service quality evaluation using the level of different facilities as independent variables. Using this model it will be possible to determine the order of importance of different facility types for overall evaluation of the passenger terminal. Furthermore this model will establish a quantitative basis to determine the overall ranking of different passenger terminals given the availability of attributes considered for the model.

# DISCUSSION

This research delivers a comprehensive methodology to benchmark the provision of facilities in a passenger terminal. Currently available models of overall service quality have two key limitations:

1. They consider only a limited number of terminal attributes

2. The models are based on passenger opinion on facilities provided at a selected airport. Therefore the influence of the facility level of service provided by different facilities at the time of the survey can be significant.

Furthermore, passenger opinion elicited in the previous studies is mainly based on the mix and the level of service of facilities provided at the airport case used for the survey. Thus the passenger may not be aware of better or worse conditions available else ware, and as a result the above methods cannot accurately model the comparative evaluation of service quality with industry best practices. Thus they lack the capability to predict the service quality outcome from expected improvement strategy.

Therefore in order to avoid above mentioned common and specific limitations of current methodologies, this research will be using a stated preference survey technique to elicit passenger perceived service quality against a predefined set of facility attributes of airport passenger terminals. The first limitation mentioned above is avoided by considering a complete set of facilities for the study. This study will perform three separate surveys for three different passenger types based on separate sets of facilities for each passenger type, thus covering the overall airport experience accurately. This study will obtain passenger opinion based on hypothetical scenarios presented to them using the stated preference survey technique; therefore the biasness of the analysis to one particular airport case is avoided. In a stated preference exercise the researcher can control the mix and the level of attributes presented to the respondent for evaluation. Therefore the respondent can be presented with a set of attributes ranging from basic to best practices in the industry. This makes the respondent compare the given scenario with industry best practices before giving the response, which avoids the third limitation mentioned above. The chosen stated preference technique, method of survey and data analysis is explained in the next section.

Nevertheless this approach also has its own limitations. The major one is that although given a realistic context, the respondent's preferences are still likely to be different from their behaviors in the real world (Kroes and Sheldon, 1988; Zibin, 1999). The effect of this limitation can be minimized by designing the contingent rating exercise as realistically as possible. In addition to the above common limitation in the stated preference method, several specific limitations of the hierarchical information integration (HII) approach affect the results of the model (Molin and Timmermans, 2009; Norojono and Young, 2003; Oppewal et al., 1994). Some of more relevant limitations identified are:

1. The approach does not test the assumed hierarchical decision structure; hence, one must assume the hierarchical structure is correct to integrate the separate experiments logically.
2. The approach produces several models rather than a single one for which overall measures of goodness-of-fit and tests of validity can be derived. A concatenated overall model cannot be estimated directly; rather the model parameters are calculated by substitution and replacement of terms in separately estimated models.
3. The validity of the bridging experiment poses problems because respondents have to evaluate or choose among profiles described in terms of their hypothetical profile ratings in the sub-experiments. The difficulties of this task are not clear, nor is it clear whether the resulting attribute evaluations reflect respondent's real decisions.

Oppewal et al. (1994) proposed an integrated HII approach in order to overcome the above limitations. However according to Molin and Timmermans (2009) the integrated HII approach was found to increase the number of attributes evaluated by a respondent compared to the conventional HII. Thus it has a drawback in terms of the potential for reducing information overload.

This outcome of this research will provide assistance to airport operators for determining the best strategy for facility improvement to reach a higher level of service quality. Airport customers on the other hand will benefit from the overall service quality rating and will be able to make a better informed decision when choosing between alternatives. This improves the current situation where the general traveling public is not given enough information on the provision of facilities at various airport terminals on a simple but accurate scale. Airport authorities also can benefit by having a methodology to objectively measure the level of facility provision at passenger terminals. It will help to set minimum service standards as part of regulations to maintain adequate level of service to airport users. Furthermore this research will add to the overall knowledge base of airport terminal service quality evaluation by introducing an overall facility benchmarking index as an evaluation technique.

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