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Modelling passengers' activity choice in airport terminal before the security checkpoint: the case of Portela airport in Lisbon

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Abstract

Airports are transport facilities that accommodate both processes related to the passenger air-trip and usually many non-aeronautical activities. This paper aims to explain and predict passenger activity choices at the airport terminal area before the security control. Lisbon Portela airport was used as a case study and pertinent data was collected at the airport by the authors. A multinomial Logit model was estimated to explain passengers' choices regarding activities in the terminal and more specifically, whether passengers choose to perform only aeronautical activities before the security checkpoint or they choose both aeronautical and non-aeronautical activities. Aspects such as travel frequency, travelling for business, performing the check-in online and having planned the activities before arriving at the airport influence the passengers towards not performing discretionary activities before security. Passengers travelling to international destinations while not living in the city of the airport and passengers arriving at the airport accompanied by friends or relatives were more likely to use the non-aeronautical areas. When testing an increase in the proportion of the passengers who complete the check-in online from 30% to 70%, we found that the share of the passengers who perform only aeronautical activities would increase from 47% to 53%. This modelling approach can be used when analyzing scenarios of the airport's operations in the future considering changes in passengers' behavior.

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Keywords: passenger activity choices, airport terminal, discrete choice modeling, Portela airport, Lisbon

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1. Introduction

Airport buildings are complex transport facilities that accommodate multiple activities that primarily serve the air travel and secondarily the passenger free time while in terminal. The travel experience in the airport terminal includes all the required processes that take place in the building, require the passenger participation, ensure the preparation of the passengers for their air trip and cover their free time. Before boarding passengers have to pass through 4 different processes: check-in, security, immigration and gate check. In between these aeronautical processes, they spend their available time in other activities which are not part of their air-trip.

Non-aeronautical activities have been gaining momentum for more than 10 years because of their high contribution to airports' revenues (Graham, 2009). However, not all of the passengers desire to engage themselves to the same type of discretionary activities; preferences differ according to passenger characteristics and the airport type. It has also been shown that at existing airports offering non-aeronautical activities before security may also alleviate long queues at the security checkpoint (Kalakou et al. 2015). After understanding when (and where) the passengers spend their time and after exploring passenger preferences over non-aeronautical services, airport managers can better plan facilities to match passengers' needs and efficiently allocate the terminal space.

Current practices show that passenger profiles define the types of the offered discretionary activities at an airport terminal. Hub airports usually offer a wide range of non-aeronautical activities to their passengers. For this type of airports, the passenger experience is of vital importance since many passengers spend their transit time in-between their long-haul flights. For instance, Frankfurt airport is regarded as a family friendly airport but it also offers many types of services targeting to business travelers. It is also indicative that at these airports, passengers can find specialized areas such as wellness institutes, prayer rooms, casinos or entertaining areas. Heathrow's "Plaza Premium Lounge Arrivals" offers a private place where passengers can freshen up with a shower and relax for £25 per person including complimentary food, soft drinks and house alcoholic beverages. Smaller hubs such as Vancouver also cater a lot for offering diverse facilities such as medical and wellness services, while sport screens are offered both before and after security close to beverage areas for the entertainment of the passengers. Conference areas, VIP lounges and special passenger services, such as laundry, are some of the services often met at business airports. In all the cases, space allocation to different activities in a terminal is important as it affects both the passenger experience and ultimately the airport's revenues. Retail arrangements should follow passenger flows and preferences since better usability of a system can be achieved through a user-centred approach which integrates the user's perspective into a system (Maguire, 2001).

Ma and Yarlagadda (2012) categorized non-aeronautical activities into ten discrete groups serving different purposes (information service, cash service, major relief, basic relaxation, social connectivity, fast self-service, shops, tax return and religion-related service) in order to use them as variables in a (passenger) agent-based model. They estimated the conditional probabilities of performing each activity through the use of Bayesian networks. Popovic et al (2010) classified airport discretionary activities into 2 types: the first one was related to optional travel-related activities such as currency exchange and the second one to non-travel activities such as shopping. They also identified 4 activity patterns: group, concurrent, individual activities and activities related to the personal belongings of the passengers. Research related to modeling passenger activities has been conducted by Hoogendoorn and Bovy (2004) who developed and applied an activity-based model including route choices in order to model passenger choices inside Amsterdam Schiphol airport. Canca et al (2013) developed a discrete-time, macroscopic attraction-based simulation model, which also included destination attraction, location and the route choices. Liu et al (2014) focused on passenger activity scheduling; they developed a nested model for the discretionary passenger activities with the following nests: most frequent, less frequent, time killing and shopping activity, and identified that some of the aspects that play a role in the choice of where and what type of activity to perform were: the age, the frequency of travel, the group size and the gender.

Following a bottom-up passenger-centric approach this paper intends to explain and predict passenger activity choices at the terminal area before the security control. We estimated a discrete choice model which reveals the factors that affect the passenger choice of performing or not performing discretionary activities before security. Such a model could later be used to forecast changes in passenger choices under different future scenarios such as changes in the percentage of the passengers who perform the check-in online. The scope of this paper is restricted to

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