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Passenger-centric airport management via new terminal interior design concepts

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Abstract

Meeting the needs of passengers will increasingly become a competitive factor for airports. Information is one of the most valued services for passengers. Therefore, timely providing of real-time data to the passengers is high on the list of airlines and airports. Since not every passenger has a mobile device at hand, relevant information need also be disseminated offline. Static and dynamic signs cover the above mentioned issues, but the place, where such signs are installed is crucial. The goal of our new design concept for terminals is providing information to passengers, where and when they need it. Each service point — from check-in through security check to boarding — has been designed using curved layout design and furniture along with large displays for information. The size of the displays is chosen such that passengers are able to recognize important information with respect to the specific service point at one glance. Waiting seats are surrounding the service point to provide an unhindered view to the displays and to promote communication. We implemented our design ideas in our artificial terminal building of an international airport. The impact of information displays is modeled by a microscopic simulation. Adopting the assumption that the information displays make it easier for the passengers to figure out the way through the terminal we simulate a whole day at the artificial terminal.

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Keywords: Design Assessment; Terminal Interior Design; Passenger-centric Management; Microscopic Simulation

1. Introduction

Travellers dream of a seamless world in transportation. With respect to the Air Transportation System this vision was formulated by the High-Level Group on Aviation Research in it's report Flightpath 2050 (cf. High Level Group on Aviation Research, 2011). Intermodality of transport is one aspect of this vision (as e. g. discussed by Vespermann and Wald, 2011, Janic, 2010, and Milbredt et al., 2017). Parallel to examining intermodal connections the potential for mitigating the main cause of breaking the seamlessness within the Air Transportation System itself needs to be explored. Delays of flights were discussed in various ways; from monetary impact (cf. Cook et al., 2004) through statistical prediction of delays using real-time data (cf. Aljubairy et al., 2016) to aircraft routing minimizing propagated delay (see Yan and Kung, 2016).

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Operations at airports are already streamlined to mitigate delays. On the airside this was achieved by introducing a collaborative approach for making decisions (A-CDM, description of concept: EUROCONTROL, 2006 and description of implementation: EUROCONTROL, 2012). Including landside operations at airports completes the operational treatment of flight delay causes (Total Airport Management, TAM, see e. g. EUROCONTROL and German Aerospace Center (DLR), 2006 and German Aerospace Center (DLR) et al., 2012). What remains is the factor "passenger".

Meeting the needs of passengers will increasingly become a competitive factor for airports. Treating passengers as disruptions for the perfectly planned operations may not address the issue of delays in its entirety. To understand the issues a passenger is faced with, a passenger-centric view needs to be employed. Transit passengers failing to find their way to the required gate is a big cause of flight delays (see Mueller and Chatterji, 2002). Therefore, successful passenger guidance increases both, passenger comfort and punctuality of flights.

Even if the impact of delayed (transfer) passengers on the flight network may have decreased in past years, these passengers are an issue in view of passenger comfort. Finding the way inside a terminal is not only a problem of the past. Recently, an EU project called SPENCER (2013) was launched to tackle this problem. Within this project a robot will be developed to help passengers reaching the appropriate gate. The robot will be tested at Amsterdam's airport Schipol. The EU project DORA (cf. DORA, 2016) considers dynamic routing of passengers using real-time data. Both indoor navigation and routing options are to be generated which every passenger can then use.

Customer satisfaction is crucial for any transportation mode. Passengers can become very frustrated if information on disruptions are not provided by the transit agency (see e. g. Caulfield and O'Mahony, 2007 and Papangelis et al., 2013). According to Garcia et al. (2012), the provision of real-time data is seen as a particularly important service and is essential for assisting passengers en-route. Passenger Information Systems (PIS) describe systems which provide information to passengers of a transportation mode of any kind. An example for a static PIS is a timetable at a bus station, whereas dynamic PIS provide real-time data.

Smartphone applications exist for various airports providing real-time data (e.g. Toronto airport, Los Angeles airport, Frankfurt airport, see Google Play-Store). Airports use these apps to also make passengers more aware of the airport layout (e.g. gates, shops) in addition to the flight plan and possible delays (cf. Frankfurt airport). Since not every passenger has a mobile device at hand or uses it for phoning only, checking the status of a flight or the way to the appropriate gate needs to be possible offline. Static and dynamic signs cover the above mentioned issues, but the place, where such signs are installed is crucial.

In this paper we present a new design concept for the interior of terminals covering the information dissemination from the infrastructure perspective. The goal of this concept is providing information to passengers, where and when they need it. Seamlessness is the guiding vision of our design concept. Each service point — from check-in through security check to boarding — has been designed using curved furniture along with displays for information. The size of the displays is chosen such that passengers are able to recognize important information with respect to the specific service point at one glance. Waiting seats are surrounding the service point to provide an unhindered view to the displays and to promote communication.

Service points only represents a part of the interior of an airport. Our approach is intended to be complementary to already existing information signage such as the big centrally installed display showing information about each flight and the guidance covering the gate infrastructure. Due to data protection issues, it not possible to display information about the passenger's individual flight at e. g. the check-in. Interactive terminals are a way to circumvent this problem, but it thwarts the idea of information at a glance. This leaves us with big displays showing information for all flights in a certain time range as it is in operation by the centralized display.

The impact of the new design ideas is assessed using our simulation environment. It comprises of a terminal building of an artificial airport called GIA (Generic International Airport) and a microscopic simulation covering all tasks for a passenger — from entering the terminal through security check to passing the gate. The microscopic nature makes it possible to track each passenger's way and the time he/she needed for the several milestones required for boarding. The artificial airport GIA includes a broad range of infrastructure for different passenger scenarios such as border control, transit area, finger and bus gates, and self-service check-in.