# Multiple Criteria Analysis of the Airport Terminal Effectiveness by Multi-objective Optimization and Simulation

*Janusz Miroforidis*

Polish Academy of Sciences

### Abstract

A rational approach to terminal airport management is not a trivial task due to relatively complex interactions between passengers and terminal infrastructure. Such infrastructure may be represented or modelled as a network of service nodes. To make a decision about such a network structure, one has to take into account not only the cost of terminal infrastructure, but also a set of quality indicators depicting passenger service level. Such decision problems may be formulated in the multiple criteria setting. We propose a bi-criteria decision making problem with a discrete-event simulation model of a terminal airport as a base model. The simulation model is used to evaluate a finite set of configurations representing a network of service nodes. To point out the most preferred Pareto optimal configuration, we propose to use an interactive decision making method to navigate Pareto optimal solutions with so-called vectors of concessions and reference points as preference carriers. Such versatile decision making scheme may be used to solve practical multiple criteria decision problems with values of criteria functions obtained by simulation runs.

*Keywords:* Discrete-event simulation, airport terminal modelling, passenger flow modelling, multiple criteria decision making, multi-objective optimization.

## 1. Introduction

For many years the problem of rational management of airports is the focus of researchers. To effectively manage an airport one has to solve many types of decision problems. Even a small airport is quite a complex system, so to solve such problems system analysis or mathematical modelling methods can be used. An example of a decision problem, which has attracted a lot of research and is well represented in the literature (see Dorndorf et al. [2], Şeker [18], Yan and Huo [19]), is the airport gate assignment problem (AGAP). AGAP concerns, so-called air-side operations of airports. It can be solved using exact or heuristic optimization methods (see Kaliszewski and Miroforidis [9], Kaliszewski et al. [13]). Another well-known decision problem relates to airport terminal operations and the airport passenger flow, through the terminal functional areas. In