Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 14 (2016) 457 – 466

Transportation Research Procedia

www.elsevier.com/locate/procedia

6th Transport Research Arena April 18-21, 2016

OPTIHUBS - multimodal hub process optimization by means of micro simulation

Daniel Elias [a,*], Birgit Nadler [a], Friedrich Nadler [a], Georg Hauger [b]

[a]*nast consulting ZT GmbH, Lindengasse 38, Vienna 1140, Austria*
[b]*Technical University of Vienna, Fachbereich Verkehrssystemplanung, Erzherzog-Johann-Platz 1, Vienna 1040, Austria*

Abstract

The development of multimodal hubs is a sensitive task due to numerous parallel occurring processes and external dependencies. There are already isolated solutions available that mostly suffer from a holistic approach. Based on the results of a predecessor research study one objective of the ongoing research project OPTIHUBS is to identify integrated solutions for multimodal hub process optimization via micro simulation technologies for optimizing administrative, operational und logistic processes at inland waterway hubs. Based on the representation of various processes, flexible parameters for transport flows, handling volumes and traffic movements the requirements for existing and potential product groups/cargo types at multimodal nodes are compiled. They form the basis for an optimized workflow management scheme which is not described in this paper. Process parameters are retrieved via observations, terminal data analysis and interviews. Furthermore real-world hub processes are recorded and supplemented. Algorithms are developed based on a catalogue of requirements issued by the research project consortium. The micro simulation tool consists of several elements that allow alterations of parameters such as transport flows, handling volumes/processes and process/time restrictions. In addition the surrounding road/rail/water traffic environment is part of the simulation in order to allow analysis of interdependencies. Results from the simulation exercises will be used at a later point in time in project delivery in order to define a strategy concept for an efficient supply chain/bottleneck analysis.

Peer-review under responsibility of Road and Bridge Research Institute (IBDiM)

* Corresponding author. Tel.: +43 1 523 47 33 - 28; fax: +43 1 523 47 33 - 31.
E-mail address: elias@nast.at

Peer-review under responsibility of Road and Bridge Research Institute (IBDiM)
doi:10.1016/j.trpro.2016.05.098

Keywords: Micro simulation; process optimization; multimodal hubs; inland waterway

1. Introduction

Based on the results of the predecessor research study Hauger et al. (2014) – SMART HUBS 2.0 – the current research project Hauger et al. (2015) – OPTIHUBS - deals with the development of a standardised simulation system with unique algorithms that combines and optimizes significant (administrative, operational und logistic) and innovative processes as well as location based conditions at multimodal hubs. The project consists of several work packages and is programmed for the time period from August 2014 until July 2016. It is sponsored through the third tender of the Austrian R&D call Mobilität der Zukunft of the FFG.

This paper focuses on the integrated solution using innovative micro simulation technologies for optimizing the introduced processes at inland waterway hubs and other terminals. Results from the simulation exercises will be expected in summer 2016 and used by the project consortium to define a strategy concept for an efficient supply chain/bottleneck analysis. Due to the proposed time schedule details of the strategy concept cannot yet be discussed in this paper.

2. Selection of a simulation tool

Prior to the selection of a specific tool a simulation concept was developed in cooperation with all research project partners that also includes strategies how to process and simulate external specifications established by the partners.

In the beginning of the simulation concept development the main obstacle was the willingness of practical project partners (port and terminal operators) to provide input in terms of potential case studies as well as explicit input data. By Mai 2015 a functioning working environment could be established. Consequently the simulation concept was treated as living document and was changed and amended several times. It includes elements that can be modelled on a macroscopic level as well as explicit micro simulation exercises that need a vehicle and process based decision process during each simulation run.

In general there are many different ways to simulate/model multimodal hubs depending on the individual task or specified focus e.g. land use, process and traffic infrastructure optimization. Therefore new approaches need to consider already existing systems and models in place as well as the data availability and in extracts topics such as

- objectives of the optimization exercise
- net model, handling and geographic referencing
- data import and export as well as corresponding interfaces
- data and traffic demand/distribution modelling
- control, handling and manipulation of processes prior and during the simulation runs
- alteration of the demand and handling of changed circumstances of the particular hub
- simulation core
- scenario handling
- deduction of key performance indicators, output reports and
- validation possibilities.

In terms of network development one should consider using open data such as OpenStreetMap (OSM) in order to have alternative data sources in addition to official sources such as municipality authorities where data needs to be requested explicitly. Open data is made increasingly available on an international level which is one of the benefits since the simulation system should be able to handle different hub environments on an international level. In addition personal amendments to the graphs can be made available in exchange to the data provided by the user cloud.

Since the model should be dealing with exercises on macroscopic and microscopic levels a node-line-model should be preferred.