FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

UNIVERSITEIT GENT

Invitation

You are cordially invited to the public defense to obtain the academic degree of

DOCTOR OF BUSINESS ECONOMICS

by Mohanad Rezeq

Humanitarian Networks Planning During Human-Made Disasters: Palestine as a Case Study

Supervisors:
Prof. dr. Tarik Aouam & Prof. dr. Frederik Gailly

Wednesday, 6 December 2024 at 16:30h
In the Faculty Board Room, Campus Tweekerken, Tweekerkenstraat 2, 9000 Ghent
Please confirm your attendance no later than 28 October by email to:
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EXAMINATION BOARD

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Abstract

This dissertation makes a substantial contribution to the field of humanitarian logistics by developing an innovative decision-support tool aimed at optimising relief-aid distribution planning in armed conflict scenarios. The tool is specifically designed to account for the impact of congestion at security checkpoints, considering how these delays influence delivery lead times and distribution costs. This research includes a real-world case study of humanitarian aid distribution, where stringent security protocols at checkpoints significantly affect operations. Various methodologies were employed to develop this robust decision-support tool, including multiphase design science and hybrid simulation-optimisation techniques. Additionally, an exploratory methodology was used to understand the challenges of the cluster-led coordination approach commonly employed in disaster response and explore how our decision-support tool can be adapted within this framework. The ultimate goal is to create a tool that is practical and highly effective in complex humanitarian settings.

Chapter 2 introduces a decision-support tool grounded in the humanitarian distribution planning (HDP) concept, designed to assist policymakers in humanitarian organisations during armed conflicts. The HDP model generates optimal plans for distributing relief aid within complex humanitarian networks that involve multiple items and stages. The primary objective is to minimise transportation, inventory and backorder costs while accounting for congestion at security checkpoints. To address this congestion, clearing functions are employed to model the relationship between truck-flow workload and lead-time duration, which refers to the average time trucks spend processing and waiting. We validate the decision support tool with a case study of Israel's nine-week military operation in the Gaza Strip in 2014. In **Chapter 3**, we develop the clearing function distribution model (CFDM) to address the problem of security checkpoint congestion within the humanitarian supply network and employ a hybrid simulation-optimisation technique to mitigate the effects of this congestion. A business process simulator is used to model both the current (AS-IS) and redesigned (TO-BE) security checkpoint procedures. The simulation results are used to approximate the clearing function, which illustrates the relationship between capacity and workload. This chapter integrates these results into the decision-support tool and compares the CFDM tool outcomes for both scenarios using key performance indicators (KPIs) such as distribution costs, backordering and process cycle time. The investigation focuses on the Kerem Abu Salem security checkpoint in the southern region of Gaza.

Finally, **Chapter 4** explores the challenges associated with implementing the cluster-led coordination approach in armed conflict settings. Then, this chapter assesses the adaptation of the developed decision-support tool into the cluster-led coordination approach using the technology acceptance model (TAM). This approach enables a comprehensive evaluation of the tool's flexibility within the cluster-led coordination approach, providing insights into its practicality and acceptance in complex humanitarian scenarios.

Curriculum vitae

Mohanad Rezeq (b. 1984, Jerusalem) earned his Master's degree in Business Administration from Al Quds University in 2013. He joined the Operations Management group within the Department of Business Informatics and Operations Management to pursue his PhD, supported by a BOF scholarship awarded in 2018. His work has been published in high-quality peer-reviewed journals. The second chapter of his dissertation was published in the '*International Journal of Systems Science: Operations & Logistics*'. The third chapter was published in the '*Journal of Humanitarian Logistics and Supply Chain Management*'. His fourth chapter is currently under review by a prestigious peer-reviewed international journal. Mohanad has also presented his research at the 33rd European Conference on Operational Research (EURO 24) in Copenhagen.