

School/Department:	<i>Rotterdam School of Management – Technology and Operations Management Department (Supply Chain Management Section)</i>
Project Title:	Flexibility Capacity in Medical Transportation Platforms
Abstract:	<p>Many developing countries lack the required health-emergency infrastructure due to the shortage of ambulance capacity. In India and Bangladesh, the average waiting time for an ambulance exceeds 40 minutes, in some cases researching several hours.</p> <p>Another reason for the slow response times of ambulances in developing countries is the lack of coordination between existing ambulance providers. As a consequence, private companies have developed platform-based business models to coordinate health-emergency responses. For example, Flare¹ started as a software provider for emergency response teams in Nairobi and now also uses the technology to coordinate ambulances. Another example is Stanplus², a start-up company that decided to implement a mixed business model in Hyderabad to coordinate hundreds of ambulances.</p> <p>Such companies typically acquire own ambulances and use them as flexible capacity. For these medical transportation platforms, we aim to develop mathematical models to determine an optimal quantity and an optimal use of flexible ambulance capacity while balancing the platform's profits and response times.</p> <p><u>Key articles:</u></p> <ul style="list-style-type: none"> - Bélanger, V., Ruiz, A., Soriano, P. (2019). Recent optimization models and trends in location, relocation, and dispatching of emergency medical vehicles. <i>European Journal of Operational Research</i>, 272(1):1-23. - Nasrollahzadeh, A.A., Khademi, A. Mayorga, M.E. (2018). Real-time ambulance dispatching and relocation. <i>Manufacturing and Service Operations Management</i>, 20(3):467-480. - McLay, L.A., Mayorga, M.E. (2013). A dispatching model for server-to-customer systems that balances efficiency and equity. <i>Manufacturing and Service Operations Management</i> 15(2):205-220.

¹ <https://flare.co.ke/>

² <https://www.stanplus.com>

<p>Requirements of candidate:</p>	<p>Background: <i>Supply Chain Management, Operations Research, (Applied) Economics or Industrial Engineering.</i></p> <p>Required skills: <i>Mathematical programming and modeling, programming (any programming language), simulation</i></p> <p>Master's degree: Yes</p> <p>EUR requirement: IELTS: 7.5 (min. 6.0 for all subs) or TOEFL: 100 (internet) or 600 (paper); GMAT-test or GRE-test: 85%</p>
<p>Supervisor information:</p>	<p>Prof. dr. Rob Zuidwijk Email address: rzuidwijk@rsm.nl Personal website: https://www.rsm.nl/people/rob-zuidwijk/ Selected key publications:</p> <ul style="list-style-type: none"> - Arslan, A.M., Agatz, N.A.H., Kroon, L.G., Zuidwijk, R.A. (2019). Crowdsourced Delivery – A Dynamic Pickup and Delivery Problem with Ad-Hoc Drivers. <i>Transportation Science</i> 53(1), 222-235. - Fan, Y., Behdani, B., Bloemhof-Ruwaard, J.M. Zuidwijk, R.A. (2019). Flow consolidation in hinterland container transport: an analysis for perishable and dry cargo. <i>Transportation Research. Part E, The Logistics and Transportation Review</i>, 130, 128-160. - Ypsilantis, P., Zuidwijk, R.A. (2019). Collaborative Fleet Deployment and Routing for Sustainable Transport. <i>Sustainability</i> 11(20):5666. - Kishore Bhoopalam, A., Agatz, N.A.H., Zuidwijk, R.A. (2018). Planning of truck platoons: A literature review and directions for future research. <i>Transportation Research. Part B, Methodological</i>, 107, 212-228. - Zuidwijk, R.A., Caro, F., Tan, T. Corbett C.J. (2013). Double-counting in Supply Chain Carbon Footprinting. <i>Manufacturing and Service Operations Management</i> 15(4), 545-558. <p>dr. Pieter Van Den Berg Email address: vandenbergrsm@rsm.nl Personal website: https://www.rsm.nl/people/pieter-van-den-berg/ Recent publication list, preferably last 3-5 years (1-2 pages)</p> <ul style="list-style-type: none"> - Abdelwahed, A., van den Berg, P.L., Brandt, T., Collins, J., Ketter, W. (2020). Evaluating and Optimizing Opportunity Fast-Charging Schedules in Transit Battery Electric Bus Networks. To appear in <i>Transportation Science</i>. - van den Berg, P.L., and van Essen, J.T. (2019). Scheduling non-urgent patient transportation while maximizing emergency coverage. <i>Transportation Science</i> 53(2): 492-509.

	<ul style="list-style-type: none"> - van den Berg, P.L., Fiskerstrand, P., Aardal, K., Einerkjær, J., Thoresen, T., and Røislien J. (2019). Improving ambulance coverage in a mixed urban-rural region in Norway using mathematical modeling. <i>PLoS ONE (online)</i>, 14(4). - van den Berg, P.L., Legemaate, G.A.G., and van der Mei, R.D. (2017). Increasing the responsiveness of firefighter services by relocating bases in Amsterdam. <i>Interfaces</i> 47(4):352-361. - Jagtenberg, C.J., van den Berg, P.L., and van der Mei, R.D. (2017). Benchmarking online dispatch algorithms for Emergency Medical Services. <i>European Journal of Operational Research</i>, 258(2):715-725. <p>dr. Stef Lemmens Email address: s.lemmens@rsm.nl Personal website: https://www.rsm.nl/people/stef-lemmens/ Recent publication list, preferably last 3-5 years (1-2 pages)</p> <ul style="list-style-type: none"> - Calmon, A.P., Graves S.C., Lemmens, S. (2020). Warranty Matching in a Consumer Electronics Closed-loop Supply Chain. Manufacturing and Service and Operations Management. Available online. - Lemmens, S., Decouttere, C., Vandaele, N., De Boeck K., Banzimana, S., Hassane S. (2019). The Integration of Flow Modeling into a Stakeholder-based Framework for Vaccine Supply Chain Design. In Barbosa-Povoa, A.P. Jenzer, H. Miranda, J.L. (Eds.), <i>Pharmaceutical Supply Chains – Medicines Shortages</i> (193-201). Cham: Springer. - Decouttere, C., Vandaele, N., Lemmens, S. Bernuzzi, M. (2016). The Vaccine Supply Chain Multathlon: the Reconciliation of Technology, Economy and Access to medicines. In Zobel, C., Altay, N. Haselkorn, M. (Eds.). <i>Advances in Managing Humanitarian Operations</i> (205-227). Cham: Springer. - Vermuyten, H., Lemmens, S., Marques, I., Beliën, J. (2016). Developing Compact Course Timetables with Optimized Student Flows. <i>European Journal of Operational Research</i>, 251(2), 651-661. - Lemmens, S., Decouttere, C., Vandaele, N., Bernuzzi, M. (2016). A review of Integrated Supply Chain Network Design Models: Key Issues for Vaccines Supply Chains. <i>Chemical Engineering Research & Design</i>, 109, 366-384.
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