Thesis topics SCM

SCM01: Generalized Facility Location Problems

Proposed by
Said Dabia

Capacity
2 students

Project description
A strategic issue of interest to distribution planners is where to best site warehouses. Opening new warehouses is a long-lasting decision mostly involving considerable construction and resource investments. In logistics, this problem is known under the name "Facility Location Problem", or FLP in short. Most research done on FLPs are based on unrealistic assumptions such that facilities/warehouses store a single item or that transshipments (i.e., inventory pooling) between the different facilities are not allowed. In real-life, several different products might be stored in the warehouses and customer orders might consist of different products (also called order-lines in practice). Furthermore, transshipments between the different facilities can be economically attractive. In this project, the student will investigate how to extend existing decision support tools for FLPs to include more realistic and practical situations (e.g., multiple items are kept in stock in the different warehouses, customer's orders consist of several order-lines, transshipments are allowed, etc.)

Methodology
Analytical/Optimization

SCM02: Outsourcing in transportation and distribution

Proposed by
Said Dabia

Capacity
2 students

Project description
Many freight forwarders in the retailing and manufacturing sectors operate private fleets for their internal and external distributions needs. In many cases, they also use common carriers to outsource transportation demand in case of demand outside a normal area, or because orders do not generate adequate volume for shipments to use private fleet, etc. (W. Randolph et al (2007)). In opposite to most of the literature, common carriers base their cost calculation on the so-called "Tariff Sheets" where, for instance, costs are based on the total weight that the common carrier has to transport, or the total distance or a combination of the two. In this project, students need to make a thorough review on the current state of research on transportation outsourcing, and the impact of the different "tariff sheet" structures on the total cost of transportation.

Methodology

Systematic review, case study, analytical/optimization.

SCM03: Electric vehicles as an alternative to conventional vehicles

Proposed by

Said Dabia

Capacity

2 students

Project description

Conventional vehicles (CVs) have serious negative effects on the environment in the form of pollution, noise and congestion. Electric vehicles (EVs) provide a potential alternative for transportation. Many carriers like DHL, UPS and DPD realized the potential EVs offer and started implementing EVs for their last-mile deliveries, especially in urban areas. However, beside their high purchasing cost (Davis et al. (2013)) and the necessity to build charging infrastructure, EVs demonstrate some negative operational performance characteristics such as limited battery capacities and relatively long charging times. To facilitate the uptake of the EVs market and facilitate a successful transition from CVs to EVs, it is important to investigate under which conditions is adopting EVs competitive than adopting CVs, and what are the key factors for a successful implementation of EVs.

Methodology

Systematic review, case study, analytical/optimization.

SCM04: Workers cross-training in logistical systems

Proposed by

Said Dabia

Capacity

2 students

Project description

In many logistical systems, workers are specialists in the sense that they are trained to do specific tasks. Cross-training enables a workload balance when some tasks require more resources than others which improves the performance of the logistical system (i.e. resource utilization, the throughput rate, the throughput time, etc.). Two important and interrelated issues are:(a) how to decide which skill(s) are strategically most desirable for workers to gain (skill pattern), and (b) how to coordinate these workers to respond dynamically to congestion (worker coordination policy). In this research, the student will study a logistical system of his choice where workers cross-training is relevant and applicable, investigate the effect of cross-training workers on the cost and the performance of a logistical system. Different cross-training strategies will be introduced and analyzed under different scenarios, and conclusions should be derived on which cross-training strategy performs the best under which conditions. The student can be inspired by previous work done in this area (e.g., Wallace et al. (2004)).

Methodology

Analytical/Optimization, simulation (provided students can use simulation tools)

SCM05: Which Drivers Should Transport Your Cargo?

Proposed by
Jelle de Vries

Capacity
2-3 students

Project description
Every day thousands of people die in fatal traffic accidents on highways worldwide. Truck drivers are involved in a large share of these accidents, and face continuous pressure to combine driving safely with meeting productivity targets. Not all drivers respond equally well to these demands. Using a combination of GPS data gathered during truck trips in India, driver survey data and data obtained from the enterprise resource planning system, we aim to examine the role of individual driver characteristics (safety consciousness and personality in particular) and leadership in predicting risky driving behavior and driving productivity. The findings can potentially increase the effectiveness of driver recruitment and help transport operations managers to determine which driver should drive on which trip.

Method
Mixed methods analyses of a large dataset (data already collected, data cleaning/sorting possibly still necessary)

SCM06: Individual Characteristics, Inventory Record Accuracy (IRA), and Time Pressure in Order Picking

Proposed by
Jelle de Vries

Capacity
1-2 students

Project description
Order picking, *the retrieval of a number of products from their storage locations in the warehouse to satisfy orders of specific customers*, is an essential activity in the supply chain accounting for up to 50% of the operating costs of a typical warehouse (Tompkins 2010). Studying how order picking productivity can be improved is therefore critical for companies in this sector to be competitive. Most of the academic literature on order picking productivity focuses on optimizing or improving technical or system-related aspects of particular picking methods such as routing (De Koster et al., 2007; Hwang et al., 2004; Petersen, 2004), storage assignment (Jarvis and McDowell, 1991), warehouse layout (Hsieh and Tsai, 2006), and zoning (Jane and Laih, 2005; Le-Duc and De Koster, 2005). To complement this line of research, we study how *human factors* affect performance in order picking tasks. More specifically, we aim to investigate how different people respond to pressure imposed by deadlines in environments that vary in terms of Inventory Record Accuracy (i.e. not all products are stored where they should be stored). The results could help warehouse managers to increase picking performance (in terms of productivity and quality) by assigning particular pickers to tasks based on specific task-demands.

References
De Koster, R., Le-Duc, T., Roodbergen, K.J., 2007. Design and control of warehouse order picking: A literature review. European Journal of Operational Research 182, 481–501.

Hsieh, L., Tsai, L., 2006. The optimum design of a warehouse system on order picking efficiency. The International Journal of Advanced Manufacturing Technology 28, 626–637.

Hwang, H.S., Oh

, Y.H., Lee, Y.K., 2004. An evaluation of routing policies for order-picking operations in low-level picker-to-part system. International Journal of Production Research 42, 3873–3889.

Jane, C.-C., Laih, Y.-W., 2005. A clustering algorithm for item assignment in a synchronized zone order picking system. European Journal of Operational Research 166, 489–496.

Jarvis, J.A.Y.M., McDowell, E.D., 1991. Optimal Product Layout in an Order Picking Warehouse. IIE Transactions 23, 93–102.

Le-Duc, T., De Koster, R., 2005. Travel distance estimation and storage zone optimization in a 2-block class-based storage strategy warehouse. International Journal of Production Research 43, 3561–3581.

Petersen, C., 2004. A comparison of picking, storage, and routing policies in manual order picking. International Journal of Production Economics 92, 11–19.

Rogers, M., Weber, W.L., 2011. Evaluating CO2 emissions and fatalities tradeoffs in truck transport. International Journal of Physical Distribution & Logistics Management 41, 750–767.

Tompkins, J.A., White, J.A., Bozer, Y.A., Tanchoco, J.M.A., 2010. Facilities planning. John Wiley & Sons, Hoboken, NJ.

Method
Analysis of experimental data (already collected), possibly considering follow-up experiment.

SCM07: Meta-Analysis Safety in Operations Management

Proposed by
Jelle de Vries

Capacity
1-2 students

Project description
On a daily basis thousands of employees suffer from severe occupational accidents worldwide. These accidents not only lead to negative consequences for the physical and mental health of employees, but also to high costs for companies and the society as a whole. A large share of these accidents take place in warehousing, transportation, and production contexts. Organizations can try to increase occupational safety in several ways. The implementation of hazard-reducing systems, rules and regulations can contribute substantially to occupational safety, but also 'softer' aspects such as leadership, safety consciousness among employees, and a safety culture in the company can be beneficial. Multiple studies have focused on the relationship between these 'softer' drivers of occupational safety, but results have been mixed and thus inconclusive. This could be due to various factors, ranging from different operationalizations of the involved constructs to insufficient sample sizes. A meta-analysis that provides insight in the similarities and differences between these studies should help to find if, and in which contexts, such 'softer' safety measures can be expected to be effective.

Method
meta-analysis, literature study

SCM08: The human factor in transport planning at VAT Logistics

Proposed by
Nienke Hofstra

Capacity
2 students

Project description
VAT Logistics is one of the largest privately owned third party logistics providers in the Netherlands. They have recently merged with Neele into the company Neele-Vat Logistics. The core task of this 3PL is facilitating the movement of loads, which requires significant human support. As the firm does not own any vehicles, transport planners procure transport services from carriers on the spot market on a daily basis and therefore they are key decision-makers. While Neele mainly focused on profit maximization, historically VAT has requested their transport planners to consolidate shipments within the firm (which can be seen as a form of internal collaboration) and procure transport services for these bundles of shipments instead of hiring transport capacity for individual shipments. Despite this rule at VAT, in practice, planners do not always collaborate internally. While the benefits of consolidation have been extensively studied and widely acknowledged in literature, the human factor in logistics is an unexplored topic in logistics research (Mesa-Arango & Ukkusuri, 2014; Tokar, 2010). Therefore, together with a PhD student this project aims to study how collaborative transport planning is influenced and how planners' characteristics influence their decision-behavior and performance. Empirical research will be done at Neele-Vat Logistics.

Method
Case study research

SCM09: Efficiency Measurement of Production Lines by Network Data Envelopment Analysis Method in the Presence of Shared Intermediate Products

Proposed by
Amir Shabani

Capacity
1-2 students

Project description
A production or service line is a set of sequential operations established in a business unit whereby materials or duties are put through a process to generate a product or service that is suitable for onward consumption. As an important component of a business system, producers continually strive to improve the production/service line's performance. To this end, various lean manufacturing tools, e.g. overall equipment effectiveness (OEE), have been implemented by firms. One of the appropriate measurement tools is data envelopment analysis (DEA). The production line has usually a network structure, where the structures range from a simple two-stage to a complex system composed of multiple divisions linked by intermediate measures. Therefore, to measure the efficiency of the production line, network DEA models are useful. Although many studies have taken into account network DEA models to measure efficiency, to the best of our knowledge, there is not any study to address a situation under which an intermediate

product is shared between different stages. Therefore, developing a model for the mentioned situation would be advantageous from the perspective of both practitioners and academicians.

Methodology
Mathematical analysis (DEA)

SCM10: Analyzing supply chain contracts

Proposed by
Christos Orlis

Capacity
1-2 students

Background
Efficient cooperation among different parties in a supply chain is a great concern in nowadays. Supply chain contracts tempt to predefine the actions of the involved parties and their respective interactions in such a way that their incentives are aligned. On top of this, a supply chain contract must also ensure, among others, that the total supply chain costs are minimized while respecting the service-level agreements (SLA) between the different parties of the supply chain.

Research project
You will be given real-life data. Your task will be to 1) make a literature review in the area of supply chain contracts, 2) examine what are the incentives/objectives of the different parties in this special case, 3) evaluate different contracting configurations (buy back, revenue sharing, quantity-flexibility, cost sharing etc.) and 4) come up with suggestions (e.g. new or existing contracting schemes) that improve the competitiveness (minimization of costs under SLA) of the entire supply chain.

Method
Literature review, Quantitative analysis

SCM11: Auctions for procuring transportation services

Proposed by
Christos Orlis

Capacity
1-2 students

Background
An auction is a mechanism selling distinct assets that can be either physical or virtual objects. Recently, auctions have been used also in the procurement of the transportation services. In such an auction, a transport company (bidder) reports an approximate annual cost for serving all the (expected) transportation requests over a geographical area. The winners of the auction are then determined by the underlying mechanism which seeks to minimize the future supply chain costs.

Auctions have been proved to be very efficient in many contexts (e.g. consider the spectrum allocation auctions carried out in the U.S.A.) since they seem to achieve high revenues. Moreover, in many auction settings, transport companies (bidders) are pushed to report their real valuations for the assets they are interested in. In our setting, high revenues will be analogous to low supply chain costs. Your task will be to make a literature review on the different auction settings that are currently used for procuring transportation services. Data from a real case will be provided so as to evaluate how different auction settings affect future supply chain costs.

Method
Literature review, Quantitative analysis

SCM12: New Product Introduction in a Multi-Channel Retail Chain

Proposed by
Roman Daukuls

Capacity
1-2 students

Background
The key task of assortment planning is to determine the optimal set of products that a retailer should carry in its stores (Kök et al., 2015; Mantrala et al., 2009). Research on assortment planning has traditionally considered the assortment problem in single store or single category (van Ryzin and Mahajan, 2009; Gaur and Honhon, 2006). More recently, researchers have turned their attention to planning customized assortments by store (Kök and Fisher, 2007; Fisher and Vaidyanathan, 2014). They estimate demand and find an optimal portfolio of assortments in each store. While these papers are of great practical value, the following extensions would be appreciated by many retailers:

1. Assortment planning should include life-cycle dynamics of products (product sales are not constant across time; many products have sales growth, maturity and decline phases)
2. Assortment planning should consider the coexistence of online and offline channels (many retailers have an online channel next to traditional stores)

These extensions require a reformulation of the demand model that serves as an input for assortment optimization problems. Based on this discussion, we propose two research topics that can contribute to the assortment planning literature.

Project description
Retailers often face the problem of adding new products to their assortments. Given the fact that many retailers operate multiple offline and online stores, new product introduction problem becomes even more challenging. In particular, each store may have a different assortment and customer base, which may have an effect on new product sales. Introducing new product in all stores may be costly and unnecessary, while introducing it in only few stores may slow down the sales growth of new product and result in lost sales.

The objectives of this thesis are:

•   Review literature on forecasting new product sales in a multi-market scenario
•   Develop and estimate a demand model that will aid new product allocation decisions in a multi-channel retail chain

SCM13: Multi-Channel Consumer Choice Models

Proposed by

Roman Daukuls

Capacity

1-2 students

Background

The key task of assortment planning is to determine the optimal set of products that a retailer should carry in its stores (Kök et al., 2015; Mantrala et al., 2009). Research on assortment planning has traditionally considered the assortment problem in single store or single category (van Ryzin and Mahajan, 2009; Gaur and Honhon, 2006). More recently, researchers have turned their attention to planning customized assortments by store (Kök and Fisher, 2007; Fisher and Vaidyanathan, 2014). They estimate demand and find an optimal portfolio of assortments in each store. While these papers are of great practical value, the following extensions would be appreciated by many retailers:

1. Assortment planning should include life-cycle dynamics of products (product sales are not constant across time; many products have sales growth, maturity and decline phases)
2. Assortment planning should consider the coexistence of online and offline channels (many retailers have an online channel next to traditional stores)

These extensions require a reformulation of the demand model that serves as an input for assortment optimization problems. Based on this discussion, we propose two research topics that can contribute to the assortment planning literature.

Project description

Retailers are only able to make good assortment decisions once they know the structure of demand for their products in their online and offline stores. While research on assortment planning relies on different demand models, many aspects of describing product demand are not considered (for example, how customers decide to purchase online vs. offline). Marketing literature provides a good source of demand models that consider both product choice and store / channel choice.

The objectives of this thesis are:

- Review demand models that are currently used in assortment planning
- Review recent marketing literature that provides empirical models of product choice in multiple channels
- Suggest (and extend, if necessary) a demand model that best fits the assortment planning purposes in a multi-channel retail chain
- Estimate this model on real data of a multichannel company

Method

Regression analysis

References

Gaur, Vishal, and Dorothée Honhon. "Assortment planning and inventory decisions under a locational choice model." *Management Science* 52.10 (2006): 1528-1543.

Fisher, Marshall, and Ramnath Vaidyanathan. "A demand estimation procedure for retail assortment optimization with results from implementations." *Management Science* 60.10 (2014): 2401-2415.

Kök, A. Gürhan, and Marshall L. Fisher. "Demand estimation and assortment optimization under substitution: Methodology and application." *Operations Research* 55.6 (2007): 1001-1021.

Kök, A. Gürhan, Marshall L. Fisher, and Ramnath Vaidyanathan. "Assortment planning: Review of literature and industry practice." Retail Supply Chain Management. Springer US, 2015. 175-236.

Mantrala, Murali K., et al. "Why is assortment planning so difficult for retailers? A framework and research agenda." *Journal of Retailing* 85.1 (2009): 71-83.

Ryzin, Garrett van, and Siddharth Mahajan. "On the relationship between inventory costs and variety benefits in retail assortments.*" Management Science* 45.11 (1999): 1496-1509.

SCM14: Inventory models for ATMs based on demand patterns and geographic characteristics

Proposed by
Annelieke Baller & Maaike Hoogeboom

Capacity
1-2 students

Background
In 2014 we started a research project on replenishment of ATMs. The project aims at developing strategies and methods to increase efficiency in the cash supply chain by integrating inventory and routing decisions while taking the specifics of this supply chain into account. The project is supported by GSN (Geldservice Nederland), a company that organizes cash management for the three largest Dutch banks.

Research project
Your project will concern analyzing ATM characteristics in relation to the corresponding demand patterns. You will investigate whether it is possible to cluster ATMs for replenishment based on their characteristics and location. You will investigate whether it is beneficial to replenish ATMs based on their cluster instead of a just in time (JIT) delivery scheme.

To analyze characteristics you can for example use ArcGIS. We have data available from GSN and this data set can be extended.

Method
Literature review, data analysis and linear programming.

SCM15: Impact of fixed replenishment quantities on a supply chain

Proposed by
Annelieke Baller & Maaike Hoogeboom

Capacity
1 student

In 2014 we started a research project on replenishment of ATMs. The project aims at developing strategies and methods to increase efficiency in the cash supply chain by integrating inventory and routing decisions while taking the specifics of this supply chain into account. The project is supported by GSN (Geldservice Nederland), a company that organizes cash management for three large Dutch banks.

Research project

Your project will concern investigating the impact on a supply chain of adopting standardized replenishment quantities. One example is replenishment of ATMs: what is the impact on the cash supply chain of having standard packages with a fixed number of banknotes of a specific denomination. You will analyze the current supply chain and the changes that would be necessary to incorporate standard replenishment packages. You will do research on the changes in the inventory model. Moreover, it may be interesting to consider what the effect would be of storing the packages at the transport company instead of in the central warehouse.

Method

Literature review and process analysis.

SCM16: Distribution planning with service-level requirements

Proposed by

David Lai

Capacity

2 students

Project description:

This research project focuses on the distribution logistics operations of a hospital network in the Netherlands. To provide healthcare logistics services, it is generally more important to guarantee high quality of services than lowering the operational costs, especially with unreliable demands, varying travel times, etc. To handle these uncertainties in the planning processes, we aim at imposing service-level guarantees on a network optimization model for distribution planning and transportation network designs in the healthcare logistics. The key questions to be addressed are:

• What measure service levels in healthcare logistics?
• How to impose service-level guarantees when determining the distribution plan?
• What would be the costs for providing such guarantees?

Related literature

Mousazadeh, M., Torabi, S. A., & Zahiri, B. (2015). A robust possibilistic programming approach for pharmaceutical supply chain network design. *Computers & Chemical Engineering*, *82*, 115-128.

Methodology

Formulating and solving integer and network optimization models. The proposed approaches could be first tested on smaller instances, before extending to formulating and analyzing practical cases.

SCM17: Planning the fleet sizes with heterogeneous vehicles

Proposed by
David Lai

Capacity
2 students

Project Description:
The vehicle routing problem determines, for each of the available vehicles, the sequence of customers to be visited, meeting the demand requirements and the vehicle capacity constraints, minimizing the overall costs. This thesis considers a heterogeneous vehicle routing problem, where vehicles are categorized into different types according to their capacity and costs. A dedicated software package has been developed for the problem. This thesis aims at making use of the software package for solving a practical problem and analyzing the potential benefits of considering heterogeneous vehicles, and the practical managerial implications and limitations. The research work will result in a spreadsheet decision support tool that is applicable in practice.

Intended methodology:
Experienced in using Excel VBA/Macros (or other programming language) is required

SCM18: Responsive Perishable Food Supply Chains: robustness and resilience

Proposed by
David Lai

Capacity
3 students

Project Description:
Considers a generic perishable supply chain where the values of products decreases in time, this project researches for network designs and distribution plans that provides greater responsiveness to varying demands.

The research begins by formulating network optimization models with stochastic demands. The different models are compared via simulation and evaluated with respected to robustness, resilience, and responsiveness measures.

Below are related analysis.

- What are the source of uncertainties? How to measure robustness, resilience, and responsiveness measures? What performance measures available for uncertain environments?
- How to formulate optimization models that incorporate these robustness, resilience, responsiveness considerations for handling uncertainties?
- How would sales forecasting accuracy impact optimal network designs?
- How to construct the scenarios of product demands for stochastic models?
- What are the optimal distribution plans and network designs under demand uncertainties?

Students are also encouraged to proposed their own research questions and thesis topic under the scope of this project.

Related literature
Crainic, T. G. (2000). Service network design in freight transportation. *European Journal of Operational Research*, *122*(2), 272-288.

Intended methodology
Formulating and solving integer and network optimization models. e.g. stochastic network optimization models, scenarios-based models, imposing service-level guarantees using chance-constraints, etc.

SCM19: Distribution planning with product assortment selection

Proposed by
David Lai

Capacity
3 students

Project Description:
This research project aims at revealing the potential benefits of integrating product assortment selection and distribution planning. Consider a new store with a number of products under consideration for sales, with a limited storage capacity, the company has to determine simultaneously the selected products for sales, the distribution plans, the inventory level, and the resulting overall profits. Customers may not always be able to find a most preferred product at the time of purchase (e.g. stock out or the preferred product is not selected for sale); this unsatisfied demand is often substituted with an alternative. Shin et al. (2015) provided an extensive literature review on modelling these user behaviors. Hariga et al. (2007) provided an optimization model to determine the product assortment, inventory replenishment, display area and shelf space allocation decisions that jointly maximize the retailer's profits.

The thesis research extends the work to investigate the impact of product assortment on distribution planning, and formulate the joint decisions of product assortment selection and distribution planning.

Related analysis:

- How do assortment decisions impact the overall sales and returns?
- What are the strategies in distribution planning with assortment decisions?
- How to determine the distribution plan simultaneously with product assortment?
- What the storage capacities impact product assortment?

Related literature:
Shin, H., Park, S., Lee, E., & Benton, W. C. (2015). A classification of the literature on the planning of substitutable products. *European Journal of Operational Research*.

Hariga, M. A., Al-Ahmari, A., & Mohamed, A. R. A. (2007). A joint optimisation model for inventory replenishment, product assortment, shelf space and display area allocation decisions. *European Journal of Operational Research*, *181*(1), 239-251

Intended methodology
Formulating assortment selections with a multicommodity network flow model, and then extend to evaluating the impact of different strategies used in categorizing products on the resulting optimal network designs.

SCM20: Media attention and funding in humanitarian operations

Proposed by
Sander de Leeuw

Capacity
1 student

Project
Humanitarian logistics pertains to a specific field in the Operations Management domain that focuses on logistics aspects of providing aid support in humanitarian action. This humanitarian action may relate to disaster response activities but also to development aid. The funding of the activities for these organizations largely depends on donors. More and more it turns out that media can affect these donations. Humanitarian aid activities that have received considerable attention in the media are more likely to receive donations than those that have received limited attention. Also the way that attention is paid to a situation may affect the donation. Key questions we will focus at are the extent to which there is a risk that NGOs will move more towards disaster response programs and towards operations with more media coverage to attract more donors? Would this be negative? What are the implications of different types of funding on preparedness of organizations? Can we predict donations based on the media volume in order to facilitate planning?

Methodology
Collection and statistical analysis of media announcements on donations and occurrence of disasters

SCM21: Logistics characteristics of webshops

Proposed by
Sander de Leeuw

Capacity
5 students

Project description
Every year VU University collects webshop data in a process to compare logistics aspects of web offerings. This year we aim at investigating the logistics aspects of websites in at least 5 countries, including USA, Australia, UK, Netherlands, Germany and France. Each student is responsible for collecting data in at least 1 country analyzing at least 100 websites per country. Students analyse developments over time and differences between countries.

Methodology
Collection of website data according to protocol and statistical analysis of the data collected

SCM22: Cross-border ecommerce logistics

Proposed by
Sander de Leeuw

1-2 students

Project description

Many studies have investigated a variety of antecedents of consumer purchase intentions in online retailing. However, few studies have been conducted on the impacts of logistics aspects on consumer purchase intentions, and none focusing at shopping across borders. Cross border shopping is becoming more popular and increase in cross border shopping is an explicit target of the EU. The objective of this study is three fold: (1) to identify which logistics factors influence consumers' online purchase intention in cross-border shopping; (2) to determine which relationships exist between these factors and online purchase intention in cross-border shopping; and (3) to find how these relationships vary across countries. The student will develop a questionnaire and conduct a survey among consumers (Dutch or other country) who purchased product online via local webshops and via foreign webshops (we would particularly like to focus at buying from Belgian, British, and German webshops).

Methodology:

Survey development an analysis (preferably structural equation modeling)

SCM23: Using automated lockers for online order fulfillment

Proposed by

Sander de Leeuw

Capacity

1-2 students

Project description

Starting January 2016 Parcel4Me (`www.parcel4me.nl`) will install a locker on the campus of VU University Amsterdam to enable consumers to pick up their online orders and to return their online products. Using lockers to pick up or return orders is not yet very common in the Netherlands but it is common in other countries such as Germany or the UK. In Tilburg, Parcel4Me has already installed a locker on the university campus which allows us to compare use across campuses which may inform us how use is scaled up over time. This also allows us to survey consumers who make use of the locker and it will provide opportunities to do real-life experiments with incentives for using the locker (prices, time windows).

Methodology:

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Dependent on question either survey jointly with transaction data
analysis or experiment
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SCM24: Development of an inventory index

Proposed by

Sander de Leeuw

Capacity

1 student

Stock markets use indices to show the health of financial markets. Also in the domain of supply chain management such indices exist. The purchasing manager index is one of them (https://www.instituteforsupplymanagement.org/ismreport/mfgrob.cfm). Inventories have since long been good proxies for the level of activity and the health of a supply chain. Rising stocks in a supply chain indicate a slow down in demand, reducing stocks an increase in demand. As such supply chain inventory may function as an indicator of economic well-being. In this project we aim to develop such an indicator.

Methodology

transaction data analysis (statistics); simulation

SCM25: Making the floating depot work in Amsterdam

Proposed by

Sander de Leeuw

Capacity

3-5 students

Project description

PostNL is going to start with a floating depot concept in the city center of Amsterdam to takek vans off the road and increase sustainability of the last mile delivery. The idea is as follows:

1. Parcels are shipped into and out of the canals in the city center of Amsterdam via a ship

2. In the city center the parcels are put on electrical vehicles for final delivery.

The figure below shows a graph of the supply chain.

There are several stakeholders involved in the floating depot concept. PostNL is the process owner and owns the loading facilities. The boat is owned and operated by a joint venture of multiple parties.. The Municipality of the city of Amsterdam takes care of regulation and of assigning docking places

The floating depot is planned to start running in 2016 but there are still several open questions that require research attention. We aim to address three questions:

Routing of the floating depot (dependent on mooring locations, time limits to moore, etc.), including guidelines for an architecture of an IT system to coordinate communication between the Floating Depot, the distribution Centre and the Small Electric Vehicles that are driving in the cities (methodology: OR modeling)

How to integrate return flows in the floating depot concept, next to parcel returns, other returns including regular waste are considered (methodology: OR modeling)

Consumer interest/perceptions in floating depot (methodology: survey)

SCM26: Integrating waste collection in parcel delivery flows

Proposed by
Sander de Leeuw

Capacity
1-3 students

Project description
Waste in particular is an area where for stakeholders (consumers, retailers and municipalities) waste management is complicated. As a result, commercial logistical companies are looking at entering the Waste Sector, which is both public as commercial. In 2015 PostNL has started to test the collection of e-waste using their parcel delivery and the City Logistics Network. Key questions we aim to answer in this project are amongst others:

1. Which supply chain models are currently used for the collection of products from consumers (whether they work or not) and what are their advantages and disadvantages? Which alternatives exist?

2. How could a viable business model look like, considering the costs of collection and processing versus the profit of recycling and the benefits for the environment and the convenience for senders?

3. How can parties (consumers, businesses) be stimulated to send back their good?

Methodology
A survey possibly combined with simulation

SCM27: Consolidated deliveries via shopping streets

Proposed by
Sander de Leeuw

Capacity
1-2 students

Project description
Due to the rise of shopping over the Internet consumer shopping patterns are changing. These changes in shopping patterns give rise to opportunities in consolidation of deliveries, such as the shop as a delivery hub (deliveries of online orders to consumers in the neighborhood of a shopping street via the shops in that shopping street) and delivery of local supply (delivery of online orders via the inventory of shops, similar to the Shutl model in the UK). Amsterdam has a few examples of consolidation already, including the 9 straatjes (http://www.9straatjesonline.com) but this is rather the consolidation of shopping. This concept can be extended further to a delivery service and deliveries of online purchases through local stores (stores serving as pickup point for a local area). PostNL has expressed an interest in this area and will be involved in this project. This may lead to at least the following research areas:

(1) the investigation of consumer preferences as well as store owner considerations/preferences to get deliveries via local shops in Amsterdam, and

(2) an investigation of consumer preferences for consolidating deliveries from different stores in a 'boodschappenservice'.

Methodology
Survey

SCM28: Online fashion demand allocation under inventory inaccuracy

Proposed by
Sander de Leeuw

Capacity
1-2 students

Once an organization has a decently large e-commerce business the online orders typically are delivered from one location – often a warehouse (for food this may be a local supermarket but we consider fashion items here). Inventory in local stores, however, may need to be sold off at the end of a season with considerable mark-downs. Allocating demand to store stock that has been in inventory for a considerable time may avoid these local mark-downs, in particular if items have different sales patterns across stores. A first project with Coolcat where we looked into allocation mechanisms already revealed a better performance of demand allocation rules that allocate demand to local store inventory first before considering central stock. In this project we aim to further detail these procedures and account for inventory in accuracy.

Methodology
simulation

SCM29: Managing returns in campaign-based online sales

Proposed by
Sander de Leeuw

Capacity
1 student

Project description
Campaign-based sales offer an assortment that changes very frequently. Westwings.nl is an example of a company offering campaigns of 3 weeks. Every 3 weeks their furniture and accessories offered differ. When a consumer orders a product from a campaign online orders are first collected and then sent to a supplier, after which these orders are delivered to customers. However, a significant percentage of products is returned but these products cannot be taken into regular stock anymore due to the fact that these products are not offered for sale anymore. There are different options for selling these products, including selling on an auction and setting up a separate site for selling the returned items. The aim of this project is to investigate the consequences of different options on the supply chain and identify the best method.

Methodology
case research, probably combined with simulation

SCM30: Donating for humanitarian aid relief: enough is enough?

Proposed by
Sander de Leeuw

Capacity
2 students

Project description
When a disaster has occurred humanitarian organizations solicit donations from institutional donors but also from consumers. When providing these donations we typically do not have a good view on what is still needed. Having an idea of the extent to which a request has reached its target may help donors deciding between donation targets. In this project we investigate to what extent information sharing is helpful in obtaining donations and whether there is a difference between unearmarked and earmarked donations.

Methodology
experiment

SCM31: Supply chain stock management for construction items

Proposed by
Sander de Leeuw

Capacity
1 student

Project
Just like in many other industries inventory in the construction industry is placed at different hierarchical locations in the supply chain. There are several options to manage inventory. In this project we aim to simulate the effect of a number of multi-echelon inventory strategies for Technische Unie, the largest Dutch wholesaler in construction items and part of Sonepar, the global leader in construction item wholesale.

Methodology
simulation

SCM32: The role of store managers in preventing inventory inaccuracies

Proposed by
Sander de Leeuw

Capacity
1 student

Project

Every organization is confronted in inaccuracies in inventory records. In retail organizations the problem often exists both at the level of a distribution center and at the level of a store. In this project we investigate inventory inaccuracies at the store level. We aim to identify the relation between inventory inaccuracy and store manager behavior. We will use data from CoolCat and perform a survey among CoolCat managers to investigate if there are differences between store managers and how that affects management of inventory inaccuracies.

Methodology

transaction data analysis and survey

SCM33: Ordering behavior in resource constrained settings

Proposed by

Eirini Spiliotopoulou

Capacity

2 students

Project description

There is a vast literature on how people make single inventory decisions (Schweitzer, 2000; Benzion, 2007; Bolton, 2008; Bostian, 2008). However, in real life supply chains multiple entities (e.g., retailers) strategically interact and their decisions are interrelated. The performance of each entity depends not only in their own decisions but also on those of others. There is limited evidence on how people make inventory decisions when they compete for scarce inventory. Chen et al. (2012) is the only study that explicitly models and experimentally estimates behavioral factors when supplier's capacity is binding. The goal of these projects is to study how people place inventory orders in a resource constrained setting (e.g., when inventory is limited and they have experienced shortages in the past). How do scarcity beliefs affect the orders? After an incidence of shortage, how long does it take for the system to stabilize? Does ordering behavior depend on the context i.e., not-for-profit (e.g., NGO) versus commercial sector? What is the role of the allocation mechanisms?

Methods

Game theory or experiment (or both)

SCM34: The role of trust in Supply Chain relationships Capacity

Proposed by

Eirini Spiliotopoulou

Capacity

1-2 students

Project description

There is a growing interest on the role of trust and trustworthiness in supply chain relationships and more specifically in information sharing among supply chain parties, under various operational settings (Ozer et al., 2011, Inderfurth et al. 2013). The proposed thesis should identify a setting, an operational decision or

an industry, where trust plays a critical role in a decision or business outcome. Based on the context, the goal would be to explore the importance and measure the impact of trust on performance.

Methods
Case study or Experiment

SCM35: Behavior in procurement auctions

Proposed by
Eirini Spiliotopoulou

Capacity
1 student

Project description
Auctions, and especially reverse auctions, are fast becoming the standard for many procurement activities both in public sector and private commercial organizations. In addition to items traditionally thought of as commodities, reverse auctions are also used to source buyer-designed goods and services. Suppliers' risk preferences and bidding behavior largely influence each mechanism's performance in terms of the overall efficiency, the informational requirements, the seller's revenue, and the buyer's profit (Katok and Roth, 2004; Ockenfels et al, 2005). Multiple studies have focused on the bidding behavior however many auction design choices remain underexplored. This thesis shall review the literature on the behavioral factors that affect bidding in procurement auctions. The goal is to provide a systematic classification of the literature, identify implications for procurement design and pinpoint research opportunities.

Methods
Meta-analysis, literature study

SCM36: The personality of the newsvendor (4 students)

Proposed by
Eirini Spiliotopoulou

Capacity
4 students

Project description
There is a rich literature on systematic biases that people exhibit when making decisions in the newsvendor context: how much to stock for a single period when demand is uncertain (Schweitzer & Cachon, 2000; Benzion et al., 2007; Bostian et al., 2008). Several mechanisms have been proposed to help people take decisions that are closer to the optimal by (e.g., task decomposition, feedback) (Bolton & Katok, 2008; Lee & Siemsen, 2013). However, in the current literature has focused only on decision making biases, leaving under-explored the personality characteristics that may play a role. The aim of the theses would be to explore the impact of personality traits (e.g., regulatory focus, goal orientation) on the newsvendor problem. The latter is the building block of many inventory models and captures the essential dynamics of decision making under uncertainty in an operations context.

SCM37: Forecasting and inventory stock policies in humanitarian aid: the case of MSF

Proposed by
Eirini Spiliotopoulou

Capacity
2 students

Project description
Ordering and inventory strategies, based on good forecasts, are essential ingredients for any efficient supply chain. However, the context of humanitarian aid presents distinct challenges (Kovács & Spens, 2007; Fawcett & Fawcett, 2013). Currently, the operations center in Amsterdam of Médecins Sans Frontières is re-considering their procurement and stocking strategies. Their aim is to selectively move from a mainly purchase-to-order to a purchase-to-stock system. The proposed theses should develop a theoretical decision framework for stocking versus direct ordering in this context, by identifying and prioritizing the relevant cost and service factors. Development of a tool that operationalizes these concepts and informs decision making in this context is expected. Data from MSF will be used to show the applicability and practical relevance of the proposed methodology. For the items that will be kept in stock, a forecasting method that takes into account the demand and product characteristics (e.g., cold chain requirements, expiration dates, counterfeit) shall be proposed and a tool shall be developed. This will enable evaluate alternatives in a comprehensive way, taking into account the tactical/operational consequences of the strategic decisions proposed.

Methods
Data-driven analysis, spreadsheet modeling

SCM38: Global Health financing: input versus output based contracts

Proposed by
Eirini Spiliotopoulou

Capacity
1 student

Project description
Since 1990, $458.0 billion of development assistance has been provided to maintain or improve health in developing countries. While funding for health in developing countries has increased substantially, identifying cost-effective interventions remains challenging. In the case of malaria, for example, a global subsidy for ACTs has been proposed in order to expand access to effective treatment but also contain the development of drug resistance. However, the impact of different subsidy schemes on supply chain efficiency is still underexplored. For example, shall donors co-finance procured or dispensed drugs for a specific disease? What are the implications in terms of inventory availability, working capital and financing requirements?

Methods
Analytical modeling, secondary data analysis

SCM39: Forecasting product returns in closed-loop supply chains

Proposed by
Sander de Leeuw

Capacity
1-2 students

Project description
Many online retailers are faced with large return percentages, in particular fashion retailers. Being able to predict the % of products that comes back based on characteristics of the product will support better workforce planning and better scrutiny of the product returned – something which in the interest of time does not always take place. In this project we aim to develop an estimation approach for forecasting product returns for an online retailer (still under negotiation which one).

Reference
Michael Krapp, Johannes Nebel, Ramin Sahamie, (2013) "Forecasting product returns in closed-loop supply chains", International Journal of Physical Distribution & Logistics Management, Vol. 43 Iss: 8, pp.614 - 637

Methodology
Statistical analysis of transaction data.

SCM40: Effective sourcing strategies for perishable product supply chains

Proposed by
Sander de Leeuw

Capacity
1 student

Project description
The purpose of this project is to assess whether an existing sourcing strategy can effectively supply products of appropriate quality (=remaining shelf life) with acceptable levels of product waste if applied to an international perishable product supply chain. This project will be performed based on Superunie data.

Reference: Willem A. Rijpkema , Roberto Rossi , Jack G.A.J. van der Vorst , (2014) "Effective sourcing strategies for perishable product supply chains", International Journal of Physical Distribution & Logistics Management, Vol. 44 Iss: 6, pp.494 – 510

Methodology
simulation or modeling

SCM41: The impact of the Christmas effect of online demand on physical distribution networks

Proposed by
Sander de Leeuw

Capacity
1-2 students

Project description
The purpose of this project is to study how cost efficiency and the reliability of a physical distribution network are affected by peaks in online shopping demand – the Christmas effect (or in the Netherlands the Sinterklaas effect – and to suggest how logistics service providers can respond to such changes. Based on a discrete event simulation approach, the project aims to apply measures to such large increases in online shopping demand focused at decision making in the parcel distribution network: aspects that may be considered are priority assignment to orders in the hub (operational), installation of sub-hubs (tactical) and a temporary increase in the hub-terminal capacity (strategic).

Reference
Hyunwoo Lim, Narushige Shiode, (2011) "The impact of online shopping demand on physical distribution networks: a simulation approach", International Journal of Physical Distribution & Logistics Management, Vol. 41 Iss: 8, pp.732 – 749

Methodology
Simulation

SCM42: Evaluating CO2 emissions and fatalities trade-offs in truck transport

Proposed by
Jelle de Vries

Capacity
1-2 students

Project description
A large share of all occupational fatalities occurs in truck transport. Trucking companies are therefore continuously investigating how to improve the safety of their drivers. At the same time, the pressure on these companies to operate 'greener' and to reduce CO_2 emissions is increasing. The relationship between these objectives is not very clear. Rogers and Weber (2011) the tradeoffs among fatalities, CO_2 emissions and value generated by the truck transportation portion of supply chains in the United States, and found that a focus on the reduction of CO_2 emissions could result in a significant increase in fatalities. This finding is striking and relevant for both transport companies and policy makers. Executing a similar analysis in the European / Dutch context could establishing the robustness of this finding.

Reference
Rogers, M., Weber, W.L., 2011. Evaluating CO2 emissions and fatalities tradeoffs in truck transport. International Journal of Physical Distribution & Logistics Management 41, 750–767.

SCM43: The effects of credit period on a supply chain's policies with cash constraint in place

Proposed by
Yousef Ghiami

Capacity
1-2 students

Background
In supply chain practices "power" plays an important role when setting supply chain policies and agreeing on payments. These policies may include prepayments or delays in payment and the relevant interest rate. There are two main cases when it comes to power distribution in a supply chain:

Case 1. In the marketplace, businesses with large customer base own the power and sometimes they may abuse this power by imposing unfair payment policies on their suppliers. In a fair business setting, a car manufacturer that usually has less cash constraints is able to support its suppliers that are (mostly) SMEs, by offering prepayments when placing an order. This results in a sustainable business practice and increases the supply chain competitiveness.

Case 2. In grocery retail industry admissible delay in payment is more common regardless of who has the power in the supply chain. The power however manifests itself when setting margins (sometimes retailers impose margins to their suppliers and they have to accept if they want to have the retailers' shelf space) and interest rates. In the case of giant retailers that enjoy the power in the business, this is the retailer that sets the policies and the suppliers have to accept providing items and receiving payment in future. The power is not always with the retailers in supply chains. For the case of leading brands in the market such as Coca-Cola, when selling their items through small grocery shops, the story is different. In this case the supplier has the power and cash. In such cases also it is again the supplier who accepts receiving the payments with delay to support the retailer's business which results in guaranteed sale for the supplier.

Purpose
Analysing the cases to get insight into such collaborations and to find the optimal policies (taking into account credit period and interest rate). The result of this research would help understand and analyse complex supply chains.

Methodology/Approach
In inventory management literature a large group of research work has been devoted to optimisation of policies for a buyer-supplier setting. In those studies a classic approach is adopted when evaluating holding cost and shortage cost. This approach however may result in policies that are not necessarily optimum. Net present value (NPV) approach values all activities and the relevant cash-flows according to the time that they occur. Taking an NPV approach, we analyse a supply chain that includes one supplier and one buyer in order to maximise the joint profit, taking into account credit period. Using mathematical modelling we obtain and optimise the relevant total profit function of the supply chain for the two cases mentioned above. We can then compare the results of the analysis with the case that there is no collaboration (prepayment or delay in payment).

Further reading

Wu, J., Ouyang, L. Y., Cárdenas-Barrón, L. E., & Goyal, S. K. (2014). Optimal credit period and lot size for deteriorating items with expiration dates under two-level trade credit financing. *European Journal of Operational Research*, *237*(3), 898-908.

Wang, W. C., Teng, J. T., & Lou, K. R. (2014). Seller's optimal credit period and cycle time in a supply chain for deteriorating items with maximum lifetime. *European Journal of Operational Research*, *232*(2), 315-321.

Beullens, P., & Janssens, G. K. (2014). Adapting inventory models for handling various payment structures using net present value equivalence analysis. *International Journal of Production Economics*, *157*, 190-200.

Beullens, P., & Janssens, G. K. (2011). Holding costs under push or pull conditions–The impact of the Anchor Point. *European Journal of Operational Research*, *215*(1), 115-125.

SCM44: How do online shops generate profit?

Proposed by
Yousef Ghiami

Capacity
1-2 students

Background
Online retail industry has gained momentum during the last decade and the number of online shops has rapidly risen. Online shops act as an intermediary between suppliers and customers, they advertise items from a wide range of suppliers to their customers and charge the supplier or customer a percentage of either the profit or sales price. Online shops have different types of pricing policy that should be taking into account when dealing with a specific case. In the first glance the profit of these shops is obtained from the extra percentage that they charge. This perception however cannot be entirely correct when the online shop is not the owner of the items. When selling an item (in some cases), an online dealer receives the money from the end customer. Only after that, the dealer places an order to the supplier. An amount of cash equal to the item price stays with the dealer until the item is delivered (this lead-time also varies for different types of items). Note that the dealer is not incurring any holding cost. This item price generates an interest for the dealer before being paid to the supplier.

Project description
Analysing the profit function of an online shop to get insights into real margins that these shops may enjoy. This analysis could be done for different types of items; items with low or high margins, items with short or long lead-time.

Methodology/Approach:
Using a discounted cash-flow model, students need to evaluate the activity of selling an item by an online shop. Using mathematical modelling techniques, students can obtain the profit function of the shop. This profit function could be then compared with profit function of the basic economic order quantity (EOQ) model to identify costs/revenues in such businesses. This comparison may show some counterintuitive results. A retailer that owns items incurs a cost of capital from the time payment for an item is made to the time the item is sold. This is however different for an online shop. From the time that demand for one unit of item is raised, and the price of the item is received to the time that the shop pays the money to the

supplier, the online shop earns interest. This interest could be a "negative" holding cost when compared with EOQ or simply a hidden profit.

Further reading

Beullens, P., & Janssens, G. K. (2014). Adapting inventory models for handling various payment structures using net present value equivalence analysis. *International Journal of Production Economics*, *157*, 190-200.

Beullens, P., & Janssens, G. K. (2011). Holding costs under push or pull conditions–The impact of the Anchor Point. *European Journal of Operational Research*, *215*(1), 115-125.

SCM45: Objective functions for production-inventory decision models

Proposed by
Yousef Ghiami

Capacity
1-2 students

Background
An inventory model is an evaluation of an inventory system and the activities that take place in that system. Depending on how accurately the system is modelled, the results of the model could be applied to the inventory system and then result in expected outcomes. It then seems correct to claim that optimum policy derived from a model that provides an inaccurate evaluation of a system, does not necessarily optimise that inventory system.

In the literature of inventory management, there are different objective functions adopted for more or less the same inventory or production-inventory models. Researchers do not provide explanations on why they adopt one specific objective when they analyse an inventory model. This is while there is no analysis on how significant the difference between this objectives could be. More specifically, in the literature of models that consider net present value approach for systems delivering deteriorating items, a group of researchers obtain the total profit (cost) function by making an average (over the inventory period) of the present value of the first inventory (production-inventory) period. This objective function is hard to interpret compared with conventional objectives in the literature.

Purpose
Presenting an analytical and empirical comparison between conventional objective function and the above mentioned objective to show the difference and also obtaining a more accurate objective.

Methodology/Approach
In this research, students need to consider a basic inventory or production-inventory system and model that using the principles of net present value approach. They should model the same system using the averaged-NPV objective and try to show which objective is more accurate using EOQ model as a reference.

Further reading

Yang, H. L. (2012). Two-warehouse partial backlogging inventory models with three-parameter Weibull distribution deterioration under inflation. *International Journal of Production Economics*, *138*(1), 107-116.

Ghiami, Y. (2014). *Models for production and inventory systems for deteriorating items with a supply-chain perspective* (Doctoral dissertation, University of Southampton