Openbare verdediging tot het behalen
van de academische graad van:
**DOCTOR IN DE TOEGEPASTE ECONOMISCHE
WETENSCHAPPEN**

Examencommissie

Prof. dr. E. Carrizosa
Department of Statistics and Operations Research
Universidad de Sevilla

Prof. dr. S. Nickel
Department of Discrete Optimization and Logistics
Karlsruhe Institute of Technology

Prof. dr. M. Despontin
Department of Mathematics, OR, Statistics and IS for Management
Vrije Universiteit Brussel

Prof. dr. C. Macharis
Department of Mathematics, OR, Statistics and IS for Management
Vrije Universiteit Brussel

Prof. dr. P. Uyttendaele
Vrije Universiteit Brussel
Director of Maritime & Transport Business Solutions

Promotor

Prof. dr. F. Plastria
Department of Mathematics, OR, Statistics and IS for Management
Vrije Universiteit Brussel

Van mevrouw **LIESELOT VANHAVERBEKE**

Die zal plaatsvinden op:

Woensdag 29 september 2010 om 17u00

**In de promotie zaal gebouw D, 2de verdieping, lokaal 01
Campus Vrije Universiteit Brussel**

COMPETITIVE LOCATION MODELS AND CONSUMER SPATIAL BEHAVIOUR

Promotor: **Prof. dr. F. Plastria**

**Gelieve uw aanwezigheid te bevestigen voor 27 september 2010:
lieselot.vanhaverbeke@vub.ac.be**

**Hoe de VUB te bereiken,
zie http://www.vub.ac.be/infoover/campussen/index.html
Pleinlaan 2 – 1050 Brussel
[T] 02 629 25 08
[F] 02 629 36 45
[E] faces@vub.ac.be**

Summary

Location, location, location. It is an often-heard saying when retailers are asked about the key success factors for their business.
The 'where?'-decision for a retailer has a long-term impact and requires a substantial investment. Changing place is unlike changing product, price or promotion a very drastic matter for a retailer in a competitive environment.

We propose an optimisation and a simulation approach to advice retailers on the most interesting location opportunities without losing sight of the "raison d'être" of competition in a retailer market, the consumers.

First we address the uncertain competitive environment in which location decisions have to be taken. We analytically formulate and solve three optimisation models that take anticipation on the future actions of new competitors into account. In line with wellknown game theory strategies, we propose a worst case maximin location model, a minimum regret location model and a von Stackelberg location model for two players. Computational tests and an efficient procedure to deal with large consumer demand populations in location models demonstrate that these formulations provide interesting results for applications in practice.

Next we focus on the increasingly segmented and complex consumer markets that form the rapid evolving context in which retailers nowadays operate. The "fishing where the fish are" rule of thumb is put into perspective in a literature review. We discuss two streams of traditional modelling of consumer spatial behaviour and then apply a general framework for spatial models to the particular context of consumer behaviour. We move to more recent modelling approaches and elaborate on the recent evolutions in the modelling of consumer spatial behaviour.
Particularly the aspect of increased mobility draws our attention and in our survey in the city of Ghent we zoom in on the shopping behaviour of consumers during commuting trips. Clearly, going where your consumers are does not fully grasp the complex challenge that consumer spatial behaviour modelling presents.

So we infer that two important concepts are revealed in our literature study of consumer spatial behaviour: mobility and bounded rationality. Next we link these recent evolutions in consumer spatial behaviour to the changing retail location patterns with an agent-based approach for location modelling.
Therefore we first introduce the methodology of agent-based modelling and simulation and review related work in relevant domains. Next we develop a conceptual model that encompasses mobility and bounded rationality on the demand side and heterogeneity in the assortment of products on the supply side.
We implement a prototype model in NetLogo. Our simulation results show the interplay between the consumer spatial behaviour and retail location decisions.

Finally, we extend the analytical and simulation approach with the simultaneous handling of location and price decisions to more accurately estimate future revenues. We successfully incorporate the mill price decision in the maximal covering location problem for revenue maximization in a competitive environment. The optimisation model seems computationally intractable, but we propose an intelligent enumeration technique that allows to solve the model to optimality in a very efficient way.
Finally we return to the agent-based approach. Similarly as in the optimisation model, we first introduce the price in the utility function of the consumer agents. Next we also incorporate the price as a decision element in the retailer agents.

We conclude that it is imperative to adopt a quantitative point of view for taking profitable business decisions in a competitive retail context, but we also recognise that another good location for a retailer is in the minds and hearts of its best consumers.

Curriculum Vitae

Lieselot Vanhaverbeke is Licentiate in Applied Economics and Advanced Master in Business Information Management.
Since 2003 she works as a teaching and research assistant at the Department of Mathematics, OR, Statistics and IS for Management at the Faculty of Economic, Social and Political Sciences and Solvay Business School at the Vrije Universiteit Brussel. Her research involves next to applying quantitative methods to management problems in the fields of location and consumer behaviour also work with geographical information systems (GIS) for decision making. As a teaching assistant she was involved in coaching students for the courses Software for Management, Distribution and Location Problems, Statistics for Decision Making and Business Models and Strategies for the Digital Economy.

Vrije Universiteit Brussel