Review on the Dissertation

GROSSO Alessandra: Mathematical Modeling for Hub and Spoke Technology

The reviewed dissertation is devoted to one of the logistic problems, specifically to the problem of the distribution logistics using the hub and spoke technology. All four goals of the dissertation, formulated in the chapter two, are focused on creation of mathematical models for optimal architecture of the hub and spoke technology for both one-way and two-ways flows of goods, both with and without a vehicle fleet selection and for optimizing their total costs, with final validation of all presented models.

The dissertation consists altogether of 144 pages with 81 pictures and 49 tables. Bibliography includes 24 references and also a list of 9 publications, published by the author both alone (two times) and as co-author. The dissertation consists of 9 chapters, which can be divided into three parts. The first part is an informative one and includes chapters 1 - 5. The chapter one briefly describes the hub and spoke technology. The chapter two formulates already mentioned goals of the dissertation. The chapter three gives a survey of the main solution of the problem and describes six existing models for a single-assignment hub and spoke technology and four for a multiple-assignment one. The summary of the presented models (chapter 3.3) I consider as a rather chaotic and I believe that two well arranged tables would be more useful for the reason. I also miss the concrete conclusions for making use of the models in the dissertation.

The second, dominant part of the dissertation includes chapters 4 - 7. The chapter four presents five mathematical models suggested for optimal architecture of hub and spoke technology, namely for one-way flow of goods without and with fleet selection, for two-ways flow of goods without and with fleet selection and for optimizing the total costs for two-ways transportation. It is generally known that "Practice makes perfect", but in fact I miss the real sense of repeating symbols once properly listed at pages 8 - 10 once more at pages 28, 31 -32, 35, 37 - 38 and 41. The chapter five presents the software, used for implementation and validation of suggested mathematical models. The software Xpress-IVE with Mosel's modeling language was chosen for that reason.

The chapter six closely connects to chapter four. On relatively simple example (3 real suppliers and 2 real consumers), all mathematical models presented in chapter four are in detail validated with a conclusion that all proposed models are functional. The chapter seven extends sphere of models activity and analyzed their applicability for much more complicated situations with a bigger quantity of entry data. The first part examines maximal quantity of entry dates from the point of view of used academic version of SW Xpress-IVE. The second part presents possibilities how to extend these limits.

As the second part forms a core of the dissertation I’ll concentrate my questions to it:

- All presented models suppose that at least one supplier hub is situated at the real supplier and at least one customer hub is situated at the real customer. Do models allow an optimization of central supplier and customer hubs outside the suppliers and customer locations?

- The most of models are focused to the optimization of a total transportation distance. Do you consider it sufficient?
• The models operate with the term “number of trips”, but for practical use is necessary to know “number of vehicles”. What is the relation between them and how is possible to calculate the number of vehicles needed?

• All types of hub and spoke transportation belongs to the intermittent transport with a certain degree of an irregularity. Do you consider the fact in your models?

• In one-way models only number of trips from customers to suppliers is calculated. How are taken into consideration back trips of empty vehicles?

• How were calculated the relative costs of transportation for vehicles? They differs according to the fact they are loaded or empty.

The third, final part of the dissertation includes chapters eight and nine. The chapter eight analyses its benefits for science and practice and possibilities of future continuing on its basis. The chapter nine forms a summary of the dissertation.

Conclusion:

The reviewed dissertation set down four targets, all of them closely connected with creation and validation of mathematical models for various types of hub and spoke technology. It is possible to state that all stated targets were fulfilled thanks to author’s active attitude to them. The fact is also supported by a very solid number (nine) of author’s publications.

The results of the dissertation form also the solid basis for practical use and for a possible continuance in research works. Personally I’d recommend, in a future, to pay more attention to the problems of cost optimizations. The dissertation is written in English and sometimes is possible to recognize that not by a native Englishman.

I am fully to commend the dissertation to defence.

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