MATCHING FLEET OPTIMIZATION SYSTEMS WITH USER REQUIREMENTS

SOME USER GROUPS' REQUIREMENTS FOR FLEET OPTIMIZATION SYSTEMS AND MATCHING WITH EXISTING SYSTEMS

Jarl Sigurdsson

The purpose of the study is to match providers of fleet optimization systems with potential users by studying the requirements of users and evaluating which optimization system is most suitable. This article is an abstract for a master thesis written at the Division of Engineering Logistics, Department of Industrial Management and Logistics, Faculty of Engineering, Lund University.

INTRODUCTION

Fleet optimization means planning how transport should be implemented based on given demand and given customers. The aim is to deliver on time, while minimizing driving time, driving cost and the number of vehicles used.

Fleet optimization may involve optimizing routes for one vehicle or an entire fleet. This study looks at the second type. Fleet optimization is very complex and computer systems have been developed to facilitate this.

If it is possible to improve a route, it can lead to big savings in transport costs. Improving routes usually means reducing time and distance driven and the number of vehicles. Fleet optimization is relevant not only for logistics companies. It can also be used by home help services, dairies, refuse collection, the oil industry and service companies.

There are several types of fleet optimization system. Some companies sell standardized products that can be used in several types of organization, while others adapt and develop systems to meet customer requirements. It can be very expensive to pay for a program to be customized and if it is possible to use a standard program, this is often preferable for reasons of cost. The degree of complexity varies markedly between systems and it is important to find the right level on the basis of the organization's needs. There are many parameters to take into consideration in fleet optimization, but not all are relevant in all types of operations. However, there are many systems that do not take aspects into consideration

that most organizations consider to be important.

The purpose of the study is to make it easier for potential users to choose a fleet optimization system. This is done by identifying user groups of fleet optimization systems and studying their needs and requirements. The study also evaluated some of the systems available on the market on the basis of user group's requirements. By studying the specification of requirements, potential purchasers can discover the requirements and wishes of previous users.

METHODOLOGY

On the basis of previous studies, in combination with fleet optimization theory and interviews with users, this project developed specifications of requirements to suit several types of organizations. These new requirements were prepared by interviewing existing and potential users of fleet optimization systems in a preliminary study. The specification of requirements was subsequently developed as greater insight into the needs of different sectors was acquired. The specification of requirements that was developed in this way was used as the basis of the interviews conducted in the main study. The interviews were conducted with users from different sectors. The users were mainly selected from the references from the two largest suppliers of fleet optimization systems in Sweden. These users answered questions regarding which of the requirements they found useful and necessary and if there were requirements they thought would be important to add. System suppliers were subsequently contacted and asked, in a survey, to say which requirements they could meet. The system suppliers were subsequently divided into archetypes based on the requirements they could meet. The responses from the system suppliers were compared with the users' requirements and finally compiled in a matrix.

THEORY

For a vehicle with no restrictions on load capacity, driver capacity or tank capacity, which must visit n customers, the number of possible routes is n! When the number of customers increases, the problem is difficult to solve exactly as the number of possible routes quickly becomes very large. The complexity increases when it is necessary to take into consideration breaks for drivers, time windows, the number of vehicles and other aspects that must be included in the calculation to achieve a realistic result. The problems rapidly become too big to be solved exactly. Therefore, intuitive, empirical algorithms have been developed to arrive at a usable solution within a reasonable period of time. Extensive studies have been made in exploring different algorithms for solving this problem effectively and modeling it accurately. Other previous studies of note for this project have been made in examining differences between fleet optimization systems and requirements suitable for fleet optimization in home care.

FINDINGS

The sectors identified are dairies, food, goods suppliers, energy companies, haulers, agriculture and service companies. The results of this study illustrate how many similarities there are between the requirements from users in different sectors. It is often difficult to identify clear characteristics for different sectors. However, some differences did emerge. No one in the goods suppliers sector was interested in real time optimization. They focused instead on operational and strategic fleet optimization. In the energy companies sector, no one indicated that it is necessary to be able to adjust stop points without new data import being needed. Only in the food, service and transport sectors were there users who considered it necessary to be able to link goods with a certain temperature to a specific type of vehicle. Only in the food and energy sectors was there no requirement for the fleet optimization program to be able to handle maps for both Sweden and abroad in the same optimization. The transport sector stood out as the only sector that required the software to take trailers and hazardous goods into consideration. The service sector has smaller vehicles than other sectors and they therefore do not need to take underpasses into consideration.

ANALYSIS

A total of 97 suppliers of fleet optimization systems were contacted. After persistent reminders, 12 had answered the survey after two months. This equates to a response rate of 12%, which may be considered too low to say anything about fleet optimization systems in general. There is reason to suspect self-censorship by suppliers who did not meet all requirements. Another reason for not responding may be that the initial questionnaire was too long and the person in question did not consider it worth the effort to answer the questions.

The fleet optimization systems were grouped according to how well they could meet users' requirements. The results are presented below.

CATEGORY A (HIGH).These suppliers answer that they can meet all requirements: AKB-ORES/Intris, Dimaps, Ecomond, Ortec and Transvision. Another company, Descartes Systems Group, answered no to just one part of a question.

CATEGORY B (MID). This group is hard to generalize as only two suppliers, PPS/EDV and Transit, are included in this category. They share few similarities. However, they answered that they could meet significantly more requirements than the third category. Each company indicated that it could not meet three requirements.

CATEGORI C (LOW). Three suppliers were placed in category C. One of them answered N/A to nearly one third of all questions, which means that it is difficult to say anything specific about that supplier. The other three lost many points on the questions concerning load, road restrictions and the ability to communicate with an on-board computer.

DEGREE TO WHICH SYSTEM SUPPLIERS MEET THE INDUSTRIES' LOWEST REQUIREMENTS

Analysis w.r.t. minimum	Food	Energy companies	Goods suppliers	Service	Refuse collection	Dairies	Transport
AKB-ORES/Intris	3	3	3	3	3	3	3
Axxom	1	2	1	1	2	2	1
CS Group	1	1	1	1	1	1	1
Descartes Systems Group	1	2	1	3	1	1	1
Dimaps	3	3	3	3	3	3	3
DNA Evolutions	1	1	1	1	1	1	1
Ecomond	3	3	3	3	3	3	3
Ortec	3	3	3	3	3	3	3
PPS/EDV	1	2	1	1	1	1	1
Profit Point	1	1	1	1	1	1	1
Transit	1	1	2	1	1	1	1
Transvision	3	3	3	3	3	3	3

Figure 1. The matrix shows which fleet optimization systems may be relevant if the requirements correspond to the *lowest* in each sector. The systems that do not meet all requirements have been marked in red and have the number 1. The systems that meet all requirements that are necessary but not all that are desirable have been marked in yellow and have the number 2. Finally, the systems that meet both necessary and desirable requirements have been marked in green and given the number 3.

The weighting was performed by first creating a sector profile with the *lowest* requirements that anyone in the sector made. Example: For the first question, the first user answers not necessary and the second necessary. For the second question, the first user answers necessary and the second not necessary. In both cases, the answer for the sector profile is then not necessary. This sector profile was then matched with the requirements the suppliers of fleet optimization systems said they could meet. The assessment was compiled in the matrix above. Number 1 was given to the systems that do not meet all the requirements the sector profile specifies as necessary. Number 2 means that the system meets all the requirements the sectors specified as necessary but not all specified as desirable, or the system supplier did not answer questions concerning requirements the sector requires. Number 3 means that the system meets both the necessary and the desirable requirements. There are questions that everyone in a sector considers to be necessary, i.e. the sector profile gets the number 3 for that question. This is why some suppliers get a 1 in the matrix.

One of the two requirements that proved to be most difficult to handle for the system suppliers was "The software must take into consideration everything that limits progress, for example underpasses, bridges, one-way streets". Four companies were unable to meet this requirements and one did not answer. At the same time, all users, with the exception of one in the energy sector, considered that it was a necessary requirement. These systems therefore could not be recommended to any of the remaining sectors. Descartes Systems Group is also placed in the high-end category even though it cannot be recommended to anyone other than the energy companies sector and the service sector. The reason is that they were able to take everything except underpasses into consideration.

The next requirement that led to the greatest difficulties was "It should be possible manually and simply to make the software prohibit roads that cannot be used for transport". Users found this requirement very important and only three respondents considered it desirable instead of necessary. The suppliers' response distribution was the same here as for the requirement that the fleet optimization system should take into consideration everything that limits progress, i.e. four answered that they could not meet this requirement and one did not answer. Only those suppliers who answered that they could meet all requirements had a solution for both of these. Among the other systems, there were some that met one requirement and not the other, and vice versa. On account of the fact that virtually all users considered these requirements to be necessary, they were very decisive when matching users and suppliers.

In this study, it was difficult to find proof that any program would be more suited to certain sectors than others. The big difference is between the programs that were able to meet all requirements and those that were not, rather than between programs that had different specialties'.

CONCLUSION

There are a large number of fleet optimization systems but it can be difficult to evaluate how an organization should choose. The organization needs to systematically structure its needs and then find a system supplier that can meet them. The hope is that the long specification of requirements in the article can be a useful tool to find a standardized system with little need for customization.

The author finds that fleet optimization systems are being developed and that their use will increase. Knowledge of their existence is still relatively limited. When the author was looking for interviewees in various sectors, for example the transport sector, it emerged that many people did not know that such programs exist.