TRANSLATING SUSTAINABILITY FROM STRATEGY TO OPERATIONS: CAN DECISION SUPPORT MODELS HELP LOGISTICS SERVICE PROVIDERS TO ATTAIN STRATEGIC AS WELL AS OPERATIONAL GOALS?

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ABSTRACT

Decision Support Models could help Logistic Service Providers as a means to make transportation more sustainable. When researching this hypothesis, we discovered that Logistic Service Providers were reluctant to use Decision Support Models when making transportation more sustainable. In this paper we show the preliminary results of a survey amongst Logistic Service Providers on how they see the role of sustainability for their business, what issues do influence their decisions on sustainability, and how they perceive the use of Decision Support Models as a tool to make transportation more sustainable.

INTRODUCTION

Environmental issues enjoy wide attention, and government, companies and institutions have incorporated sustainability in their business strategies (De Ron 2001; McDonough & M. Braungart 2002). It should not come as a surprise that it also features on the agenda of many logistics decision making processes (Ploos van Amstel 2008). On the question what is meant by sustainable transportation many different opinions exist (Pezzey 1997), but the most common aspect seems to be the reduction of greenhouse gasses like CO2 and particles (Pieters & Herder 2009). In order to aid Logistic Service Providers (LSP) to reduce these greenhouse gasses, many decision support models (DSM) have been built by researchers and consultants, on own account, or to the order of the authorities. These DSM's are meant,to help decision makers in the field of transportation when considering attaining the sustainability of existing networks, or developping new, more sustainable networks. Examples of these DSMs are Transtools developed by the European Union and Digiscan developed to the order of the Dutch Government (Pieters et al 2009). They all aim to support strategic decisions on how to set up more sustainable transportation networks.

For a DSM to be successfully used, it should provide means of evaluating the trade-offs between various alternatives and arrive at an optimal set of solutions. (Moynihan 1995; Van der Vorst 2000; Palmer 2007). But searching for an optimum two problems have to be met: 1) The multi-level feature of design decisions and 2) The coordination problems within the supply network (Schneeweiss 2003). Another complication is that measuring the environmental effects of transportation on all levels of decision making (strategic, tactical or operational (Braat 1991) is difficult or even impossible (Bell & Morse 2003).

Researching the value of DSMs for sustainable transportation business strategies in the Netherlands, we discovered that Digiscan was the only known DSM, but was hardly used anymore in case additional external consultancy was not available. Consultants and student did use this tool, but LSPs, as the intended user group, had lost its interest for this DSM. Understanding why a once successful DSM for sustainable transportation, like Digiscan, failed to be used anymore by the intended user group, could clarify what LSPs want from a DSM for sustainable transportation. This could help us to build DSMs that could be really effective in their support for realinsing more sustainable forms of transportation.

SUSTAINABLE TRANSPORTATION

In order to realize sustainable transportation, the LSP can rely upon the following practical measures:

- Use of environmental friendly transport vehicles
- Use of environmental friendly fuels
- Measures to raise the load factor
- More uses of environmental friendly transport modalities for interregional transport, such as rail or ships
- Reduction of transport by investments in:
    - Combining flows of goods
    - Adapting the warehouse locations
    - Using route planning systems
- Investments in environmental friendly buildings.
- Purchase of environmental friendly goods and services (for example green energy)
- Other measures such as training of the employers on sustainability, stimulation of driving economical, reduction of travel, environmental friendly lease cars etc.

A large impact on sustainability could be expected from the use of more intermodal transport. The European Commission (2002) valued the total external costs of road transport concerning long distances to be double compared to rail transport, and 5 up to 6 time to river barge and short sea shipping. The last decades had been characterized by an enormous increase of freight transport. This increase had been linked with an always larger percentage of the road transport in the total transport volume, with the consequence of growing congestion problems and pressure on the environment. Since the 1990´s both the European Union and the Dutch government have tried to stimulate intermodal transport, especially by subsidy regulations and liberalization of rail transport and inland shipping. In the Netherlands a fine network of inland terminals exists. The increase in the transshipment at these terminals however relies on the increase of the maritime container transport and not on the use of intermodal transport to the hinterland. Up to that point the clear improvement of the infrastructure has not resulted in an enlargement of the market share of intermodal transport. This confirms the assumption that state policy only has a facilitating function; the eventual decision concerning the use of intermodal transport is in with hands of the market parties (Macharis 2007).

RESEARCH SCOPE AND METHODOLOGY

That leads us to our question whether and how information and (calculation) tools can help LSPs in reaching their aims in the field of sustainability, including raising the use of alternative transport modalities. For this purpose, we have send a questionnaire to small and medium (SME) LSPs, in order to find an answer on the next question:

How do logistical service providers translate their strategic policy in the field of sustainability into activities on tactical and operational level and which role plays intermodal transport?

As a basis for this research we have formulated three hypotheses:

Hypothesis 1 (strategic level)	Sustainability is an essential component in the strategic (transport) policy of logistical service providers, but this policy is insufficiently translated to durable intermodal transport networks.
Hypothesis 2 (tactical level)	When drawing new, or changing existing networks in terms of sustainability, little attention is given to intermodal transportation.
Hypothesis 3 (operational level)	When transport tasks are implemented by the LSP, the customer will judge them on speed and costs, rather than on sustainable

intermodal transport.

Based on this hypotheses we have developed a survey for small and medium sized LSPs. We expect that especially within this group of LSPs, a need exists for a DSM in order to help them with environmental issues. Large international LSP's are provided with their own tools, supporting their decisions for setting up their intermodal, sustainable networks. The survey contained three types of questions:

1. Questions concerning the role of sustainability in the mission and vision of the LSP, and its motivation to incorporate sustainability into its strategic policy. And the role that intermodal transport questions plays in these decisions.
2. Questions concerning the influence of customers, competition, logistical service and costs on decisions at operational level.
3. Questions concerning the motivation to set up models for intermodal networks and the use of several types to support these decisions.

We invited 40 LSP to answer these questions in order to get significant results. Unfortunately at the moment of writing this paper the survey had been answered by just 13 LSP. So it is only possible at this moment to give some indications concerning the expected outcomes. Also for this reason the findings concerning the correctness of the hypotheses are provisional.

PROVISIONAL RESULTS FROM THE ENQUETE

The role of sustainability in the strategy of a LSP

Sustainability seems to be an aspect in the strategic policy of most (85%) LSP. Motivation to work on sustainability, beside taking social responsibility (54%), has mainly been based on external pressure: improvement of the company's image (32%), customer demand (32%) and reacting to measures of the government (32%). Although intermodal transport is considered by 54% of the respondents, it plays almost no role in the operational phase (just 15%). The respondents rather try to achieve sustainability with measures such as stimulating economical driving (85%), the reduction of transport (77%), combining flows of goods (62%) and more environmental friendly vehicles (62%).

The influence of customers, competition, logistical service and costs on transport decisions at operational level

On the one hand the market seems to be invoked as an argument to incorporate sustainability in the company´s policy (32%) and is frequently mentioned as a basic condition to get in new customers (46%). On the other hand 38% state that there is little chance of losing customers due to not being sustainable. Building durable transport strategies appears problematic. The main reasons given for this are that the customer:

- is not prepared to pay extra for sustainability (92%);
- will not make concessions on the speed of the transport (85%);
- will not aid the LSP considering optimizing the transport by planning the supply chain differently (62%).

The LSPs themselves indicate that they react proactively to sustainability (92%) and are open for cooperation with competitors on this issue (85%), but they expect the willingness of these colleagues to be low (54%). This indicates that they have a more positive idea on their own behavior towards sustainability compared with the outside environment. Intermodal transport plays no role in the considerations at the predominating part of the LSP (77%). Of course this answer could be the result of the restrictions of the domain the respondents are working in. This aspect will have to be investigated thoroughly later on in the survey – we need to have more answers. When the respondents indicate the possibility of intermodal transport, they indicate this will be

stipulated by customer requirements as punctuality, small volumes etc. (46%). It appears that intermodal transport has only a chance when LSP (with possible colleague companies) and customer jointly search for solutions and possibilities offered by intermodal transportation.**The use of models in order to support strategic decisions on sustainability**

The majority of the respondents (62%) doesn´t use a DSM to improve sustainability . This group uses internal company instruments or confess to be unfamiliar with the subject. Those who do use a DSM (38%) mention Excel calculations, planning tools, CO2 - estimates and compare calculations and notes. When asked what kind of models would be suitable for their decisions, the majority of the companies tend to opt for models which combine mathematical calculations with personal experiences (62%). The need for pure mathematical models is low (8%). On the other hand, half of the respondents who want combined models expect these models to rely more on mathematical algorithms as on personal experiences and knowledge. A quarter wants both aspects to play an equal role.

As a preliminary conclusion it could be said that a combination of models based on hard data with models based on experience could create a good structure to build a decision process most helpful for the LSP.

THE USE OF DECISION SUPPORT MODELS BY LOGISTIC SERVICE PROVIDERS

When asked if they used a DSM for sustainable decisions a minority (38%) answered yes. The reason why the rest did not use a DSM seems to be a lack of knowledge of DSM's in general. This may be due to the character of DSM's, or due to the knowledge or attitude of logistic managers. A logistic manager translates complicated situations on a strategic and tactical level into aspects of a more operational level. Taking the following aspects into consideration that:

- a DSM comes in three variations: 1) qualitative or heuristic, 2) mathematical and 3) mixed (Palmer 2007);
- these DSMs support physical transport decision on operational, tactical and strategic level (Schneeweiss 2003);
- the decision makers on transportation are rarely faced with strategic issues (Weijers, Glöckner & Pieters 2007) and
- a DSM on a strategic level will include less detailed aspects as compared to a model used at a tactical and on an operational level (Tipi 2009).

These facts will impact the appreciation of a strategic DSM by the logisatics manager, as, supposedly, he would be inclined to use this DSM not as much for strategic use, but for short and middle term goals as well. Another aspect when considering sustainability is that reduction of greenhouse gasses is the main focus for a LSP. It should therefore not come as a surprise that most of these DSMs concentrate on this aspect (Nagurney 2000; Van der Vorst 2000; Palmer 2007; Venigalla 2008) or try to determine the external costs (Maibach 2008; Delucchi 2008) and therefore tend to be mathematical.

Figure 1 Relationship between indicators, data, information and level

In order to understand the situation as mentioned above, we have adapted the module of Bell and Morse and build a model as shown in figure 1. It shows that a DSM used for strategic purposes will generate indices on which companies develop their strategy for the future. On a tactical level the DSM should produce indicators and for operational decisions as many indicators as are needed. Combined with Ashby's Law (1958) which states that the variety in a DSM must be equal to or larger than the variety of the perturbations which the DSM wants to control, we may expect an explosion of variables for the operational level. A DSM for operational sustainable transportation aspects will have to have more variables as a DSM for strategic sustainable transportation issues. This will result in a DSM which is difficult to maintain as the data needs to be updated on a regular basis in order to assure that the user will have the latest reliable information. If this updating of variables required to make the DSM suitable for an operational level, has to be done by the user and will take up much of his time, the updating of this information will be less frequent and the accuracy of the outcome of the DSM will fall and consequently the DSM will not be used anymore.

CONCLUSIONS FOR STRUCTURING DECISION SUPPORT MODELS

Taking these considerations into account, we think that a DSM in order to become suitable for a sustainable transportation strategy, requires not be difficult to maintain, and therefore requires to rely on a limited database, suitable just for the required task. For any organization, applying an overall DSM which deals with all aspects of sustainability and transport for this organization, will therefore not be a good idea. Such a DSM will require too much data and maintenance and be difficult to manage. In our opinion, an organization should use a structure of DSMs, all dealing with sustainability, on different levels. An individual DSM would target only one or two levels as shown in figure 2.

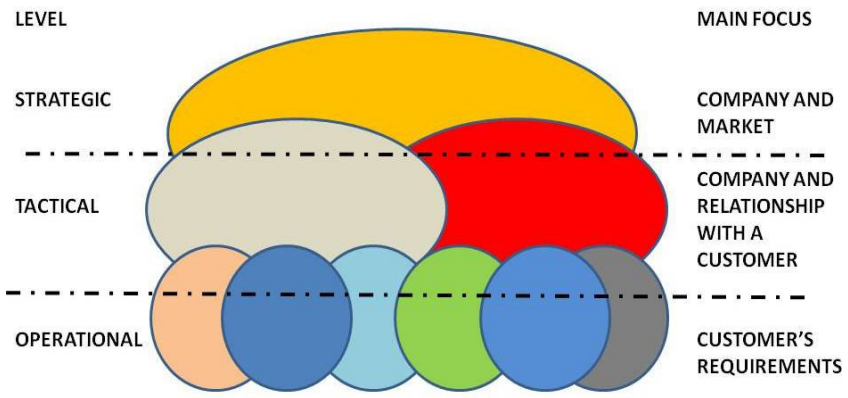

Figure 2 level of employment of DSMs within an organization

This model is supported by the view of Palmer (2007);

1. The qualitative or heuristic models for setting up the overall company´s strategy and its relationship with the market;
2. Models which are a mix of heuristic and mathematical aspects to determine the internal structure of the company and the relationship with important customers and
3. Mathematical models for decisions focussing on individual or groups of customers.

The various models do not have to be interrelated horizontally directly, but should fit vertically in order not to create a breach with the company´s strategy. They can be build

on a modular basis and suit the requirements for this specific situation. By focusing more on the intended user, the chance of a DSM to be actually used will increase as it focuses on the specific needs of this individual user or user group. By serving with one DSM the specific and not often coinciding needs of many users, the higher the danger that a DSM will fit all user´s needs but will be used by none.

The outcome of the outstanding survey will be used for further research and should result in an advice to builders and users of these DSM in order to save time and money and to improve the sustainability of transportation.

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