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# Getting supply chain strategies involved in “E-commerce & Environment” – A research potential for LCA case studies

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## **Abstract**

Based on a previous content analysis work, there is nowadays a need for assessing a list of strategies related to the management of supply chains and logistics discipline, such as postponement, customisation, centralisation/decentralisation, etc. The need for environmental assessment of these strategies stems from the challenging necessity for bridging two fields: logistics/supply chain management field, and the environmental field. Equally important, a cumulating experience from performing such assessments would hopefully enhance the ability of assessing complex issues such as E-commerce within a framework of a recent, novel model of assessment – *‘the horizontal assessment’*. The ultimate purpose of this paper is to discuss the windows of opportunities of environmental assessment of these strategies. One idea is: *to acquire the experience of LCA case studies and Energy analysis studies as an input for this model*. Research methods of literature survey, case survey and concept development are conducted to discuss and model the aspects and elements of this idea.

## **Introduction**

In a research project that discusses and models the environmental assessment of E-commerce, it has been proposed that instead of doing ‘vertical assessments’ (which is infact Life cycle assessment – LCA), it is much more rewarding to reach a better picture of the environmental implications to perform a *‘Horizontal assessment’* (Abukhader and Jönson, 2003a). Whereas LCA is an assessment of products, horizontal assessment is an assessment of technology such as E-commerce for example. The idea is based on that four processes (production, packaging, warehousing and transportation) are denominators of all supply chains, which means a much larger grip over the whole picture. E-commerce is not a single product (single supply chain), but represents the transactions of the miscellaneous market products. Abukhader and Jönson (2003b) finds that in fact, additionally, horizontal assessment emphasises the systems analysis perspective in this regard.

The proposed horizontal model is based on carrying out two tasks in order that a “horizontal assessment of E-commerce” can be performed (Figure 1): a) Environmental assessment of supply chain strategies, and b) evaluation of E-commerce impact on the supply chain strategies (Abukhader and Jönson, 2003a). In other meaning, in order to approach assessment of E-commerce, it has to go via a work of evaluation of supply chain strategies first, then E-commerce. The aim of the current paper is to show the further value of this proposal, and to discuss the windows of opportunities to the *environmental evaluation of supply chain strategies*.

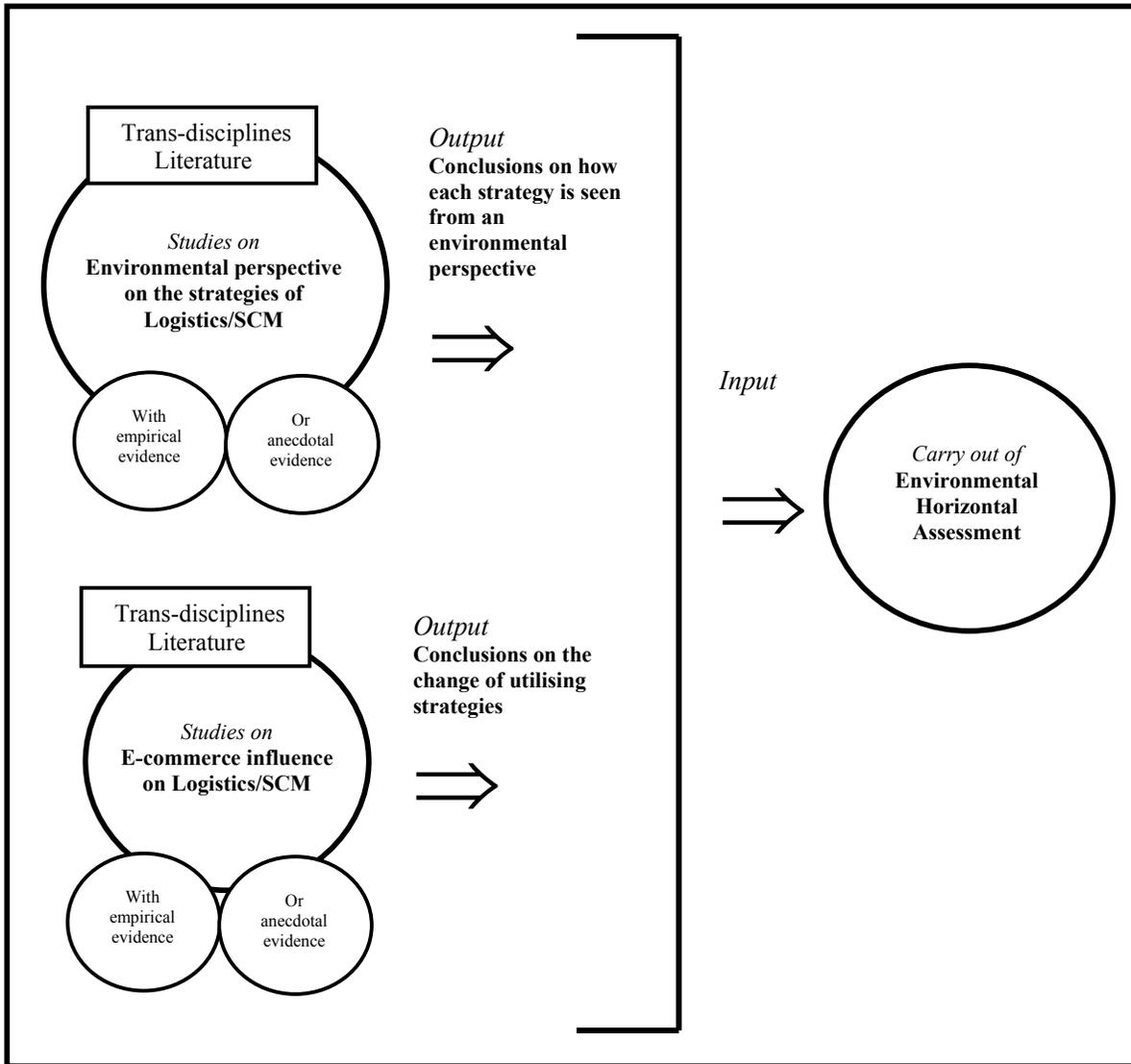


Figure 1. Horizontal assessment of E-commerce (After Abukhader and Jönson, 2003a)

In fact, there are two benefits out of building knowledge on the environmental understanding of supply chain strategies: 1) backing an assessment of E-commerce, and 2) enriching a subject of two fields: logistics/supply chain management (log/SCM) and the environmental field, in response to a challenging necessity to bridge the two fields. Abukhader and Jönson (2004) demonstrate that the subject "log/SCM & environment" is much less treated than the other subjects of the body of knowledge in log/SCM discipline. One observation in its literature is that there are missing

complementary themes; this may explain why such a subject is rather “stagnating” and achieving little progress in either the logistics-related journals or other-disciplines-related journals. Moreover, one can notice that there is relatively a small ground of common language/terminology between log/SCM and the environmental fields. Examples of this are:

1. In the logistics discipline, the term ‘environment’ is used to denote a different meaning: the outbound forces on organisations including regulations, customer/market, impact on natural resources, etc. Instead ‘ecology’ is sometimes used to replace it.
2. On the other hand, in the environmental side, the term ‘logistics’ is sometimes dealt with as being a type of ‘goods transport’, and this has to be corrected because logistics is a system of a group of processes of: transportation (inbound and outbound), warehousing (storing and distribution), packaging, inventory management, order processing, and some other minor activities.

The supply chain strategies are several, influencing the routes of four main processes: production, transportation, warehousing and packaging. Examples are mainly:

*Postponement (in packaging, in transportation)*

*Centralisation/Decentralisation (in warehousing, in transportation)*

*Customisation/Mass production - Economies of scale/Economies of scope (in production, in transportation)*

*Standardisation/Differentiation (in products, in packaging)*

*Focused factories (in production)*

*Just-In-Time (in production, in transportation)*

Developing a first setup for the evaluation of these strategies, in this current paper proposes one idea in this respect: ***why not utilising the cumulating experience of results/conclusions of LCA studies and the Energy analysis studies as an input into the carry out of the horizontal assessment.***

## **Methodology**

The research methods used in this paper to tackle the development problem of the horizontal assessment are the following:

- *Literature survey* across the environmental management field if there exists a similar or close type of discussions, i.e. a form of assessment for a more aggregate level of decision-making than the usual product level of decision-making.
- *Case survey* for LCAs studies in general, with an aim to:
  1. Find out if there are examples of LCA assessing some types of strategy (not necessarily related to logistics/SCM); and,
  2. Study and build some suggestions how the wealth of LCAs up-to-date can be utilised as an input to the horizontal assessment.

- *Concept development*, with an aim to build constructs that model the strategies into measurable elements.

The case survey work has been limited to LCA studies only and not including the Energy analysis studies, which is kept for future further work.

## Findings and Discussion

### 1. Literature survey

Across the environmental assessment related literature, one can find a clear focus on product/material level of decision-making, whilst there has been a small opportunity for discussing more aggregate levels of decision-making. Yet, it is a valuable endeavour to reach a type of environmental hierarchy or ranking regarding large systems or strategic measures. Among the few examples found, two hierarchies are (in Faruk et al., 2002): *solid waste management hierarchy* (Reuse – Recycle – Incineration with energy recovery – Incineration without energy recovery – Landfill), *modes of transport* (Transport by water [barge or ocean freighter] OR by pipeline – Transport by rail [diesel or electricity] – Diesel road transport – Petrol road transport – Transport by air), etc. These hierarchies can be helpful components in formulating judgments of environmental impact, although “circumspection is necessary when consulting any guidance hierarchy”. For instance, as to the first hierarchy, whereas “good evidence exists for it as a robust construct and for the generalisation it describes”, “instances that undermine the hierarchy are numerous”. In general, “these constructs are not meant to be applied rigidly; they are neither infallibly accurate nor complete taxonomies. That is, they will not always reflect either a proper order of preference or all the options available”.

### 2. Case survey

Attempting to reach as many LCA cases as possible, it has been important to realise that “the development and use of LCA has been documented in a large number of reports, books and proceedings from workshops and conferences. Many publications must be considered ‘grey’ or ‘yellow’ literature” (European Environment Agency, 1998). In addition, the studies can be found in several different languages than English. It seems therefore not an easy task to reach a considerable number of LCA studies. Yet, it would still be a valuable search if it covers multiple sources (triangulation): journals, conferences/seminars, websites of known research centres in LCA, websites of environmental organisations, consulting some experts, and searching libraries in person.

My survey has arrived at the following studies that discuss a type of strategy (a form of more aggregate level of decision making):

A) Product-specific type of strategies (low level of commonality)

- *Hair recuperation vs. Traditional unhairing*. This is a case of tanning process of leather production (Puig et al, 1999).

- *Fleshings valorisation vs. Disposal.* This is a case of tanning process of leather production (Puig et al, 1999).
- *Water softening vs. Usual drinking water.* This is a case for domestic clothes washing (Bronchi et al., 2002).

B) General, non-product-specific type of strategies (much higher, common level):

- *Recycling versus Incineration.* A number of cases in this regard are reviewed in Finnveden and Ekvall (1998). “The environmental impacts of different waste-management practises for paper, including packaging materials, is an issue which has been much discussed in several countries. More specifically, the preference on environmental grounds for recycling over incineration with energy recovery has been challenged”.
- *Continuous batch operation versus Small separate plants.* This is one case of LCA comparing these two strategies for the treatment of toilet and kitchen waste (Bengtsson et al., 1997).
- *Local vs. Central sludge treatment.* This is one case on sludge treatment (Bengtsson et al., 1997).
- *Renovating versus Building new construction.* This is one case study in construction field (Trusty and Mail, 2002).

### **3. General discussion**

Whereas the term ‘process’ indicates an event of producing a “meaningful” (finished, and not work-in-progress) product, and constitutes a group of activities/tasks/sub-works, the term ‘strategy’ controls/steers a process or a route of processes to achieve a goal at the final end. The strategy influences the process through a change in contents and/or path of this event. If the goal is to treat the paper package dumped from a household, then a route of processes to collect, disassemble, melt, transport (etc.) can be designed according to either recycling strategy or incineration strategy. One can notice here that there are in fact two categories of strategies: “general, non-product-specific” and “product-specific”. When a strategy is more general, non-specific to a product, it is then of a higher aggregate level of decision. The warehousing process, for instance, is common to theoretically almost all commodities of the market, while a tanning process is just limited to the leather (product). Therefore, a centralisation strategy of warehousing has much more influence on urban planning than a hair recuperation strategy of tanning. Similarly, water softening, being tied to a specific product production (water type suitable for clothes washing), is not much universal among the miscellaneous commodities of the market.

The results of the survey seem to indicate that there are not many available LCA cases that treat the supply chain strategies listed in this paper. But it is true that the two cases: “Continuous batch operation” and Local vs. central” are in fact similar to the centralisation and economies of scale strategies listed for supply chains. In order that some conclusions and reasonable judgment/statements to be made, a number of cases regarding a strategy and its opponent have been to be available. This situation exists somewhat in recycling vs. Incineration for paper packaging. It

seems such a situation has not yet repeated for other strategies. As seen above, only single cases are available. Despite this scarcity, one can realise that it is valuable to find out answers for more aggregate levels of decision than the usual product/material decision-making level. Challenging the claim of importance of strategies evaluation, one may argue that sometimes a change that may happen in a process (in contents or in path) as to one of its activities or materials, may not involve a change in the strategy. Centralisation of warehousing may take several forms of different process plans (in contents or path) and still at the end all called centralisation. In this sense, it is meaningless or useless to look into the strategies evaluation issue. Despite this point, still, looking into what happens in the networks of supply chains through strategies evaluation angle gives a better grip in all situations, and in fact provides the opportunity to investigate where/what level the change (big or small) has taken place.

In the absence of LCA cases that discusses the supply chain strategies, how can the general wealth of LCAs up-to-date be utilised as an input? Suggested ways in this respect can be:

*a. Gaining the past*

- By re-activating the previous LCA studies done, in particular large-sized companies, to simulate the calculations for a case of changing the warehousing strategy for example. Performing three to four works of different companies might provide some insights about the possibilities/obstacles.

*b. Scenario building*

- By performing scenario cases that focus on comparing, for instance, warehousing conditions/forms, once centralising and once decentralising in a specific region in a country.

*c. LCA-based Delphi*

- By handling a Delphi workshop, which is fed with the LCA studies performing scenario cases that focus on comparing, for instance, warehousing conditions/forms, once centralising and once decentralising in a specific region in a country.

*d. Modelling into constructs (concept development)*

- This method is to conduct conceptualisation first-of-all before any contact with LCA. Taking the centralisation and decentralisation strategies of warehousing process as an example to work with, two design factors are behind these strategies: size and number. A piece of research work is currently in progress to model constructs around these two factors (Abukhader, 2004). This should not be confused with other topics such as finding optimum location, the functionality of the warehouse, or the ownership (rented vs. owned/leased). For instance, some companies already follow some logistics models in finding an optimal location of the warehouse (such as Greenhut's model) considering several variables including the environmental variable. However, this does not tell about the environmental preference between centralisation and decentralisation, because the calculations are done after the decision-maker has taken the decision to centralise or decentralise.

The third method, i.e. modelling into constructs, is utilised in our current research project (Abukhader, 2004).

## Concluding Remarks

Performing assessment of supply chain strategies from an environmental perspective would be beneficial for several reasons:

1. Alleviation of the assessment of complex issues such as E-commerce and maybe other IT issues.
2. Bridging and building language and terminology between the logistics/supply chain management field and the environmental field.
3. Guidance for a more aggregate level of decision-making (in private or governmental sectors).
4. Possible openings for opportunities of learning new knowledge.

To support this endeavour, it is suggested that the cumulating experience of LCA case studies and Energy analysis studies can have a potential in supporting assessments of these strategies. Ways of contribution of LCA can be several, including modelling the strategies into constructs, which our research project is adopting currently to proceed in this direction. Towards this ambition, a pool of the total wealth of LCA studies and Energy analysis studies should be built, registering all those in journals or in the "grey" publications, in different languages. At the time some centers are succeeding in building life cycle inventories databases, unfortunately an international database of life cycle studies is not there yet.

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