



The 6th International Conference on Life Cycle Management in Gothenburg 2013

TOWARDS A FRAMEWORK OF LIFE CYCLE MANAGEMENT

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Keywords: LCM; information diversity; information flows; information cycle

ABSTRACT

This research builds on the technical competence of lifecycle tools and focuses on how the obtained lifecycle knowledge is used by industry corporations to support sustainability informed decision making. A review of the literature and preliminary practice review on lifecycle tools' effectiveness in supporting decision making capability as well as working with industrial partners on product lifecycle sustainability has produced the knowledge that has generated three frameworks, info-diversity, info-complexity and info-cycle frameworks. These frameworks are currently developing further as additional information will be obtained from future work with industrial partners. This paper highlights the progress so far and outlines future goals that could lead to the development of a lifecycle management (LCM) framework.

INTRODUCTION

Companies make decisions that affect people and the environment, directly through their own operations or indirectly through their value chain. These impacts challenge the business sector to address the issue of sustainability. This challenge requires firms with well-planned strategies at the organization (i.e. business units) level that are aligned with the performance at the operational (i.e. value chain) level. Although more and more companies claim activity towards sustainability at the strategic and operational levels, it appears that the frameworks used to support these activities do not adequately account for environmental and social issues. There is a need for sustainability evaluation to be included as a part of everyday business processes (Labuschagne & Brent, 2005); this evaluation process should map the value chain and address problems that relate to the three pillars of sustainability.

Life Cycle Thinking (LCT) is a way to consider the upstream and downstream issues and ensure that solutions are applied at the actual part of the value chain leading to implementable sustainable solutions (Thabrew & Ries, 2009). Lifecycle tools (i.e. ELCA, LCC, and SLCA) individually accomplish the criterion of mapping the value chain according to their focus, but there is need to combine the three lifecycle perspectives to help understand the problems that are related to the three dimensions. This analysis will be very useful for sustainability-informed decision making.

Life Cycle Management (LCM) is a system that manages sustainability related information to support decision making towards more sustainable products from a lifecycle perspective. At

the moment, the technical competency of individual lifecycle tools is high and these tools provide valuable information. Based on observation and discussion within companies, it would be very useful to identify how the obtained information is going to be used to support decision making towards more sustainable products. Using the three lifecycle tools will yield disconnected stories of the lifecycle of the same object. This information will then have to be managed from the business unit that is related to support sustainability in the organization who then distributes this information to the units responsible for decision making. The information is divided and distributed according to the role of the recipient and the lifecycle stage that they represent. This results in multiple sustainability related information flows within an organization.

This research aims to help the coordinator of sustainability within an organization by developing a strategic LCM framework that assists in reaching more sustainable products from a lifecycle perspective. A set of exploratory frameworks have been developed through an extensive review of the literature and exploratory studies. These frameworks are going to be tested in different organizations. The aim is to: a) map sustainability related information flows in different companies, b) identify if the current information flows help towards more sustainable decision making and c) find ways to improve information flows by developing a LCM framework.

METHOD

Conducting LCT studies on products and explore the applicability of the frameworks through action research is the chosen method. The studies focus on involvement with real company projects that seek solving problems related to lifecycle sustainability. Action research is used because there is the intention to solve a complex problem by obtaining a holistic view (Waterman et al., 2001). Furthermore, the research is conducted in real social contexts where participants are actively involved and help to refine the frameworks through their feedback (Kemmis & McTaggart, 2000).

RESULTS

So far, the results have yielded three frameworks; these frameworks are under development and change form as more experience from the ongoing studies is gained. The first is the info-diversity framework which is described in Figure 1. Info-diversity attempts to map the sustainability related information through the lifecycle of a product and describe the diversity of information that can be obtained. The second, the info-complexity framework, maps the sustainability related information flows in an organization, as seen in Figure 2. Finally, the info-cycle framework, also described in Figure 2, attempts to map the sustainability related information cycle from lifecycle tools raw information to the actions it may affect in an organization.

DISCUSSION

The info-diversity framework was inspired by Rebitzer & Hunkeler's (2003) framework on LCC and Jensen & Remmen's (2004) framework on product chain collaboration. By focusing on how the obtained information can support decision making, the product-process-location approach is proposed. Product and process approach is inspired by Labuschagne & Brent

(2005) who pointed out the difference between product and asset lifecycles. The product's life cycle starts at resource extraction (or when the material renews its life through end-of-life management) and includes the resource or resources' transition to useful raw material, product, waste and end-of-life option. The process lifecycle contains the processes that transform the materials to products, the use phase processes and end-of-life processes. In addition, it includes the processes' inputs and outputs. The location approach was derived from Potting & Hauschild (1997) who mentioned that the unique situation at each location leads to different impacts for the same exposure. Each location's environmental, economic and social situation have different reactions to each activity.

Thus far, the study that used the product-process-location approach has proved helpful in decision making. However, working on the location aspect proved problematic as the access to location data was extremely difficult to obtain and the methodology as to how this data was acquired raised issues of uncertainty on the information's validity.

The case company as described in Figure 2, is the value chain actor that is responsible for the design and marketing of the product under study. The case company is comprised of the executive board that makes strategic decisions and the business units that implement them through their own processes and interactions with the value chain actors. The case company has a business unit responsible for promoting sustainability within the organization. This unit is accountable for the flow of sustainability related information directly within the organization and indirectly with the value chain actors. Additionally, they inform the other units of issues relating to sustainability and offer advice on how the units can make more sustainability-informed decisions affecting the lifecycle performance of the product.

The flow of sustainability information in the organization triggered the framework of info-cycle. The results of the lifecycle tools analysis generate information that gives knowledge to the sustainability related unit about the product's lifecycle issues. The sustainability unit informs the executive board about the hotspots and possible solutions. The board authorizes the direction and criteria towards sustainability inspired mainly by stakeholders' theory and CSR. The sustainability unit then interacts with the other units informing them about changes that may be implemented; these changes will assist in creating greater sustainability informed decisions yielding actions that will improve the overall performance of the product.

CONCLUSIONS

The current frameworks are based on a literature review, a study using location approach and a study focusing on the lifecycle of a product. This research will be expanded with the addition of further projects offering more insight and refinements to these framework as to create a LCM framework. The preliminary discussions with individuals from the industry regarding the abovementioned frameworks has been met with positive interaction and comments. We are looking forward to discussing and using our frameworks on future projects with more industrial partners.

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FIGURES

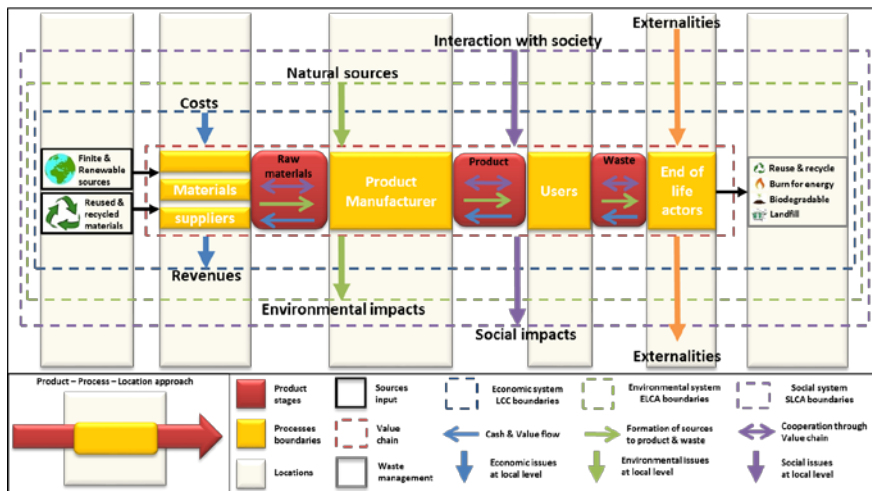


Figure 1. Info-diversity framework.

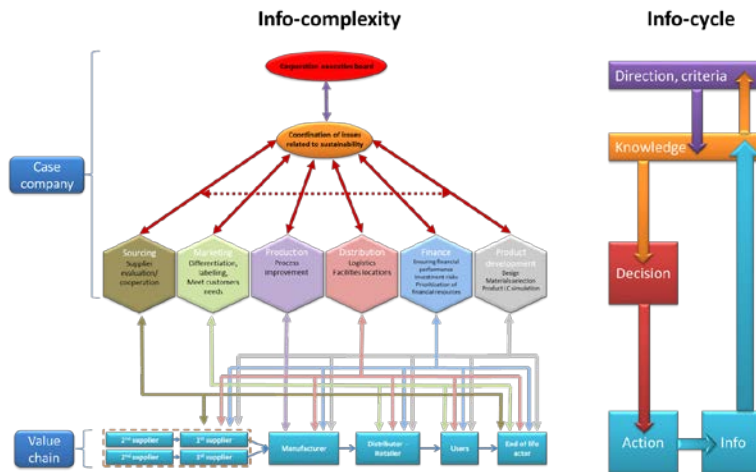


Figure 2. Info-complexity and Info-cycle.