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A designer's guide to LCA

How to improve your design process with Life Cycle Assessments?

Based on an interview with Philip Hathaway



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A life-cycle assessment (LCA) is a method for quantitatively assessing the environmental impact of a product throughout its lifecycle. The assessment begins at raw-material extraction, continues through the product's manufacturing, distribution, and use, and ends with the recycling or final disposal of the product.

Although an extremely valuable technique, the process of making an LCA can be tedious and time-consuming, inconsistent with a fast-paced and highly changing design processes. MMID has written before about how sustainability awareness can be used as a tool throughout the design process to ensure the integration of an environmentally conscious mindset. How can designers use a tool such as LCA to their advantage without compromising their workflow? How did the LCA come to be? What should be front-of-mind while conducting one? This article will cover these questions and more.

History of the LCA

During the 1960s, large companies such as Coca-Cola addressed the solid waste aspects of their manufacturing systems to save money. They conducted extensive studies about their packaging to minimize waste (and thus cost). By minimizing cost and waste, they also minimized energy use, resulting in a positive consequence for the environment. Throughout the years, methods like these got more refined and started encompassing more aspects of a product's lifecycle. Eventually, in 1993, the Environmental Protection Agency in the USA published a guiding document about Resource and Environmental Profile Analysis. This would later evolve into the LCAs standard framework ISO 14044.

How to conduct an LCA?

We will briefly discuss the four main steps of an LCA as described according to ISO 14044. Note that the level of detail can vary between different analyses. This summary does by no means justice to the immense level of detail some LCAs can reach. For further elaboration on how to do an LCA, you can go to one of the sources under this article or contact MMID.

1. Goal and Scope

An LCA starts by defining the goal and the scope of your assessment. Define which product or service will be taken into consideration and set clear boundaries about the parts of the lifecycle to be analyzed. It is also possible to narrow your LCA down to only measuring how much of a

certain resource your product uses. For example, to measure only the liters of water or amount of energy your product needs. Be very clear in your boundaries and think purposefully about what is to be excluded.

2. Life Cycle Inventory (LCI)

The Life Cycle Inventory analysis involves making a list of all the flow vectors from and to nature for your product. This entails the raw material, energy required, emissions, use of resources, and all other resources and emissions relevant to your product. Remember; that the more detailed your flows, the more accurate your analysis will be.



3. Life Cycle Impact Assessment (LCIA)

The life cycle impact assessment entails finding precise data for all the flows you have established. This can be an intricate and difficult process. It requires a detailed explanation of the entire journey of your product from manufacture to disposal.

4. Interpretation

During the interpretation phase, the results from the inventory and impact assessments are summarized in a set of conclusions and recommendations. It is recommended to have your findings critically assessed for completeness, sensitivity, and consistency. If your LCA was done to compare options or products together they are evaluated here as well.

The fast-track LCA

As described above, an LCA can be a time-consuming and tedious process. Sometimes, a good alternative can be a fast-track LCA. The fast-track LCA is a valuable tool designers can use to assess simple products or parts, and thus critically shape the environmental impact of a design decision. It can be used as a decision-making tool or as an inspiration for the creation of something new.

Compared to a full LCA a fast-track LCA uses third-party life-cycle inventory databases of environmental assessments of products to get an understanding of the impact hotspots of a product in an early phase. A fast-track LCA can expedite the implementation in the design process. With the fast-track LCA, results regarding materials or processing can be compared relatively quickly to make the best decision on how the product can impact sustainability goals.

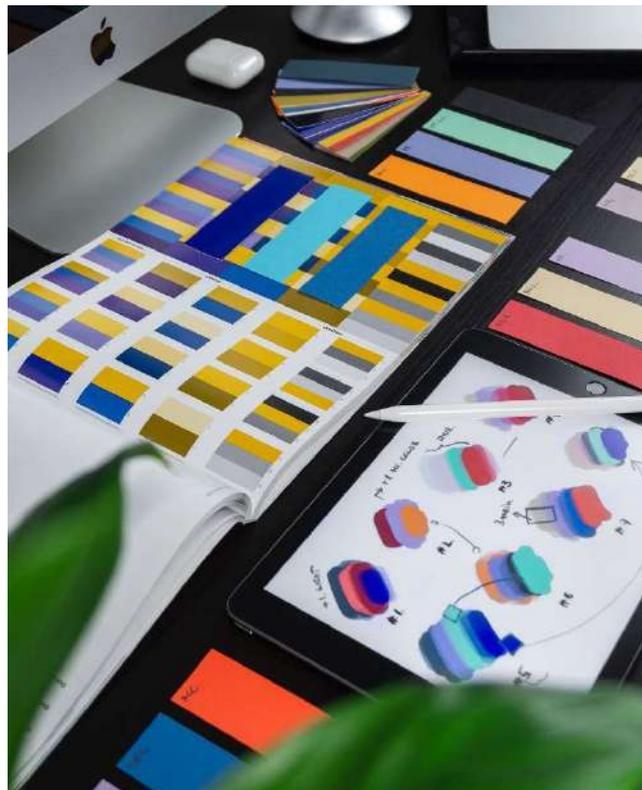
Here at MMID, we're currently running a project applying this approach. Database use can expedite the process, but it still requires planning,

coordination, and patience with team members to ascertain and verify information about the product during the Life Cycle Impact Assessment phase. The final stage of the LCA, the interpretation of data, requires expertise to interpret and present the data. The approach has given us a good and relatively rapid indication of the benefits this product has over its competition regarding sustainability goals. It has also given us food for thought about how we can further improve the product's contribution to sustainability goals.

How designers can use LCAs to their advantage

LCAs can be used by designers while redesigning an existing product or when designing a new one. When an existing product with an LCA study available needs to be redesigned, you have data that highlights the parts of the product that have the biggest impact, providing a great basis for improvements.

When designing a new product, performing quick LCAs (such as the fast-track) for concepts can



give good indications of where improvements can be made and help decision-making when selecting concepts.

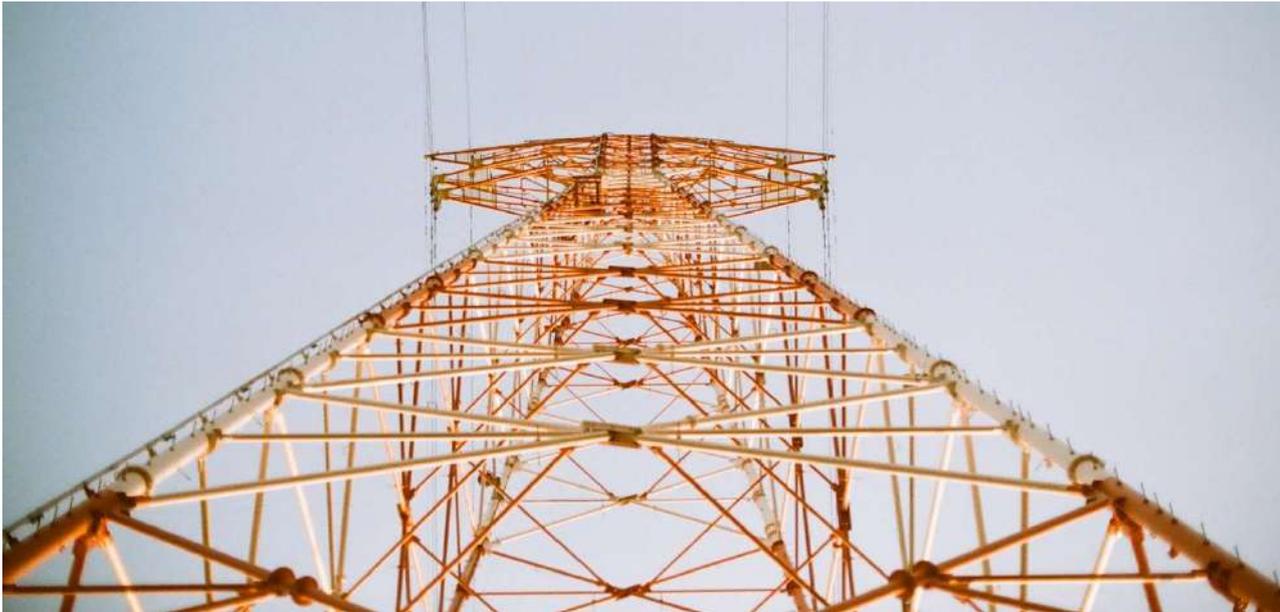
Critique on LCA

One must be clear about the scope and goal of the LCA since it is a simplification of a complex reality. As with all simplifications, this means that reality will be distorted in some way. The challenge for anyone using an LCA is to make sure the simplification and distortions do not influence the results too much. The best way to do this is to carefully define the goal and scope of the LCA study. This helps minimize that risk and makes it clear what system the LCA sets out to assess.

The goal and scope describe the most important choices and boundary judgments, which are often subjective. They describe what is taken into the assessment and what is left out. For instance, small amounts of ingredients/components that contribute little to the total footprint 'could' be left out of the scope of the study. Thus, the boundary judgments exclude them, but it must not be forgotten that many little things can add up to a lot. Conducting an LCA is data-intensive, and the one using the method will need some patience.

An LCA is just one method to help in achieving sustainability goals. For instance, already building an understanding and thinking about the life cycle of a product can help identify opportunities to improve a product's contribution to sustainability goals; this is sometimes referred to as Life Cycle Thinking. Designers conducting an LCA need to be clear about the

role of the LCA in the overall sustainability strategy; what does the company mean by the term sustainability, and how does an LCA fit into that strategy?



How MMID can help you look for sustainable solutions

If a company intends to develop a sustainable (and good) product it should strive for optimal performance for as long as possible; thus, be effective, efficient, durable, and desirable. MMID has a good track record in doing this.

MMID takes a holistic approach to designing products. This approach encourages consideration of environmental impacts upstream and downstream of production and use. Traditionally this is called a Life Cycle Thinking Approach. MMID has the talent, skills, experience, and

processes to understand the flow of materials and resources of a product. The early product-definition phase is where most sustainability consequences are established, making it extremely important that designers consider the environment from the very start.

Do you want to design more sustainably? Are you curious about LCAs? Contact us to learn how you can implement sustainability in your products.

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