

Appendix

Lifecycle Phase Checklists

These checklists summarize the important items that can affect the legal standing, business results, and environmental impact of your product.

If it hasn't been obvious already, you'll notice that most of these items need to be addressed at design time. Even though they may relate to later phases of the product lifecycle, after the product or service has been designed it is usually too late for these items to have a serious impact on the overall design. However, there may be ongoing opportunities to switch parts or vendors, redesign packaging, change logistics strategies, and so on, and make ongoing improvements to a shipping product.

Another key point is that your product will be subject to the laws of the countries, states, provinces, and other jurisdictions where you intend to sell it. It is also important to understand how your product will be characterized in each jurisdiction, so you can know which laws will apply.

Finally, we assume that you've been able to do a high-level lifecycle analysis of the energy usage, greenhouse gas (GHG) emissions, and water usage of your product so that you can use it to guide your decisions.

The “Make” Phase

As we’ve described, our focus on the “Make” phase leads us to think about how products are manufactured and delivered to customers; in general, we don’t need to worry about this phase for services. For some products it may be important to look at the impact of design and testing as well, but for higher-volume products this is often a minor impact. In this phase, we’re often focused on chemicals that make up a product, energy to make a product, packaging, and logistics. Here’s a checklist of key items for the “Make” phase.

“MAKE” PHASE CHECKLIST

Legal Implications

___ Make sure you understand and can meet all relevant chemical and substance laws that will apply to your product.

Business Opportunities and Threats

___ Know whether you are using any materials that may involve destructive or socially suspect extractive processes.

___ Minimize packaging and make it easy for your customers to responsibly dispose of it.

___ Understand your use of materials and natural resources, and understand the cost impacts of historical market prices or future pricing scenarios.

Major Impacts

___ Use your lifecycle analysis to see whether there are major impacts during the “Make” phase for which you’ll need to create a plan over time, including energy usage, GHG emissions, and water usage (you should minimize these as part of your design, but also put in place a plan to focus on and reduce these over time).

___ Understand any hazardous chemicals or emissions that will result from the manufacture of your product, look for alternatives to eliminate them, and make sure you have a plan to manage them appropriately.

Low-Hanging Fruit

___ For complex products the ways in which components and final products are packaged and shipped during the “Make” phase can offer opportunities for simple changes that can be both financially and legally beneficial.

___ Look for simple ways to cut the weight of your product; this will have positive impacts throughout the rest of the lifecycle.

The “Use” Phase

As we consider the “Use” phase, we’ve seen the focus turn to the impacts of customer use of the product, or delivery of the service. Energy use is often a main focus of this phase, which brings in legal issues, standards, and the potential to affect the customer’s costs. Here’s a checklist of key items for the “Use” phase.

“USE” PHASE CHECKLIST

Legal Implications

___ Understand all relevant laws and standards regarding energy usage and emissions.

Business Opportunities and Threats

___ Look for opportunities to lower the energy costs for your customers through efficiency gains.

___ Understand the ease with which energy will be supplied to your product, and make sure it is easy for your customers to obtain and use the needed energy.

___ Understand whether there are voluntary energy measures that your customers will expect, and provide them relevant data.

___ Look for ways to reduce the customer and environmental impact of product breakdowns and repairs.

Major Impacts

___ Use your lifecycle analysis to see whether there are major impacts during the “Use” phase of your product or service that you need to reduce. As in the “Make” phase, these need to be addressed during design time, but also include processes to continue to drive them down over time.

___ Look at the mini lifecycles of any consumable used by your product, and understand its impacts and customer implications.

___ Remember to look at the “hidden” impacts and the impacts of online services related to your product.

Low-Hanging Fruit

___ Look for small changes that can drive your power usage down; small changes may add up and open up different energy delivery opportunities.

Required Reading for Citizen Engineers

- *Code 2.0*, by Lawrence Lessig (Basic Books, 2006)
- *Cradle to Cradle*, by William McDonough and Michael Braungart (North Point Press, 2002)
- *The Future of Ideas*, by Lawrence Lessig (Vintage, 2002)
- *Green to Gold*, by Daniel Esty and Andrew Winston (Wiley, 2009)
- *Hot, Flat, and Crowded*, by Thomas Friedman (Farrar, Straus and Giroux, 2008)
- *The Mythical Man-Month*, by Frederick Brooks, Jr. (Addison-Wesley, 1995)
- *Remix: Making Art and Commerce Thrive in the Hybrid Economy*, by Lawrence Lessig (Penguin Press, 2008)
- *The Structure of Scientific Revolutions*, by Thomas S. Kuhn, (University of Chicago Press, 1962)
- *Sustainable Energy: Choosing Among Options*, by Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, Michael W. Golay, and William A. Peters (MIT Press, 2005)
- *Wikinomics: How Mass Collaboration Changes Everything*, by Don Tapscott and Anthony Williams (Portfolio Hardcover, 2006)
- *The World Is Flat*, by Thomas Friedman (Picador, 2007)
- *Zen and the Art of Motorcycle Maintenance*, by Robert Pirsig (Harper Perennial Modern Classics, 2008)

The “Renew” Phase

Finally, we’ve seen that the “Renew” phase focuses on what happens to our products at the end of their useful life. As with the “Make” phase, this is primarily an issue for products. This phase again causes us to look at the materials we use in making the product, as well as how it is put together.

“RENEW” PHASE CHECKLIST

Legal Implications

___ Understand all relevant laws and standards regarding product take-back and disposal for the places you intend to sell your product. In many instances, there may be reporting requirements for which you need to have processes in place.

Business Opportunities and Threats

___ Try to avoid onerous disposal requirements that will be a burden to your customers.

___ Understand what materials you may be able to use that will have value in the recycling market at the end of your product’s life.

___ Look for ways to simplify the disassembly of your product.

Major Impacts

___ Use your lifecycle analysis to see whether there are major impacts during the “Renew” phase of your product that you need to address. These will tend to concern chemicals or materials that are highly toxic and difficult to dispose of responsibly.

Low-Hanging Fruit

___ Have your disassembly team or partner look at your product before you commit to manufacture. They may identify small changes that could improve the money you get at end of life, or that could lower the cost to disassemble and recycle your product.