



SUSTAINABLE INNOVATION (PART I)

HOW COMPANIES ARE CREATING VALUE AND REDUCING THEIR DAMAGE
TO THE ENVIRONMENT

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What constitutes a *sustainable* innovation? We define a sustainable innovation as an innovation that attempts to tackle a societal problem. However, there are different degrees of innovation. A common descriptor for sustainable innovations is “transformational”. In fact, we would argue that most sustainable innovations are transformational and vice versa: most transformational innovations are sustainable innovations. We distinguish transformational innovation from other forms of innovation through a hierarchical approach in which we identify four major types of innovation: 1) incremental, 2) radical, 3) game-changing, and 4) transformational. These four different levels of innovation can most easily be differentiated through the framework depicted in Figure 1. The two axis in the framework provide structure to a sustainable innovation, which can either be a low-risk innovation that uses existing technologies in current markets (incremental innovation), or can be higher-risk innovations that either utilize new technologies (radical innovation), open new markets (game-changing innovation), or both (transformational innovation). It is the latter form of innovation that we encourage organizations to be contributors to.

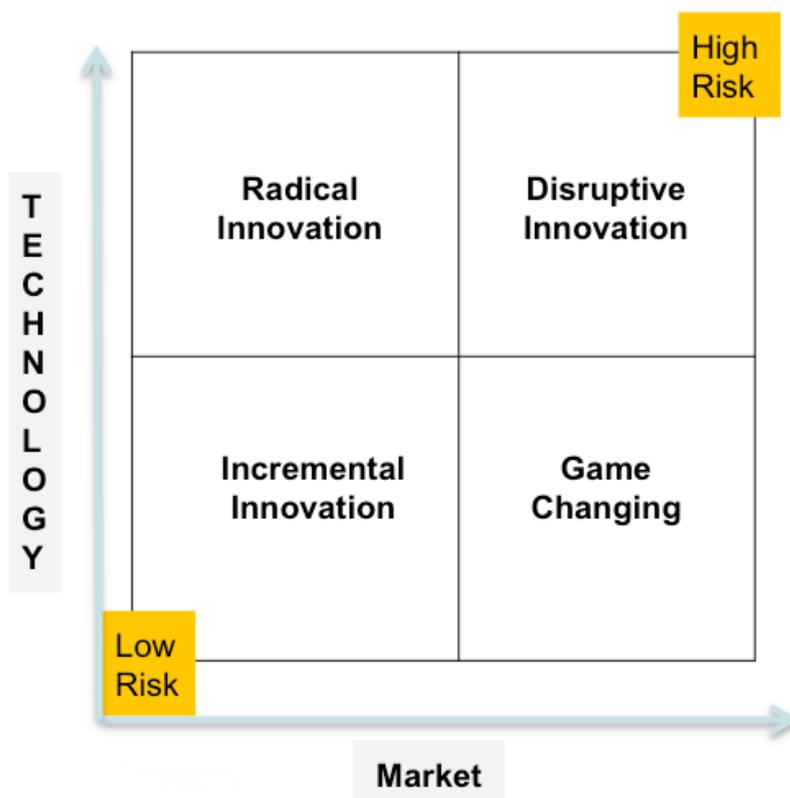


Figure 1: The 4 Types of Sustainable Innovation

To help clarify the different forms of innovation, we explore sustainable innovations in the plastic materials sector, which accounts for 415 billion pounds annually.¹ Aquafina was an early innovator in the sector, realizing that it could decrease costs if it were to reduce the amount of plastic in water bottles. Aquafina’s decision to decrease the amount of plastic in its water bottles by 50% is an example of incremental innovation. It is now a common practice throughout the beverage company and other sectors that use plastic to transport their products. While it did not open new markets or use new technologies, the innovation saved Aquafina a significant amount of money while reducing its footprint on the world. Most incremental innovations can therefore be described as “low-hanging fruit”—saving organizations money while also reducing their negative externalities.

Another interesting example of incremental innovation is from Method—a company that primarily focuses on soap cleaning products. Distinguishing the company from others is the fact that they use ocean waste in their bottles. Moreover, the company estimates that there are “100-million tons of garbage floating in the Pacific Ocean alone”.² Of this debris, 80% are estimated to be from plastic,

¹ <http://www.launch.org/innovators/akshay-sethi>; <https://vimeo.com/76075098>

² <http://methodhome.com/beyond-the-bottle/ocean-plastic/>

with approximately 46,000 pieces of plastic floating on every square mile of ocean. This waste has led to the deaths of over one-million species of marine life.³ Method therefore works with beach clean-up groups to convert plastic waste into bottles. On average, roughly 25% of each bottle is from recycled ocean plastic while the remaining comes from mainstream recycled plastic.⁴

Although it can be argued that Method utilizes a new technology to transform ocean plastic into a material that can be used in recycled bottles, it is largely similar to the current process for recycling materials. Ambercycle, however, promises to change that with a new technology it is developing, thereby demonstrating radical innovation in the sector. Polyethylene terephthalate, or PET, is currently the most widely circulated plastic. While PET can be recycled, only 6% is actually “recycled” in the way most people conceptualize it, while 10% is burned, and the remaining 84% is returned to the environment. To increase the efficiency and decrease the cost of the recycling process, the team at Ambercycle is developing unique enzymes that can degrade PET plastic into the two chemicals that constitute it: terephthalic acid and ethylene glycol.⁵

As Akshay Sethi admits, Ambercycle does not alter the current industry but rather fits into existing value chains. So what does a game-changing innovation look like, or one that actually creates a new market? In 2001, Princeton freshman Tom Szaky began producing organic fertilizer from worm waste packaged in used soda bottles. Pursuing a vision to eliminate the concept of waste, Szaky dropped out of Princeton and founded Terracycle. As described above, only a small portion of recyclable goods actually gets recycled. Szaky therefore decided to scale his operation by continuing to use discarded bottles rather than purchasing bottles. Soon, Terracycle began setting up collection bins at schools, companies, and various facilities. In many instances, the company pays organizations for the bottles it collects. As such, Terracycle has created a new value chain for plastic bottles but simply cleaning and reusing them as opposed to breaking them down.

But what if there were a new, more sustainable way to produce plastic in the first place? After all, plastics are currently made from petroleum products. In 2010, this amounted to 2.7% of the petroleum consumption in the U.S. and approximately 4% in Europe.⁶ A model for transformational innovation, Newlight Technologies has invented a carbon capture technology that is capable of developing plastics from greenhouse gases. Methane, or CH₄, is the second most prevalent greenhouse gas and has an effect on climate change that is 20 times more potent than carbon dioxide, or CO₂, over a 100-year timeframe.⁷ In fact, methane leakage, in addition to other negative externalities, is the source of most critiques directed at the fracking industry. Newlight Technologies is able to capture methane from the atmosphere and combine it with oxygen to develop what it coins as “AirCarbon”, a carbon-negative plastic that can replace the traditional plastics we use every day.

As described, sustainable innovation can range from decreasing materials, to developing new technologies, to creating new sectors, to combining all of the above. It is the latter category that defines transformational innovation, which we urge all organizations to pursue. It is important to note that organizations do not need to go through each stage of an innovation. Instead they can “leap-frog” by focusing on transformational innovations as Newlight Technologies demonstrated. While it may be a higher-risk innovation to pursue, transformational innovation promises to disrupt existing technologies and industries to create the highest positive impact.

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³ <http://epa.gov/region9/marine-debris/faq.html>; <http://thinkoutsidethebin.com/2011/06/02/a-sea-of-plastic-more-plastic-than-plankton-in-our-ocean/>

⁴ <http://methodhome.com/blog/ocean-plastic-into-bottles/>

⁵ <https://vimeo.com/76075098>

⁶ <http://www.eia.gov/tools/faqs/faq.cfm?id=34&t=6>; <http://www.paprec.com/en/understanding-recycling/recycling-plastic/making-plastic-extracting-raw-material>

⁷ <http://epa.gov/climatechange/ghgemissions/gases/ch4.html>

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