Understand it

Apply it

Generate quick win ideas

Check an existing concept

More detail ...

Design wheel

Explore

Create

Evaluate

Manage

Impact map

Performance dashboard

Role-based guidance

Topic-based guidance

See examples

Engineering & research

What is wrong with Business As Usual?

- Marketing and company strategy often provide the direction for engineering and research. This works well if it is market-driven, not if it is product-driven. "*There can be no prescription without diagnosis*."
- However, this market-driven approach requires equal representation from strategists, marketing, engineering and research. If not, R&D expertise can become a wasted resource.
- R&D is where the 99 percent failure rate leads to the 1 percent of success. Far better for failure to happen here than in the market. If R&D is insulated from the rest of your business, no-one can clearly understand what is valuable. This is likely to lead to:
  - Adding irrelevant features that add cost and complexity without adding value.
  - Your marketplace may not understand your product or under-utilise it, and not perceive or receive their total value.
  - With long time-to-market relationships with manufacturers, the product may be out-of-date by the time it reaches market, if longer term proposals from R&D are not appropriately ranked.
- The end result is either a costly R&D-driven product failure that is often (and mistakenly) viewed as a marketing failure, or a marketing-driven product failure that is often (and mistakenly) viewed as a product/service design failure.

What can I do better?

- Use a **People, Profit, Planet** representation to capture engineering and research impacts, beyond purely financial, and use this to inform design and marketing factors, in tight cooperation with strategy and marketing.
- Understand how your supply chain operates, beyond the first tier of immediate suppliers, and adapt engineering and research to assist. Ensure engineering and research is represented in the strategic planning stage.
- Look beyond compliance for longer-term options. This should be the case for research, but incremental changes can prove more costly in the long run. This holds very true for materials extraction, manufacturing processes, and types of material, especially at end-of-life (EoL).

How can I do better?

- This toolkit provides a system model as a **Design Wheel**. By using it you can identify hotspots that are priorities for engineering and research options and understand the wider impacts of proposed changes.
- Ensure **People, Profit, Planet** performance KPIs are included in scorecards, to encourage continuous improvement.
- Work closely with suppliers/manufacturers.
- Build awareness of the **People, Profit, Planet assessment criteria** via training, communications and use of tools that help evaluate these.
- Decide on an engineering and research roadmap that is market-driven, but ensure elements of leadership. Consider more than one approach, for example:
  - embedding the basics of **DOT** and the Circular Economy
  - enhancing existing products
  - transformational R&D

- Present risks of BAU as a baseline against each case and the technology readiness levels (TRLs) of your R&D, based on **People, Profit, Planet** criteria.
- Reconsider current R&D practice to see if a Circular Economy approach might add more value; this might include increased product longevity for leasing options, or materials and construction that are easier to recover at EoL. What changes in the product and service design may be required to facilitate this? How would this be marketed?
- Where hazardous processes exist, extra cost exists to handle it. When considering an alternative less-harmful material that might cost more, ensure the reduction in handling costs (mining, manufacturing, EoL) are also represented to offset this cost increase.

How do I measure success?

- Look for improvements that are aligned across the **People, Profit, Planet** criteria and not purely driven by improved features and functionality.
- Benchmark R&D progress against preceding products, and consider scoring against your R&D roadmap, the company's materials strategy, and your company's product strategy.
- Have the R&D decisions made reduced exposure to materials and/or energy price and supply risks?
- Evaluate **People, Profit, Planet** success factors at the R&D development, to avoid costly re-engineering later, and track against successive product generations. Consider going beyond RoHS compliance with suppliers as a long term strategy – it is likely to cost less in the long run.
- Consider a company strategy for phasing out certain processes and materials, following the Cradle to Cradle principles.

Further reading

- Service Design: From Insight to Implementation
- High-value plastics from complex waste streams
- The Raw Materials Initiative
- The EU14 Critical Materials
- EU Strategy on Raw Materials
- Critical Materials in Strategic Energy Technologies (SET)
- UK Government website on Environmental Regulations.
- Full product transparency, an e-book by Ramon Arratia of InterfaceFLOR.
- The Ecodesign Directive 2009/125/EC has been transposed in the UK by the Eco-design for Energy-related Products Regulations 2010 (SI 2010 No.2617). It aims to improve the environmental performance of products throughout the life-cycle, by integration of environmental aspects at a very early stage in product design. The original Directive was recast in 2009 and was previously known as the Energy-Using Products (EuP) Directive 2005/32/EC. This was transposed into UK law under Statutory Instrument (SI 2007 No.2037) which is now revoked.
- PAS 141: 2011 for reuse of UEEE and WEEE (2012 Recast)
- WRI's Greening the supply chain
- Eco Design For Packaging & Packaging Waste Directive (94/62/EC)
- BS 8887-1:2006 Design for manufacture, assembly, disassembly and end-of-life processing (MADE). General concepts, process and requirements.
- BS PAS 2060 (carbon neutrality)
- BS 8887-2:2009 Design for manufacture, assembly, disassembly and end-of-life processing (MADE). Terms and definitions.
- IEEE 1680.1-2009 Standard for Environmental Assessment of Personal Computer Products.
- EU Batteries Directive 2006/66/EC
- Hazardous chemicals substitution. ChemSec
- In California in August 2010 Senate Bill 1454 went under consideration to ban all biodegradable claims on plastic bottles, with the intention to extend this to all plastic products, because of numerous marketing eco-claims that were confusing at best.

- In May 2011 the European Commission began a call for views on whether requirements around biodegradable and compostable packaging are fit for purpose as laid out in the Eco Design For Packaging & Packaging Waste Directive (94/62/EC) for the same reason.
- Note: There are two main types of biodegradable plastics: oxo-biodegradable and hydro-biodegradable. Both will first undergo chemical degradation by oxidation and hydrolysis for oxo- and hydro-biodegradable plastics respectively. This results in their physical disintegration and a drastic reduction in their molecular weights. These smaller, lower molecular weight fragments are then amenable to biodegradation by microbes.
- Hydro-biodegradable plastics tend to degrade and biodegrade somewhat faster than oxo-biodegradables but the end result is the same – both plastics are converted to carbon dioxide, water and biomass. Oxo-biodegradable plastics are generally less expensive, possess better physical properties and are easier to process on current plastic processing equipment than hydro-biodegradable plastics.
