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Designing Our Tomorrow

Designing for people profit and planet

DOT in a nutshell

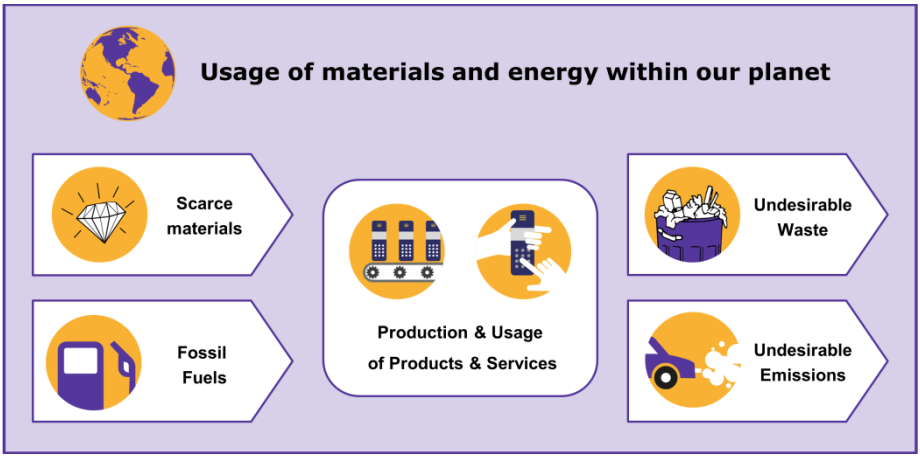
UNIVERSITY OF CAMBRIDGE
Engineering Design Centre

BT

www.designingourtomorrow.com

What is the problem?

Many businesses currently rely on the materials & energy cycle shown in the diagram below:



Key points

- The Living Planet Report (2012) estimates that 1.5 planets would be required to support the current activities of the world's population.
- Businesses are increasingly feeling the constraints of 'one planet' in the form of rising costs of commodities, fuel & electricity, and increasing restrictions to the allowable materials, emissions & waste.
- In the face of these constraints, some businesses will adapt better than others. Some will continue to grow, and others will cease to exist.

In order to achieve long-term profitability, businesses will need to use materials and energy much more efficiently. Examples include the sale of services rather than products, and reconfiguring the business operations so that 'man-made' materials can be re-used indefinitely, rather than being 'consumed' and then 'wasted'.

What is the answer?

The development of successful products and services requires informed decision-making at the concept stage, because it can become prohibitively expensive to make changes later on.

Design concepts that reduce environmental impacts, increase profits and improve the user experience will be readily adopted. In contrast, design concepts that compromise profitability or the user experience are unlikely to make it to market.

Designing Our Tomorrow enables

Competitive Advantage by finding solutions

that make better use of the **Planet's Resources**

and also improve the **User Experience**

The performance indicators used to judge and select new concepts should cover 'whole-life' impacts for users, the business, the wider society and the planet. Importantly, the rising costs of commodities, fuel & electricity should be considered when evaluating future profitability.

This booklet summarises the specific activities that should be performed to deliver a lead design concept, together with evidence that it is better across all the performance indicators. Furthermore, a case study of the through-letterbox design of the new BT Home Hub is presented, which reduces business costs, reduces vehicle miles and increases customer satisfaction.

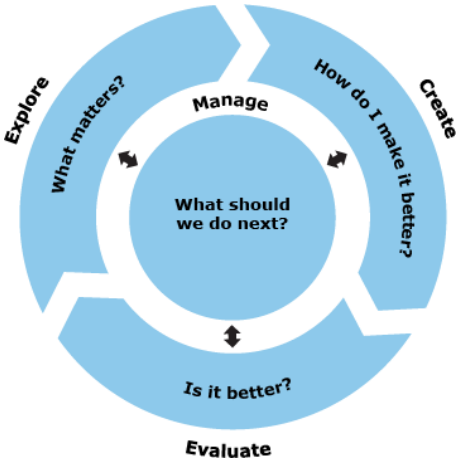
How should products & services be developed?

1. **Explore:** Determine 'What happens?' and **'What matters?'**.

2. **Create:** Set up a creative environment to generate ideas for **'How do I make it better?'**.

3. **Evaluate:** Judge and test the design concepts to determine **'Is it better?'**.

4. **Manage:** Review the evidence to decide **'What should we do next?'**



1. Explore

- **Choose a benchmark.** Choose an existing product, service, or combination(s) of both to use as a benchmark that provides equivalent benefits to the user as the concept being developed.
- **Investigate 'What happens?'.** Use the benchmark to investigate the user and business stakeholders, the real-world scenarios of use, and the flows of materials and energy.
- **Determine 'What matters?'.** Prioritise the issues to determine 'What matters?', for performance indicators that cover 'whole-life' impacts for users, the business, the wider society and the planet.

2. Create

- **Break free.** Don't get stuck in old ways of thinking. Start by trying to get as many ideas as possible, and avoid making judgements too early on. Encourage wacky ideas, look for inspiration in unusual places, and ask 'How else could it be done?'.
- **Sketch out concepts.** Group related ideas together and refine them to produce descriptions & illustrations of concepts that can be compared against the benchmark. Aim for at least one 'safe' concept and at least one 'crazy' concept.
- **Be systematic.** Seek out and resolve the unintended consequences of the concepts, by systematically considering all the user and business stakeholders, real-world scenarios of use, and the flows of materials and energy that were identified within 'Explore'.

3. Evaluate

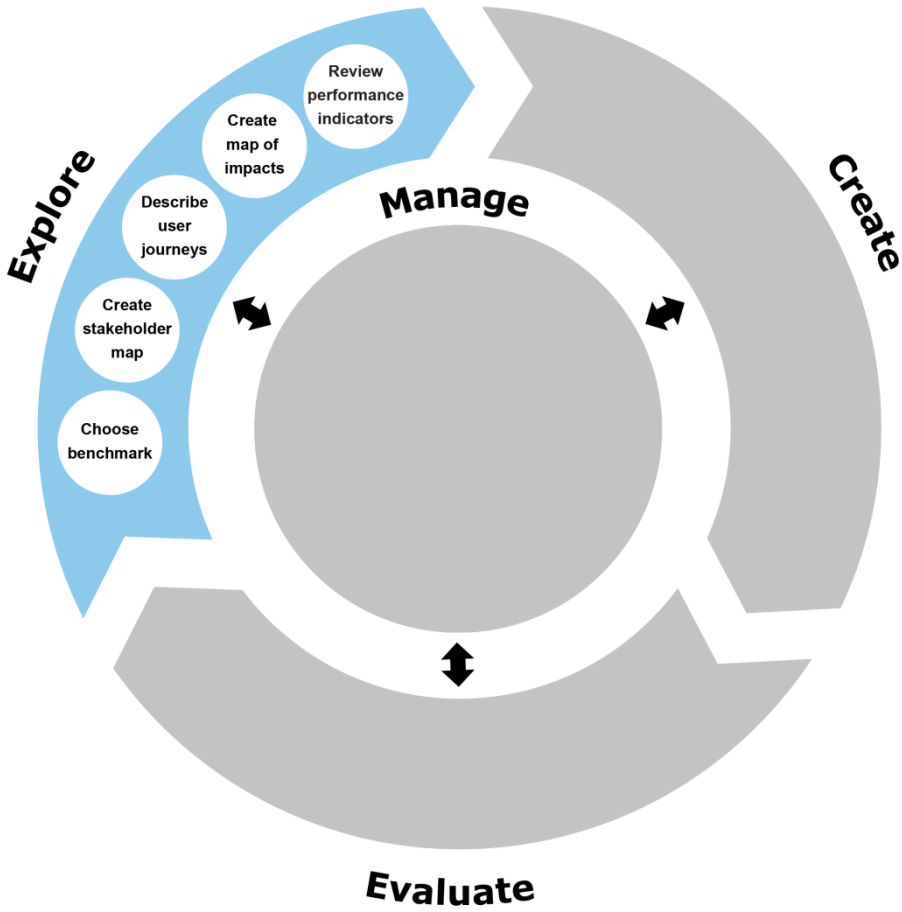
- **Wear different hats.** Role-play the Chief 'X' Officers (Marketing, Financial, Technical, Operations, Sustainability) to judge the concepts against the 'priority' performance indicators that were identified within 'Explore'.
- **Prove it.** Consider the uncertainty involved in the judgements obtained through role-play. Back these judgements up with evidence where necessary, and especially for user-related issues.
- **Test early, test often.** Perform quick evaluations with rough prototypes, early enough that things can still be improved.

4. Manage

- **Repeat to refine.** The process of evaluation should lead to a clearer understanding of 'What matters?' for users, the business, the wider society and the planet. Successive cycles of 'Explore', 'Create' and 'Evaluate' should improve the solutions and eventually deliver one lead concept.
- **Plan to be flexible.** Make sure the plan can accommodate the 'game-changers' that are inevitably discovered during the process.

Explore

The 'Explore' phase of the design cycle is about understanding the user and business stakeholders, the real-world scenarios of use, and the flows of materials and energy across the whole-life of the product. These findings should be drawn together to determine 'What matters?' for performance indicators that cover the users, the business, the wider society and the planet. Specific activities are shown in the diagram below, and described opposite:



The full set of activities are shown in the 'Design Wheel' on the back page.

Choose benchmark

The stakeholders, real-world scenarios of use, and flows of materials and energy are considered relative to a benchmark. Choosing this benchmark is the first activity within 'Explore'.

The current product (or an equivalent competitor product) could be used as a benchmark. However, if you wanted to develop a breakthrough product, or shift from a product to a service, you might choose multiple existing product/service combinations that provide equivalent benefits to the user as the concept being developed.

Create stakeholder map

Identify the key players who have something to gain or lose from the concept being developed, covering the **users** (e.g. purchasers, installers, end-users, supporters, maintainers); the **business** (e.g designers, manufacturers, retailers, refurbishers); and the **wider society** (e.g. regulators and shareholders).

Market segmentation and personas can help to characterise the different types of users.

Describe user journeys

Describe the real-world scenarios of use according to the tasks that the user performs across the whole-life of the benchmark product. A framework for user tasks is shown on pages 7-8, which includes purchase, installation, use, end-of-life triggers and subsequent actions.

Create a map of impacts

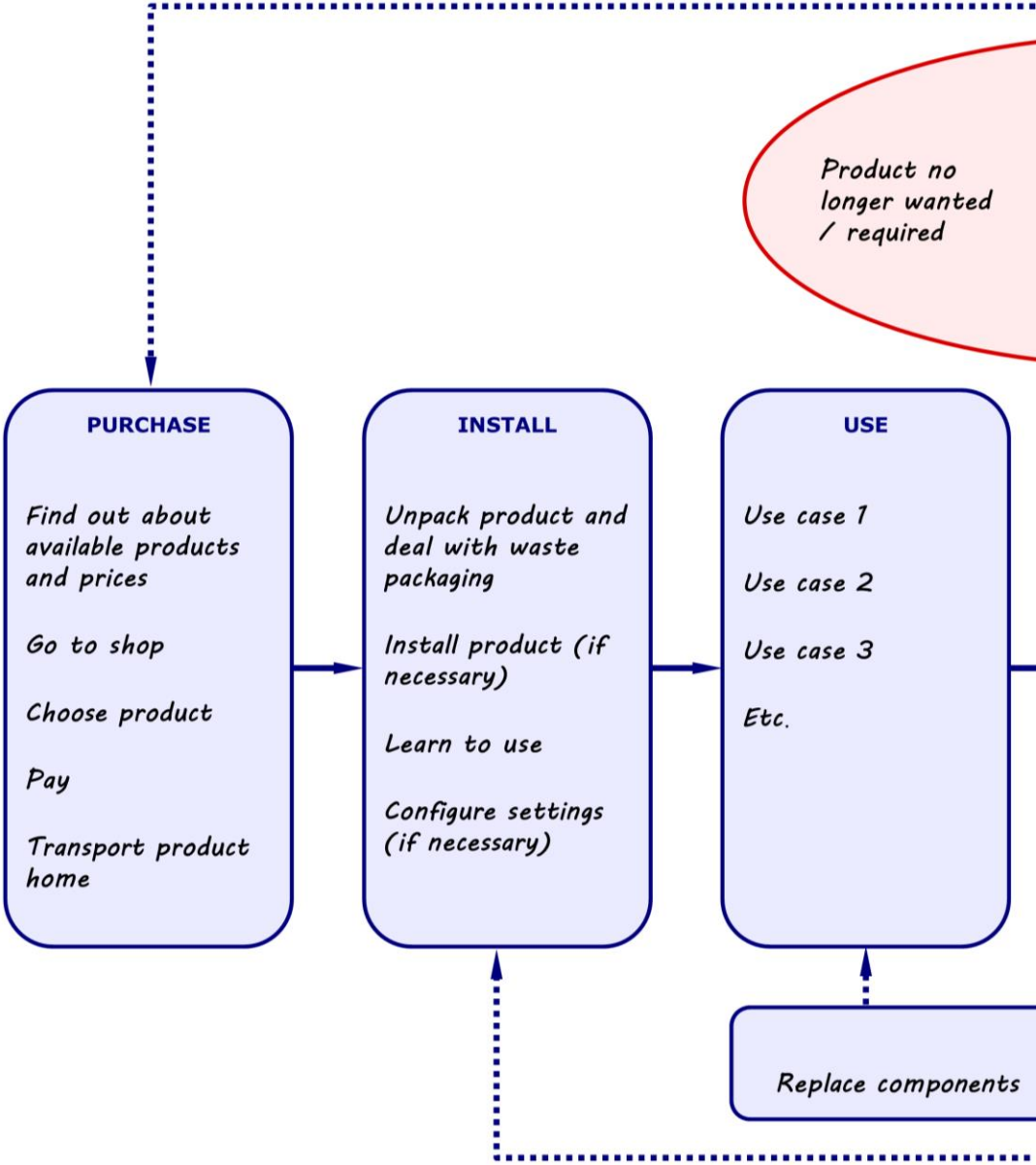
Use an **impact map** (www.designingourtomorrow.com/impact-map) to show how materials and energy are used across the whole-life of the product. An example impact map is shown on pages 9-10.

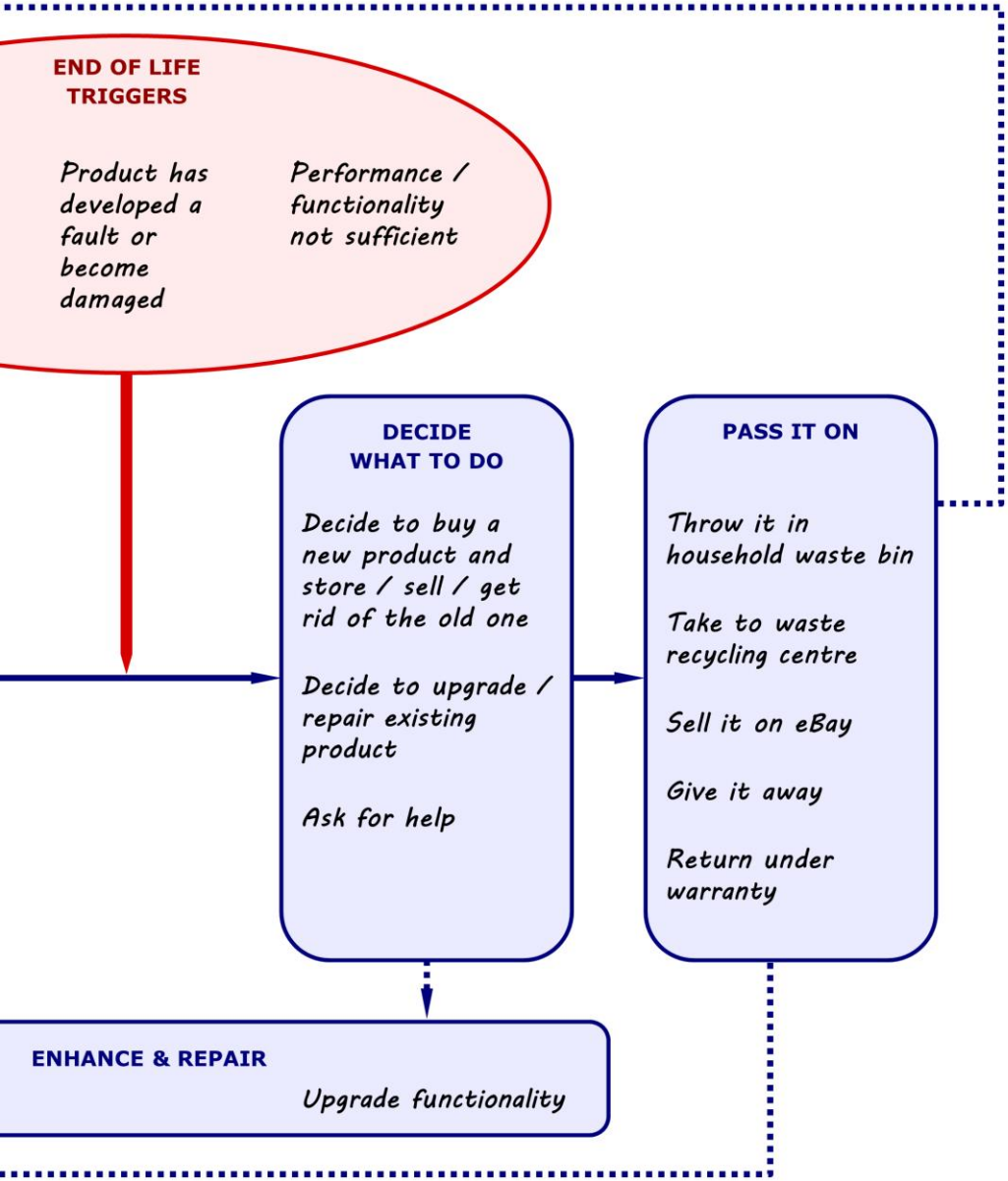
Review performance indicators

A framework of performance indicators is shown on pages 11-12. Use this framework to prioritise the issues and determine 'What matters?'.

Framework for user tasks

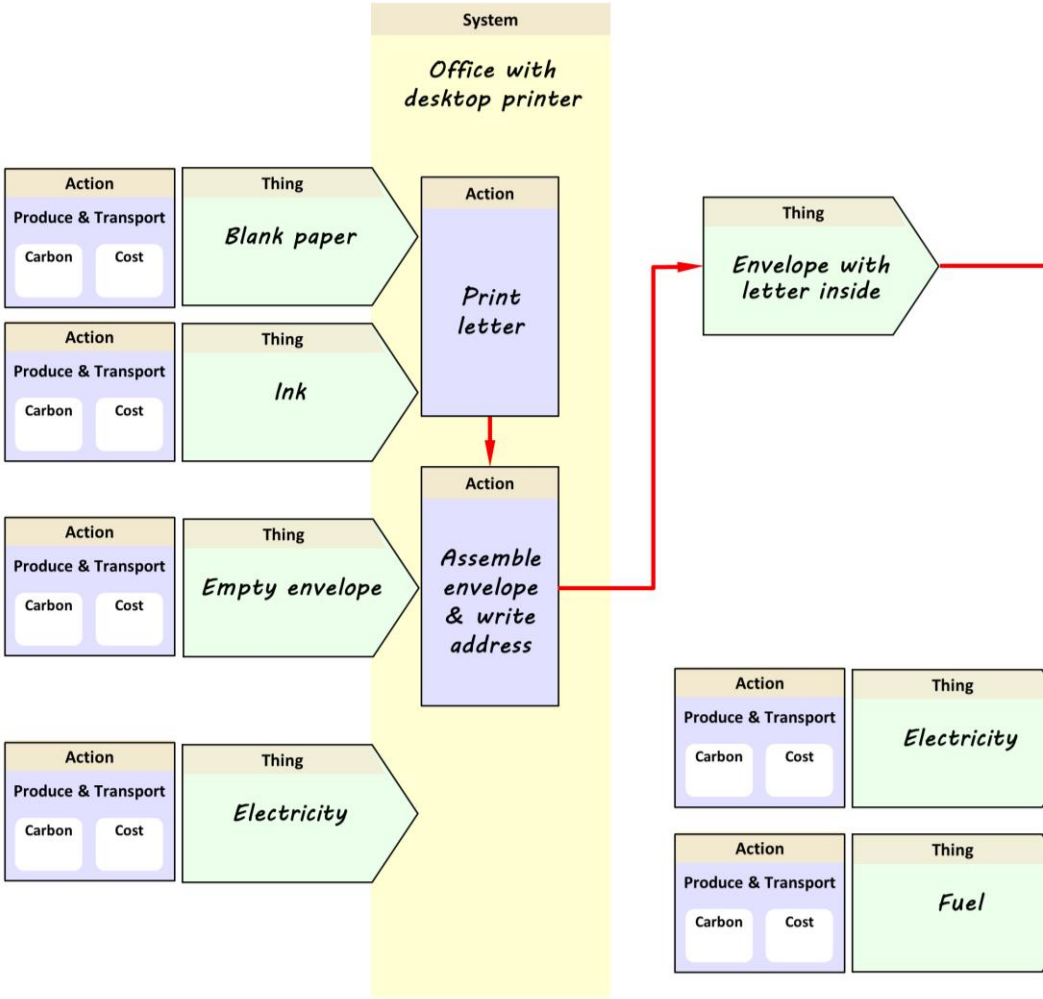
The diagram below shows the tasks the user may perform across the whole-life of a consumer product.



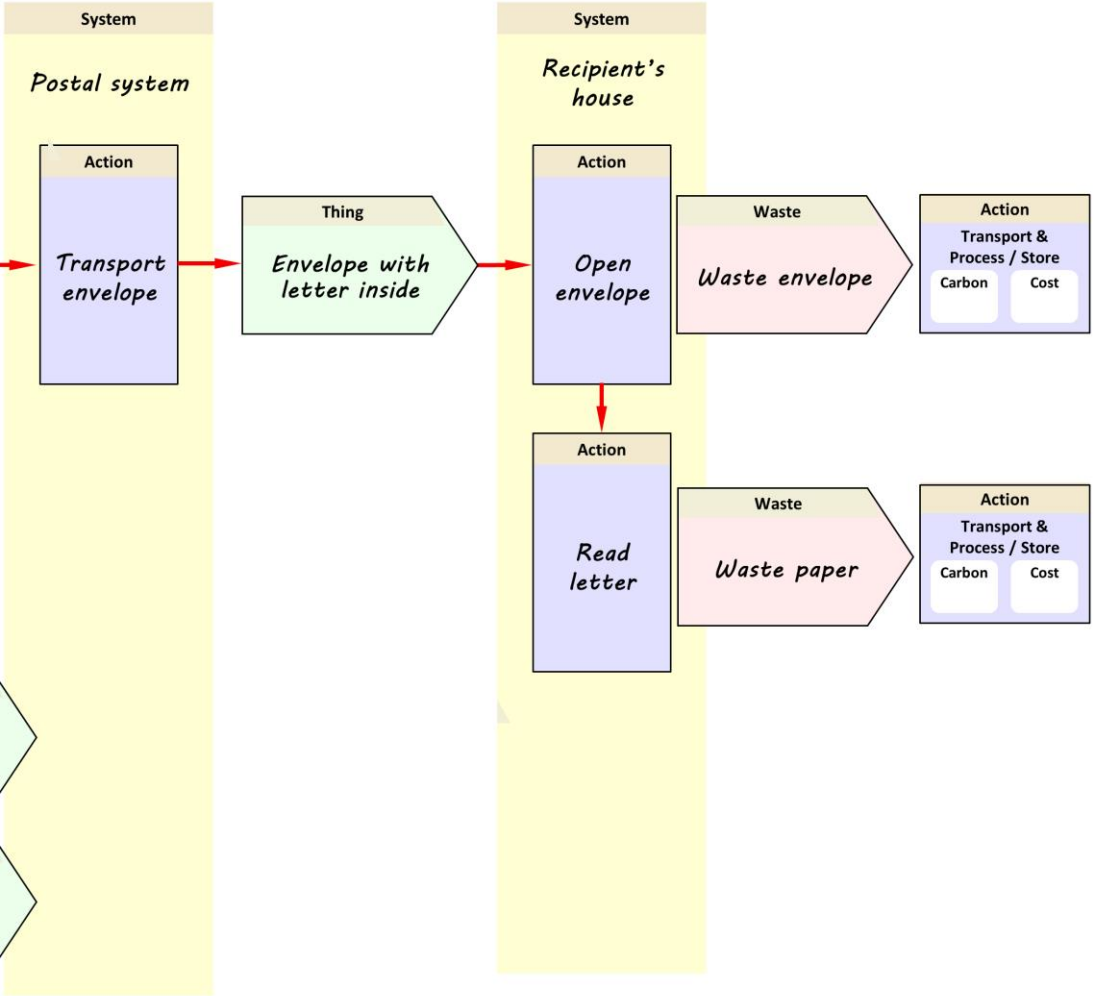

END OF LIFE TRIGGERS
Product has developed a fault or become damaged
Performance / functionality not sufficient
DECIDE WHAT TO DO
Decide to buy a new product and store / sell / get rid of the old one
Decide to upgrade / repair existing product
Ask for help
PASS IT ON
Throw it in household waste bin
Take to waste recycling centre
Sell it on eBay
Give it away
Return under warranty
ENHANCE & REPAIR
Upgrade functionality

Example map of impacts

As a basic example, the diagram below shows the flow of materials and energy for a letter that is printed, sent, delivered, read and then discarded. Given a particular real-world scenario, numerical analysis could readily provide the 'carbon' and 'cost' impacts to fill in the blank white boxes.



More detail on the impact map and this example is available at
www.designingourtomorrow.com/impact-map



Framework of performance indicators

This framework matches a set of **performance indicators** to the corresponding **stakeholders**, across the **whole-life of the product**.

The **whole-life of the product** typically involves the stages:

- Develop it
- Make it
- Distribute & sell it
- Use it
- Pass it on
- Reprocess it

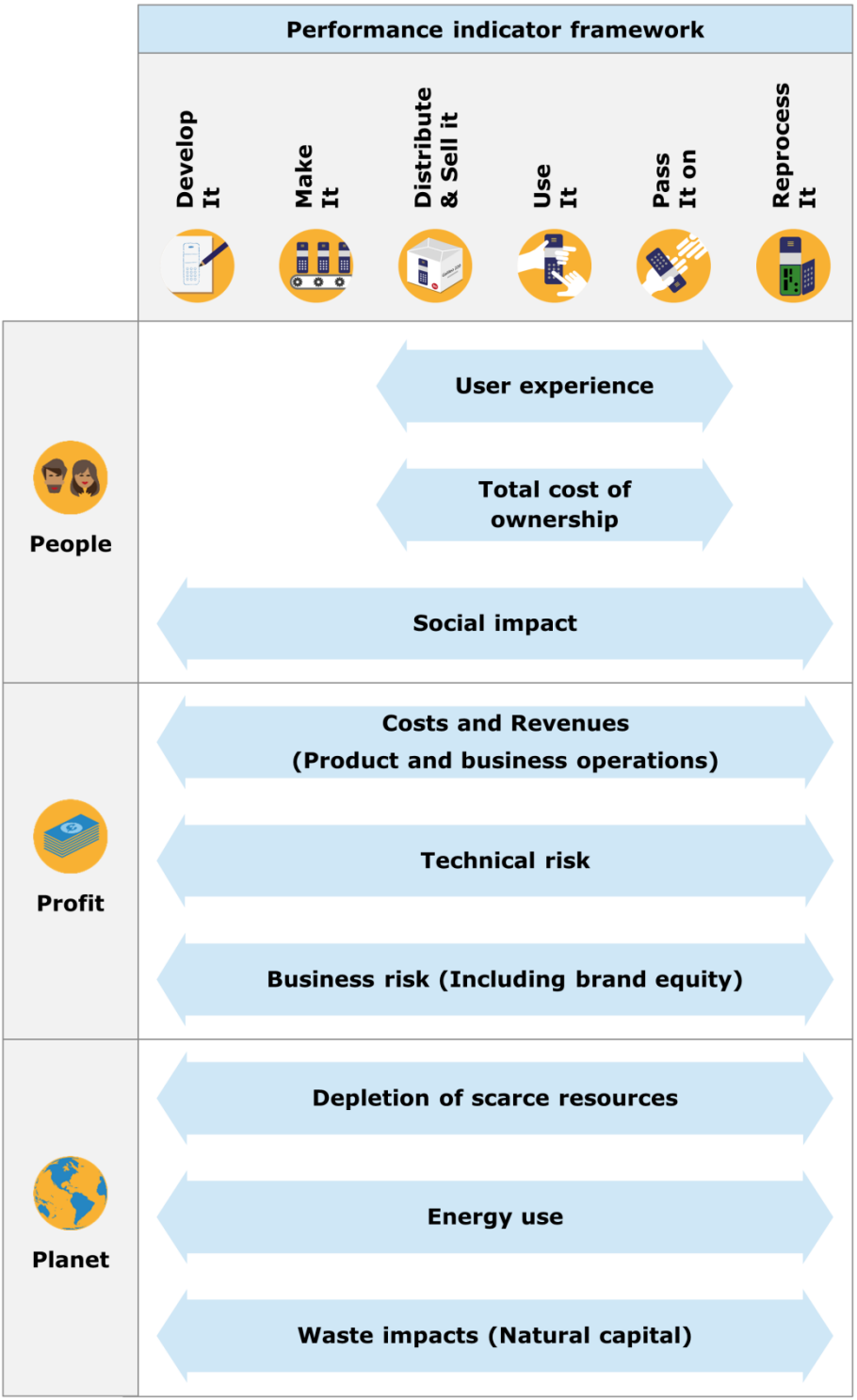
For most current products, the user 'Passes it on' by throwing it in the bin, and 'Reprocess it' represents storage in landfill. However, most solutions to address 'One Planet Living' require much more refurbishment and recycling within 'Reprocess it'.

The **stakeholders** should typically cover the users, the business and the wider society. In addition, many businesses rely on the natural capital provided by the planet's ecosystems. So, the stakeholders can be categorised according to:

- People (Users & society)
- Profit (Business)
- Planet (Eco-systems)

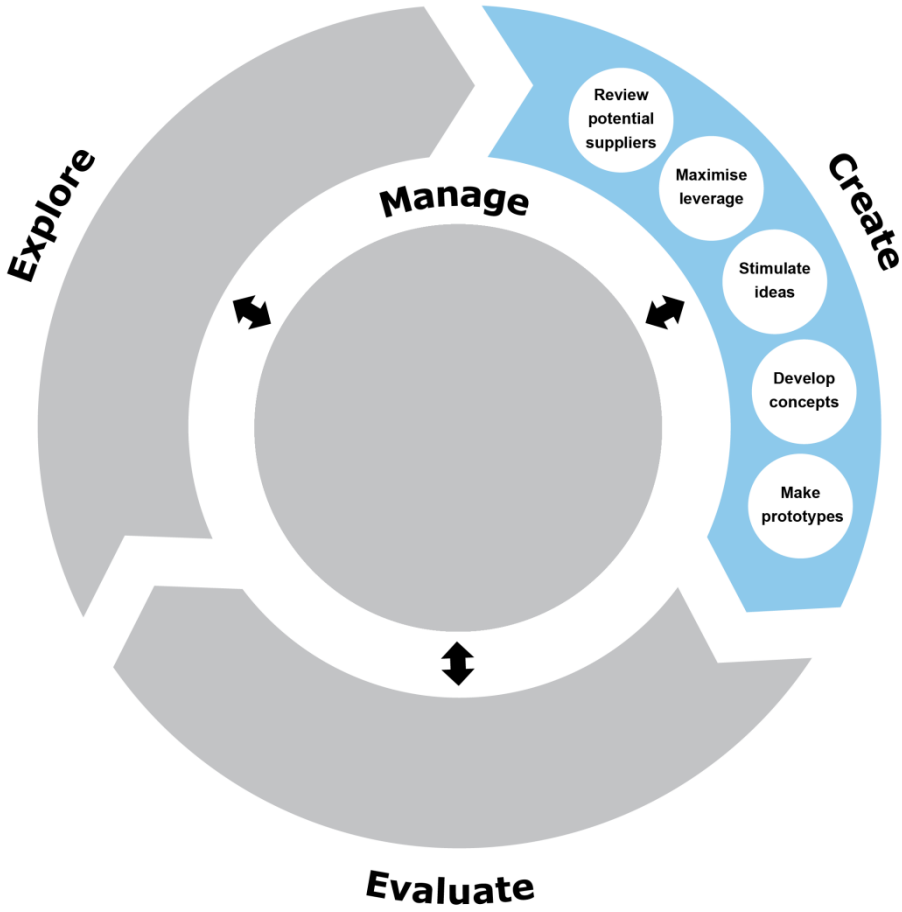
The framework shown opposite describes the **performance indicators** that are relevant for these stakeholder categories, across the whole-life of the product. Use this framework as a prompt to help consider the issues and determine 'What matters?'.

Many of these performance indicators are inter-related and overlapping. For example, refurbishing products typically reduces the 'Depletion of scarce resources', 'Energy use' and 'Waste impacts'. Improving the 'User experience' will also improve the 'Brand equity' and reduce the 'Costs' of product support and consumer returns.


Performance indicator framework
Develop It
Make It
Distribute & Sell it
Use It
Pass It on
Reprocess It
People
User experience
Total cost of ownership
Social impact
Profit
Costs and Revenues (Product and business operations)
Technical risk
Business risk (Including brand equity)
Planet
Depletion of scarce resources
Energy use
Waste impacts (Natural capital)

Create

The 'Create' phase of the design cycle is about developing concepts in order to make things better for the 'priority' performance indicators that were identified within the 'Explore' phase, which cover 'whole-life' impacts for users, the business, the wider society and the planet. The specific activities are shown in the diagram below, and described overleaf:



The full set of activities are shown in the 'Design Wheel' on the back page.

Review potential suppliers

Consider existing and alternative suppliers according to the environmental impacts of the goods they supply, and the behaviour of their business as a whole. Consider both incremental improvements and new technologies that offer step-change improvements.

Maximise leverage

Look for opportunities where the product can enable substantial positive impacts. Example opportunities include 'home energy', 'personal transportation' and 'user health, safety and well-being'.

Stimulate ideas

Don't get stuck in old ways of thinking. Start by trying to get as many ideas as possible, and avoid making judgements too early on. Encourage wacky ideas, look for inspiration in unusual places, and ask 'How else could it be done?'.

As a stimulus for ideas, use the Impact Map (see page 9) to look for opportunities where the 'waste' could become 'food' for another business, and consider how 'end-of-life' triggers within the User journey could be resolved in a manner that minimises environmental impact while maximising revenue for the business.

Develop concepts

Group related ideas together and refine them to produce descriptions & illustrations of concepts that can be compared against the benchmark. Aim for at least one 'safe' concept and at least one 'crazy' concept.

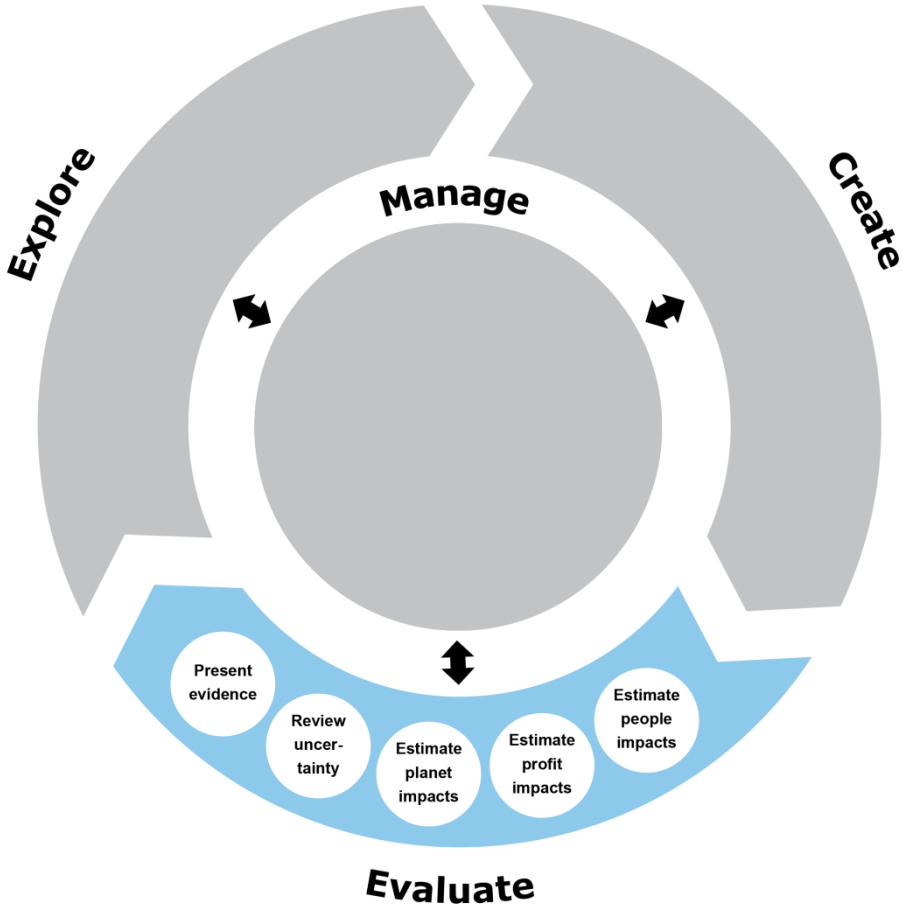
However, make sure you seek out and resolve the unintended consequences of the concepts, by systematically considering all the user and business stakeholders, real-world scenarios of use, and the flows of materials and energy that were identified within 'Explore'.

Make prototypes

Use drawings and models to communicate the concept and enable it to be tested.

Evaluate

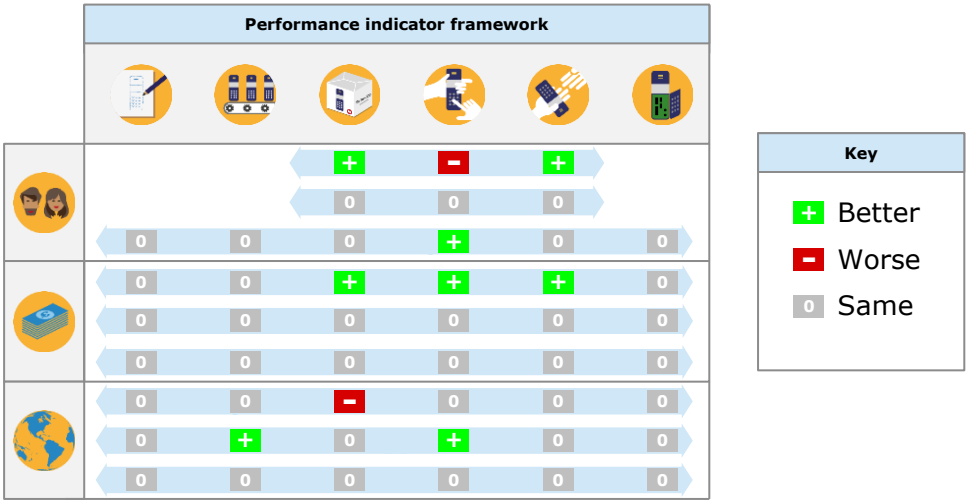
Evaluate the concept(s) to determine whether they are better than the chosen benchmark, for the 'priority' performance indicators that were identified within the 'Explore' phase. These performance indicators should cover 'whole-life' impacts for users, the business, the wider society and the planet. The specific activities are shown in the diagram below, and described opposite:



The full set of activities are shown in the 'Design Wheel' on the back page.

Estimate people, profit and planet impacts

Using the ‘Performance indicator framework’ from pages 11-12 as a prompt, judge whether the concept is better, worse or the same as the chosen benchmark, for each row and column of this grid. A simplified example of the outcome is shown below.



A performance dashboard should be used to help capture these evaluations (www.designingourtomorrow.com/dashboard). Use the stakeholder map, user journeys and impact map as prompts to ensure the evaluation is complete.

Review uncertainty

For all of the estimates involved in a concept evaluation, consider which ones critically influence the decision-making, and consider whether these estimates are accurate enough for their purpose.

Present evidence

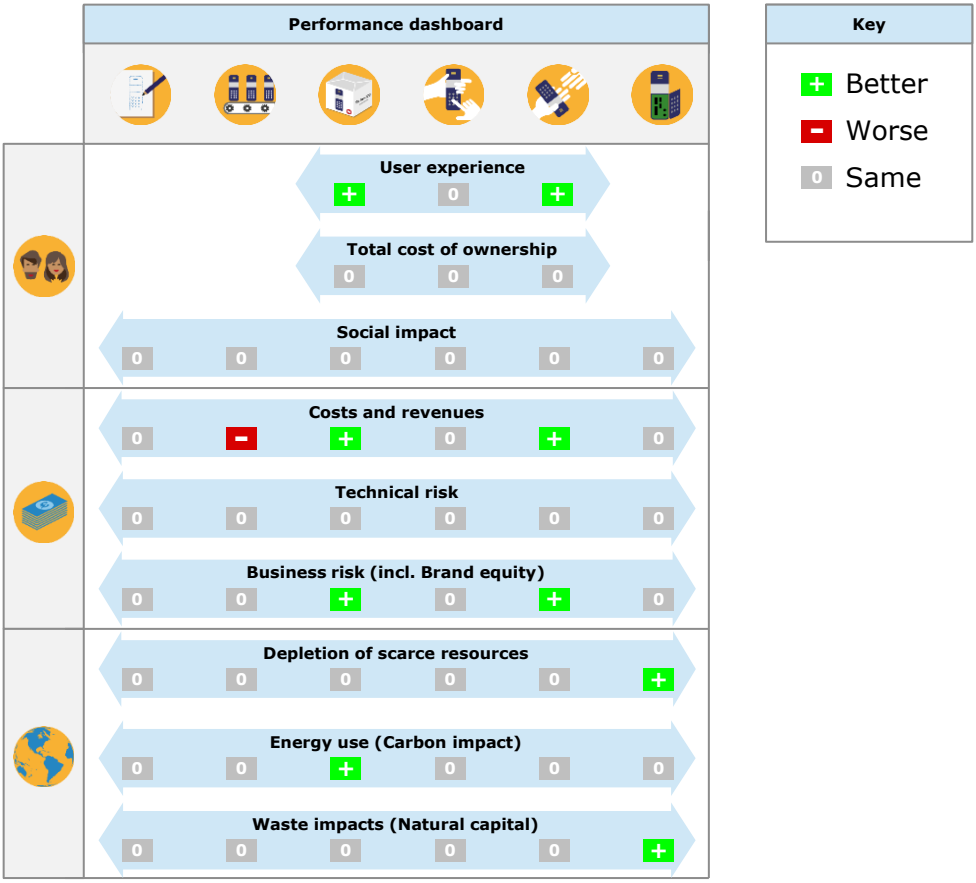
Use the performance dashboard to summarise each concept by presenting the overall judgements of the Chief 'X' Officers: CMO, CFO, CTO, COO, CSO (Marketing, Financial, Technical, Operations, Sustainability).

Case Study: BT Home Hub 4

The new Home Hub 4 has been designed with a slim-line shape and spring-loaded feet so that it will fit through most letterboxes.

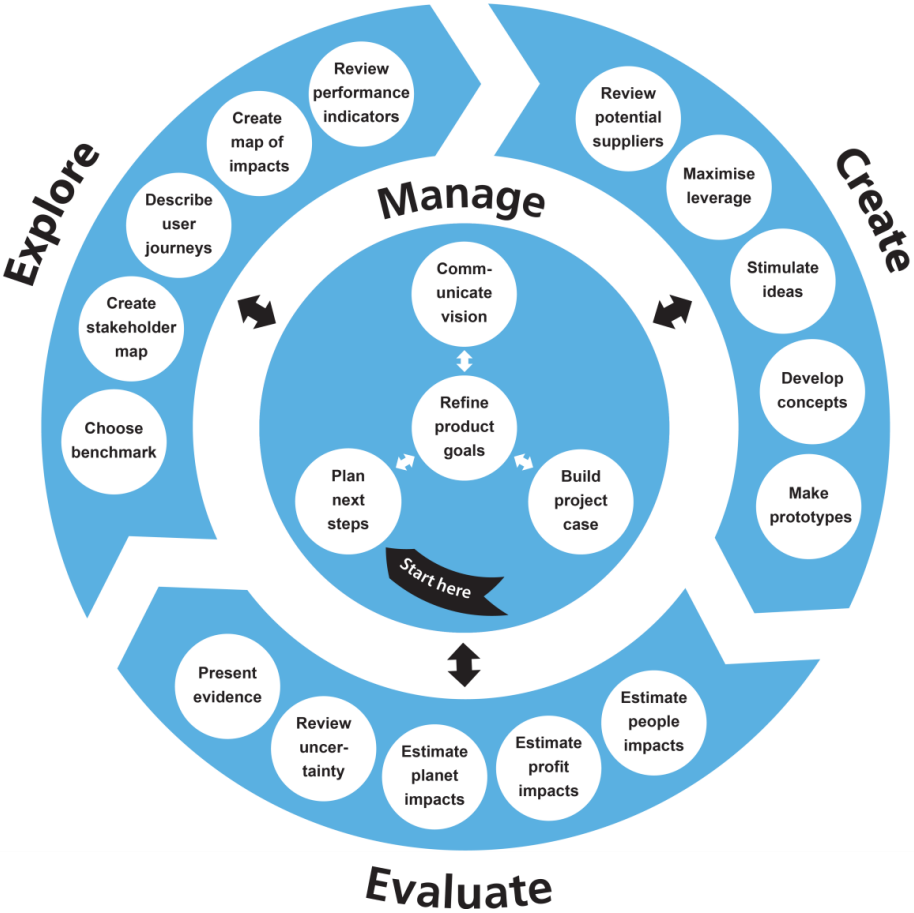
- The slim-line design means that the hub can be efficiently recovered at the end of its useful life, for refurbishment or materials recovery.
- The box is made from 100% recycled cardboard, and the use of soy inks enables the box to be recycled again.
- Setup instructions are printed on the inside of the box, and the instructions are specific to the configuration of equipment that the customer has in the box (this varies depending on whether the Internet is provided via ADSL or fibre).

The **performance dashboard** shown opposite evaluates this 'slim-line' Hub 4 by comparison against against a 'hypothetical' Hub 4 that is a more typical 'box-like' shape. After the end of their useful lives, this evaluation assumes that the letter-box design means that more hubs will be posted back to BT by the consumer, which will increase BT's ability to satisfy consumer demand by providing refurbished hubs.



- **User experience** improved because of reduced repeat delivery attempts, and reduced trips by customers to pick up parcels from the local depot.
- **Cost** of making it slightly increased, but reduced costs of delivering the product and collecting it after the end of its useful life.
- **Brand equity** increased due to association with responsible resource use during delivery and collection after end of life.
- **Depletion of scarce resources** reduced because recovered hubs can be used again.
- **Energy use** reduced because less miles travelled by delivery vans and less consumer's collecting hubs from parcel depots.
- **Waste impacts** reduced because the hub is easier to recover after the end of its useful life.

Design wheel



Cambridge University can support these activities with through training and consultancy, please contact edc-toolkit@eng.cam.ac.uk for details.

Further guidance and tools are also available at www.designingourtomorrow.com