Design for Sustainable Behaviour

Background

For many consumer products**, the use phase is the most significant in terms of environmental impact,** primarily energy use.

Technological responses to mitigate this form a substantial proportion of work in ecodesign and engineering fields: increased efficiency of operation and reduction of waste generated are important goals.

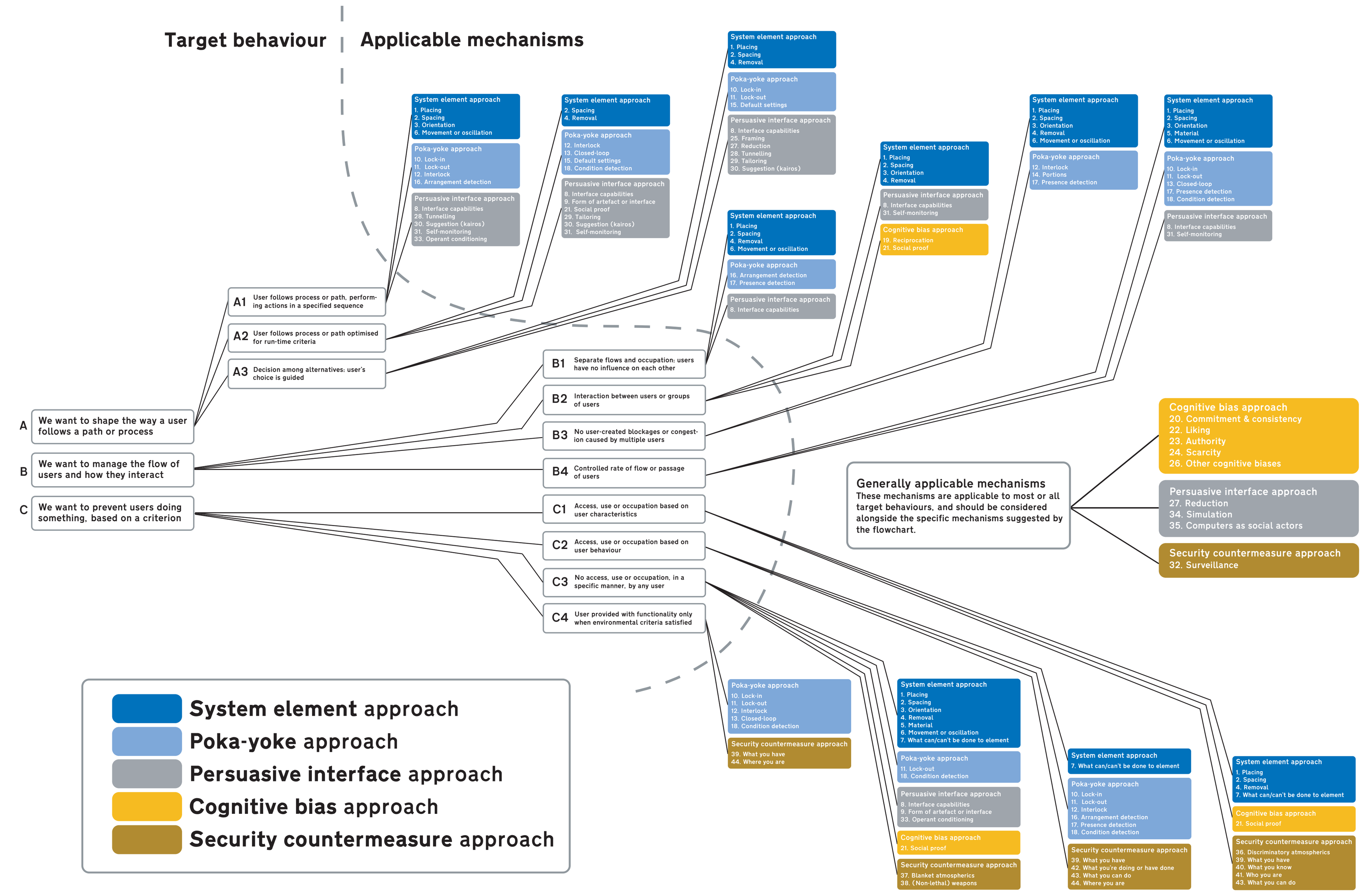
But it's equally worthwhile to reduce or alter the manner or period of products' use, which implies **changing users' behaviour**. Political responses — educational, economic and legal measures — often aim to address this, but interaction design, engineering, computer science and architectural techniques can also be applied.

The Design with Intent Method

The variety of approaches to designing behaviour change, from different fields, might loosely be described as **Design with Intent** — **strategic design intended to result in certain user behaviour**. While applied in very different contexts, from avoiding assembly errors in manufacturing to routing pedestrians through a shopping centre, the DwI techniques can be abstracted to a set of possible approaches which can then be applied to other situations where a certain target user behaviour is desired.

For example, if the target behaviour is to reduce the volume of unnecessary extra water boiled in an electric kettle, just-in-time feedback on the cost of electricity for the operation may be successful in causing the user to change his or her behaviour. Equally, though, a physical behaviour-shaping constraint such as requiring the user to pre-select the amount of water required before filling the kettle — manipulating affordances by using a forcing function or interlock — may have the same result.

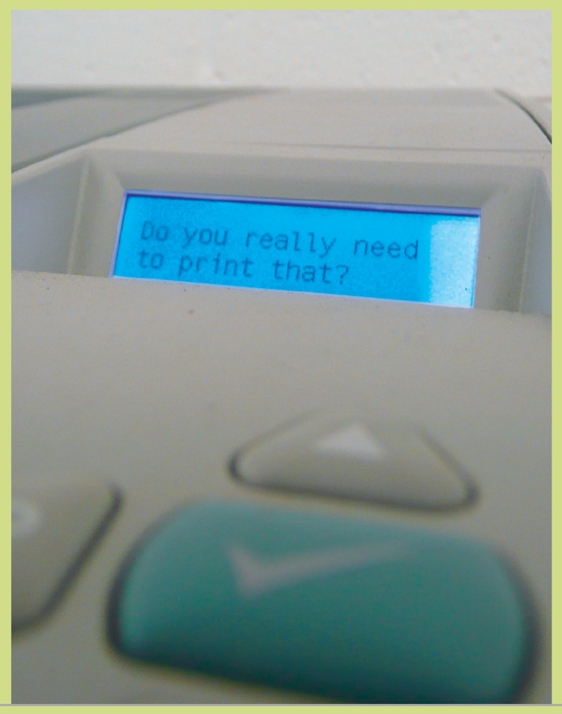
The method under development, to be tested in workshop sessions with undergraduate design students and practising design consultants, suggests DwI techniques, both physical and psychological, applicable to design problems expressed as target behaviours (along similar lines to TRIZ methodology, although less complex), via a tree (**see right** for current iteration).



Summary: Making users more efficient

By applying a range of design and engineering techniques, it's possible to create products which **help users to reduce the environmental impact of using them**: effectively, **making users more efficient** by designing for sustainable behaviour.

We're developing a method for helping designers to create behaviour-changing products and systems, and then running user trials with prototypes as a result, to see which approaches and techniques are most effective at improving user efficiency.



Example target behaviour:

A1 User follows process or path, performing actions in a specified sequence

As an example, consider this target behaviour. We want a user to follow a process or path, performing actions in a specified sequence. In a ecodesign context, this is likely to mean the **most efficient sequence**. A car's air conditioning system could require the windows to be fully closed before operating. A bathroom sink could require the plug to be in place before the tap could be left in a 'running' position. Interfaces which suggest the 'most efficient' action to the user, at the right point (e.g. when to change gear — see right), can also help encourage users to follow the intended sequence of actions. The examples shown here are involve safety considerations (pedestrian crossing and starter button) as well as efficiency (gearchange light).

Papers so far:

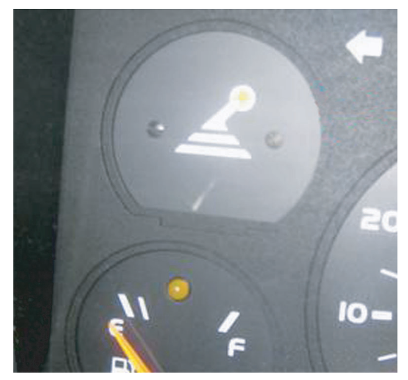
Lockton, D., Harrison, D.J., Stanton, N.A. (2008) 'Making the user more efficient: Design for sustainable behaviour', To appear in: International Journal of Sustainable Engineering Vol.1 Issue 1 (forthcoming)

Lockton, D., Harrison, D.J., Stanton, N.A. 'Design With Intent: Persuasive Technology in a Wider Context'. in H. Oinas-Kukkonen et al. (Eds.): PERSUASIVE 2008, LNCS 5033, pp. 274 – 278, 2008

System element approach
1. Placing
2. Spacing
3. Orientation
6. Movement or oscillation

Placing, **Spacing** and **Orientation** — how system elements are laid out — are some of the most fundamental mechanisms a designer can employ to help a user to follow a process or path in the intended sequence, and can be used both in the 'real' world and, as metaphors, in software. **Movement or oscillation**, as an 'action' property of system elements, which may involve changing their placing / spacing / orientation, can also be used to help achieve similar aims.
Example (left): A staggered pedestrian crossing designed so that users face oncoming traffic.

Poka-yoke approach
10. Lock-in
11. Lock-out
12. Interlock
16. Arrangement detection



Poka-yoke (Japanese: mistake-proofing) is an approach usually applied in manufacturing engineering. The idea is to avoid slip-type errors by preventing a user proceeding until the error condition has been rectified, or warn the user of the error. Similar concepts, forcing functions, have been developed in interaction design — the three main mechanisms, **Interlock**, **Lock-in** and **Lock-out**, together with **Arrangement detection** warnings, can all help make sure a user follows the intended sequence.
Example: (far left) This Toyota Verso requires the clutch pedal to be depressed before the starter button will operate, to reduce the risk of starting in gear.

Persuasive interface approach
8. Interface capabilities
28. Tunnelling
30. Suggestion (kairos)
31. Self-monitoring
33. Operant conditioning

The design of the interface of a product or system can persuade users to follow a process or path in a specified sequence, using a number of psychological persuasion mechanisms (originally outlined by B J Fogg). As well as the technical **Interface capabilities** themselves, **Tunnelling**, **Suggestion (kairos)**, **Self-monitoring** and **Operant conditioning** may all apply.
Example (above left): This Volvo gearchange indicator light suggests the most efficient moment to change gear, based on measurement of engine RPM and throttle position.

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