Breaking & forming habits using technology: theoretical pointers from psychology

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This paper contends that careful examination of existing psychological theories from the dual-system and habit formation perspectives is crucial in understanding the challenges involved in creating seamlessly interactive human-computer interfaces.

Habits. Dual-system theories. HCI. Behaviour change technology.

1. INTRODUCTION

Despite the centrality of habits in HCI, research in the area tends to be light on theoretical underpinnings. Failing to take into account habit and dual-system theory means potentially failing to account of the roots of interaction behaviours since a great deal of human behaviour, including habits around technology, falls into the category of 'habit'.

To qualify this strong claim, we need a clear definition of what a habit is. Following Judah et al. (2012) and Orbell & Verplanken (2010), I define a habit as a learnt behaviour that is frequently repeated, has a high degree of automaticity and is performed in response to stable contextual cues. 'Automaticity' in this context means that a habit may be carried out without a person directing conscious awareness towards it.

Under this definition, it is clear that repeated human-computer interaction with a stable interface where aspects of the interaction are learned to the extent of automaticity occurring, fall into the category of 'habit'.

Some aspects of habitual behaviour are implicit in usability guidelines, yet little research explicitly unpacks habit theories, let alone more specific theories of behaviour such as dual system theory, in order to fully understand this sort of interaction: Aarts et al. (1997) argue that "little theoretical and empirical attention has been given to the process of habit formation".

Yet an understanding of the theoretical underpinnings is crucial in understanding how best to support the user. This is not only to help users to form habits around new technology in order that they can interact in efficient, seamless ways, but also to avoid breaking existing habits with new interface designs such that users experience disorientation and frustration.

2. THE THEORIES

2.1 Dual-system theory

Various flavours of dual system theory have emerged from several fields of research including psychology, neuroscience and behavioural economics (e.g. see Stanovich & West, 2000; and see Evans (2008) for a review).

Most of the theories' common assumptions are that people's decision-making systems are comprised of two systems: System 1 being a set of fast, heuristic, impulsive, associative, contextual, automatic, parallel processes, with System 2 being a rational, slow, considered, rule-based, abstract serial system. Weaker versions of the theory posit dual processes, rather than separate systems, but for reasons of clarity we here restrict the discussion to dual systems theory.

Dual system theories of this sort still encompass a behaviourist viewpoint, since the acquisition and repetition of behaviour emerging from System 1 still rests partly on associative learning, but they allow us to additionally explore the influence of cognitive constructs on habit formation and breaking.

2.2 Habit formation theory

Dual systems may also operate in the *acquisition* of habits, as well as in their practice: both Verplanken & Wood (2006) and Wood & Neal (2007) theorise dual systems in habit learning, emphasising the importance of motivation in the formation of habits,

alongside the simpler associative behaviourist views of habit formation. The theories receive some support from explorations of habit formation in neuroscience: functional magnetic resonance imaging (FMRI) studies by Poldrack et al. (2001) found evidence of a dual process in learning, with two distinct memory systems activating in habit learning and knowledge learning.

A very high level integrated view of the operation of behavioural choice processes under dual system theory is shown in Figure 1.
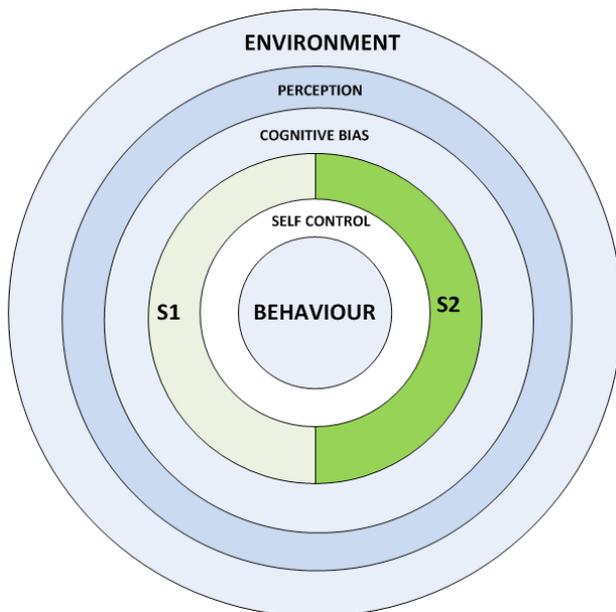

Figure 1: dual system view of behavioural inputs

Under certain circumstances, a context (or interface) cue can trigger a habitual behaviour via System 1 without the slower rational decision-making System 2 being involved. The broad implication is that for an interface to be truly 'intuitive', a user should be able to interact with it without engaging System 2 at all: they should not have to guess at possible outcomes for given actions, relying instead on pre-existing associative memories triggered by interface cues or other cognitive short-cuts in the form of perceptual triggers or cognitive biases.

Of course, achieving a purely intuitive interface at the outset is not always possible with complex HCI domains (and heterogeneous users), so System 2 may be involved at the outset in the formation of a habit. For example, consider the use of the office storage metaphor employed by most WIMP systems: for a new generation of users, who have never encountered a paper-storage based office, such metaphors are increasingly inappropriate. The design issue in such circumstances then becomes how to optimise habit learning so that slow System 2 decisions are overtaken by rapid System 1 forms.

The theory also has important implications for the design of interruptions and warnings for the user, particularly where the underlying system requires a decision from the user: these must be deliberately habit-breaking in order to 'jolt' the user out of their comfortable System 1 and activate System 2 in order to provide the required decision. It would perhaps be unwise to present the user with similar dialogue boxes for both trivial and crucial decisions if they have habituated to simply clicking "OK" for any dialogue box.

Note that the diagram, for reasons of visual clarity, may be misleading: System 1 is comprised of a number of parallel processes, rather than constituting a single serial system, although System 2 is generally taken to be a serial process. There are therefore multiple potential routes through System 2 to speedy, seamless interaction: detecting and exploiting them is crucial.

This paper has merely scratched the surface of the exciting new intersection between habit psychology theory and HCI in practice: there is much work to be done, but a rich seam of research to mine and build upon.

3. REFERENCES

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