Stopping Information Search: A NeuroIS Investigation

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Information search is now a ubiquitous aspect of users' interactions with information systems and a fundamental first step in their decision-making processes. To make decisions or solve problems, people must *stop* their information search. Prior research has investigated cognitive stopping heuristics, or rules, in various types of search (e.g., Browne and Pitts 2004; Browne, Pitts, and Wetherbe 2007; Ho, Bodoff, and Tam 2011). The purpose of the present research is to investigate information search and stopping using functional Magnetic Resonance Imaging (fMRI) data.

Information is now overly abundant in many contexts. There is more information available for processing than can be reasonably incorporated into decision making, problem solving, or in preparation for action. Our brains are simply ill-equipped to handle the quantities of information available to consume. Shallow processing (Carr 2010) often leads to the overconsumption of information, which interferes with consolidation of memories and results in information overload, attentional exhaustion, and even mental health problems. Thus, the need to stop information consumption is an important practical problem and raises a host of important research questions. In this research we aim to gain a better understanding of how and why people stop searching for information.

Based on a review of the information search literature (e.g., Pirolli and Card's (1999) Information Foraging Theory and Simon's (1996) theory of heuristic search) and stopping literature (e.g., Browne et al, 2007; Ho et al. 2011), we generated four research questions:

R1: How does brain activity differ for search activity and stopping activity?
R2: How does brain activity differ for various types of self-reported stopping rules?
R3: Does stopping information search activate the same areas of the brain as stopping motor responses?
R4: Does brain activity differ for searching and stopping when moderated by various psychological characteristics?

Subjects were 21 students from a business school subject pool at a large university in the southwestern U.S. The experimental task required a subject to search for information about three products individually within a product class, such as televisions, and this was repeated for seven product classes. When subjects indicated they had gathered sufficient information (that is, they indicated they wanted to *stop*), they were given a question about why they chose to stop. This type of design is different from typical inhibition studies in neuroscience, such as stop-signal and go/no-go tasks, because the subjects rather than the researcher controlled the decision to stop.

Results revealed that a number of brain networks showed significantly higher blood-oxygen-level-dependent (BOLD) activation during stopping than during searching. The first was an executive control network comprised of the dorsolateral pre-frontal cortex and the anterior cingulate cortex. Together the greater activation of these two areas suggests that subjects were actively employing top down executive control to attend to the stop decision and evaluate the value of a stop response.

Second, the insula and the caudate/putamen were more active on both sides of the brain during stopping than during searching. This is a typical network of activation in stop-signal tasks, and is indicative of inhibition, which represents the behavior of stopping. These areas inhibit the urge for a person to continue with what he is doing, which suggests that he will stop.

Together, these areas of activation provide strong evidence that different areas of the brain are involved in searching and stopping. Implications for decision making more generally will be discussed.

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