

CHAPTER 6

A MULTITASKING FRAMEWORK FOR COGNITIVE INFORMATION RETRIEVAL

AMANDA SPINK

Queensland University of Technology

CHARLES COLE

McGill University

1. INTRODUCTION

Information retrieval (IR) research has developed considerably since the 1950's to include consideration of more cognitive, interactive and iterative processes during the interaction between humans and IR or Web systems (Ingwersen, 1992, 1996). Interactive search sessions by humans with IR systems have been depicted as interactive IR models (Saracevic, 1997). Human-IR system interaction is also modeled as taking place within the context of broader human information behavior (HIB) processes (Spink et al., 2002).

Research into the human or cognitive (user modeling) aspects of IR is a growing body of research on user interactivity, task performance and measures for observing user interactivity. The task context and situational characteristics of users' searches and evaluation have also been identified as key elements in a user's interaction with an IR system (Cool and Spink, 2002; Vakkari, 2003).

Major theorized interactive IR models have been proposed relating to the single search episode, including Ingwersen's (1992,1996) Cognitive Model of IR Interaction, Belkin et al.'s (1995) Episodic Interaction Model, and Saracevic's (1996,1997) Stratified Model of IR Interaction. In this chapter we examine Saracevic's Stratified Model of IR Interaction and extend the model within the framework of cognitive IR (CIR) to depict CIR as a multitasking process. This chapter provides a new direction for CIR research by conceptualizing IR with a multitasking context.

The next section of the chapter defines the concept of multitasking in the cognitive sciences and Section 3 discusses the emerging understanding of multitasking information behavior. In Section 4, cognitive IR is depicted within a multitasking framework using Saracevic's (1996, 1997) Stratified Model of IR Interaction. In Section 5, we link information searching and seeking models together, via Saracevic's Stratified Model of IR Interaction, but starting with a unitask model of HIB. We begin to model multitasking in cognitive IR in Section 6. In Sections 7 and 8, we increase the complexity of our developing multitasking model of cognitive IR by adding coordinating mechanisms, including feedback loops. Finally, in Section 9, we conclude the chapter and indicate future directions for further research.

2. CONCEPT OF MULTITASKING

Multitasking is the ability of humans to simultaneously handle the demands of multiple tasks through task switching (Just et al., 2000; Rubenstein, Meyer, and Evans, 2001). Cognitive psychologists have for decades studied many aspects of multitasking or task switching (Miyata and Norman, 1986; Carlson and Sohn, 2000). Although multitasking continues to be an important research area for technologies designers in general, many interactive technologies do not provide effective support for managing multitasking behaviors (Wickens, 1992). However, due to the increasing complexity of the global information environment people are increasingly engaged in multitasking and information task switching behaviors.

There are positive and negative aspects of multitasking. Rubinstein, Meyer and Evans (2001) found that multitasking between different types of tasks can reduce productivity. Wickens (1992), on the other hand, suggests that *time sharing* allows the simultaneous performance of multiple tasks and time swapping allows the sequential performance of tasks. Our position is that multitasking is a critical human behavior that allows people to cope with ever more complex environments by handling multiple tasks through task switching (Burgess, 2000; Carlson and Sohn, 2000; Lee and Taatgen, 2002).

3. MULTITASKING INFORMATION BEHAVIOR

When information is added to the mix, the concept of multitasking takes on an added layer of complexity. Multitasking information behavior may involve a combination of cognitive and physical actions, on dual or multiple tasks concurrently or sequentially, including switching between different information tasks. Cognitively, humans may sequence their thinking on information tasks and information task switching at different levels of complexity and speed. CIR is embedded within multitasking information behaviors that occur when users juggle the challenge of searching on multiple topics during the same search session.

IR systems users may engage in multitasking information behavior in two ways. First, a user may begin their IR system interaction with multiple topics, or second begin with a single topic and then develop additional topics during the search process. Both processes include information task switching, or switching back and forth between different topics during a search session. For example, a user may switch between seeking health information and new car information as they think and work on multiple information problems concurrently.

Our view, however, is that information searching, especially on the Internet, involves a much wider series of behaviors than purposive information seeking—thus we feel the term HIB is more appropriate. An example of an HIB perspective on user information seeking and searching within a multitasking framework view of cognitive IR is “vanity searching,” where the user puts his or name into the IR system.

A recent poll shows that 27 percent of Internet users conduct this sort of searching behavior (AOL Europe/ RoperASW Cyberstudy on Community, 2003). It is a searching behavior, but also a wider, HIB, because it serves no task-specific searching purpose; rather vanity searching plays into the searcher’s sense of place in a sociological context