Chapter 2
Classic and Alternative Mobile Search: A Review and Agenda

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ABSTRACT
As mobile search turns into a mainstream activity, the author reflects on research that provides insights into the impact of current interfaces and pointers to yet unmet needs. Classic text dominated interface and interaction techniques are reviewed, showing how they can enhance the user experience. While today's interfaces emphasise direct, query-result approaches, serving up discrete chunks of content, the author suggests an alternative set of features for future mobile search. With reference to example systems, the paper argues for indirect, continuous and multimodal approaches. Further, while almost all mobile search research has focused on the 'developed' world, the paper outlines challenges and impact of work targeted at 'developing' world contexts.

INTRODUCTION
Mobile search is becoming an everyday activity for millions of people, with a recent study reporting that forty percent of US mobile users already use a search engine to navigate to mobile sites (Kamvar et al., 2009). In addition to web-wide searches, device-based tools are now needed to manage the quantities of on-board content that ranges from apps to books to music and more. The significance of searching as a key to effective mobile use cannot be overstated; and, this is before the billions of relatively new mobile users – in developing or ‘emerging’ markets – are taken...
into account. For people in many parts of India, China, Africa or Latin America, the mobile will be their primary experience of the web and computers. Better search engines that accommodate these users’ particular needs - their lack of textual literacy and limited exposure to conventional computers, to name just two – could have a hugely significant impact on the quality of life of the majority of the planet’s inhabitants.

In this article, we will begin by considering the nature of mobile search. How, if at all, does it, or will it, differ from conventional desktop search? To do this, we will look at what the data seems to be saying about the trends in things people use mobiles to search for; how they do mobile search; and, what drives them to use a mobile in the first place.

Classically, mobile search engines have been textually driven – you pose a query by typing and result lists with various forms of artefact surrogates, such as the web page titles or keywords, are returned. We will explore a number of interaction methods and interfaces that have been proposed to make this process more efficient, effective and satisfying. Search engines have always been important in helping people make sense of the otherwise overwhelming complexity of vast information spaces. Without such innovative interaction designs, these spaces will feel like black holes when traversed through the relatively tiny screens and input mechanisms found on mobiles.

While conventional mobile search engines will remain important, in the second half of the article we will lay out the case for alternative approaches. Ones that take account of social, real-time activity; others that allow us to reflect on our search activities, seeing them as processes that create persistent, interrogatable archives of information seeking behaviours. Then, there are the research prototypes that move away from simple text input and output, engaging a wider set of modalities. There has been a great deal of work on image-based and speech-based mobile search often combining these forms of interaction with others (e.g., Edwards et al., 2008; Pack et al., 2008). We will not be focussing on these; rather we will explore less explicit forms of query specification and result presentation through the use of gesture, audio adaption and haptics. Straight-forward speech and visual search, though, may well prove critical in developing world contexts, contexts that we will return to at the end of the article.

**THE NATURE OF MOBILE SEARCH**

Consider the last time you used a mobile search engine. What did you need to know? How urgent was your information need? What other resources did you have to hand to help you satisfy this need? Did the mobile help or were there some interaction or content issues?

A number of studies have been published in an attempt to understand the form and changes in mobile search behaviour. Two complementary types of analysis have been performed. First, log-files, held by mobile operators and search engine providers, containing millions of individual queries have been sifted. Typically, these studies determine mobile query lengths; click-through rates (where a click-through is defined as a search leading to a click to a result site); and, popular topics.

Log-files are only available to a very limited number of researchers, typically those working with the companies that create them. They also fail to capture important elements such as the intentions or needs behind the stark search terms or the context the query was performed within. Resources available to a user like other people, street signs, notebooks along with hurdles to entering a query and reviewing results – the busyness of a commuter street; the immersive chatter of a social gathering - need to be understood to gain a rich picture of mobile information needs. To overcome these log-file limitations, then, researchers have deployed human logging techniques: diary approaches and experience sample methodologies.