Chapter 1

Attention and Pervasive Computing:
A Case Study of Online Advertising

Jarmo Kuisma
Helsinki School of Economics HSE, Finland

Jaana Simola
Helsinki School of Economics HSE, Finland

Anssi Öörni
Helsinki School of Economics HSE, Finland

ABSTRACT

Attention is one of the most limited mental resources. The capacity of our visual attention is challenged by the increasingly rich media content and decreasing size of user interfaces embedded in many everyday appliances. Observations in fields such as advertising, with lengthy traditions in investigating the effects of visual attention and recognition may offer insights into effective interface design for pervasive computing applications. This study examines the impact of repetition and attention on recognition for four types of online ads: horizontal and vertical ads appearing in both animated and static forms. The authors observed that repetition enhanced recognition of ads, and that animated ads were generally better recognized while the effect of ad format was less significant. This chapter measured attention by eye fixations and fixation durations and found a strong relationship between attention and ad recognition.

INTRODUCTION

Emerging pervasive computing technologies and tools require more from our visual resources in both daily business and at home. Although pervasive computing devices are sometimes nearly invisible, like embedded intelligence in cars or smart homes, an interface is needed to access these applications.

Typically, these interfaces are built around displays that may vary from standard computer screens to immersed miniaturized displays and even displays that we can wear.

The desirable quality of increasing intelligence of products and services is the higher potential for control it offers to consumers. Seizing this potential, however, depends crucially on our ability to acquire information to act on. To embed intelligence in

ever-smaller objects, user interfaces also have to decrease in size or multiple devices must share an interface. This results in increasing load on our perceptual mechanism. Ravaja, Kallinen, Saari and Keltikangas-Järvinen (2004) studied cognitive responses when viewing video messages and postulated that message content is likely to elicit less attention, is perceived to be less creditable, and is remembered less effectively when presented on a small screen instead of a large screen. Visual attention, memory and learning by repeated exposures become critical for example when driving at night in a strange city and looking at small displays like speedometers and navigators while also observing the mirrors and traffic signs.

Like traffic, the Internet sites represent cluttered environments demanding attention for visual search and learning spatial locations of objects to navigate through various pages that often contain distracters such as animated ads and pop-ups before the user reaches the intended target information.

In the following we discuss the effectiveness of online advertising, a subject that has been debated among academics and practitioners since the commercialization of the Internet. As a consequence, advertisers have developed various types of advertising techniques and formats such as static and animated banners, skyscrapers, and pop-ups to attract consumers' attention. Despite the growing number of online advertising techniques, banner advertising still forms an important revenue stream and total Internet advertising revenues have increased annually by over 20% from 2002 to 2007 in the United States (PriceWaterhouseCoopers, 2008).

Previous research has offered contradictory results concerning the effectiveness of online ads. Some researchers have reported that consumers learn to avoid looking at banner ads (Benway & Lane, 1998; Bernard, 2001; Cho & Cheon, 2004; Stenfors, Morén, & Balkenius, 2003), that ad type or animation do not improve ad recognition, and that ads tend to distract information search

(Burke, Hornof, Nielsen, & Gorman, 2005; Dréze & Hussherr, 2003; Hong, Thong, & Tam, 2004). Contrary findings have suggested that advertising type affects consumers' memory and brand recall, and that animation attracts attention and enhances recognition (Burns & Lutz, 2006; Yoo & Kim, 2006).

While banner advertising and the effects of animation on recognition have been widely examined, there has been relatively little research on the effects of repetition and attention on memory in the web environment. In conventional media such as TV or newspapers, the effectiveness of the message is supposed first to increase at low levels of repetition and then decrease relatively as message repetition increases above the optimal level (Berlyne, 1970; Cacioppo & Petty, 1979). In broadcast media, the frequency and duration of exposure is internally controlled and repetition may increase consumers' capability to remember advertisements. However, on the cluttered Internet sites, the opportunity to see ads and the duration of exposure also depends on consumers' navigational behaviour and information searching goals.

In this study, we explored how repetition, ad types and attention affect recognition memory in a controlled experiment using typical real-world web pages as stimuli. The background theory, hypothesis, research methodology, findings and conclusions are discussed in the following and general remarks and recommendations for pervasive computing applications are elaborated.

BACKGROUND

Repetition and Recognition

In general, effective advertising is remembered and believed and it is rationally and/or emotionally appealing and persuasive. Repetition of advertising is frequently used to improve message effectiveness. Both consumer researchers and marketers have attempted to understand the relationship

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