Geospatial Encountering: Opportunistic Information Discovery in Web-based GIS Environments

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ABSTRACT
Web-based geographical information systems have become ubiquitous in daily life. They include such familiar tools as Google Earth, Google Maps, and a plethora of geolocational mobile applications for smart phones. These geospatial web systems present new opportunities for users to discover information opportunistically, in unexpected and non-intentional ways. This paper examines one specific type of incidental information acquisition - information encountering (Erdelez, 1997) - as it may occur in geospatial web environments. Accordingly, this preliminary research brings together findings and frameworks developed within two diverse fields: a) human information behavior, and b) geographic information systems.

The Information Encountering model serves as a conceptual framework for understanding how the distinctive characteristics of geospatial web applications impact the nature of information encountering episodes. Exploratory research was conducted via a focus group session. Users were found to engage regularly with a variety of geolocational systems and report frequent episodes of information encountering, but they also display difficulty recalling details of individual episodes. Findings suggest the need to develop tools to capture information encountering experiences in the field, at or close to the time they occur.

Keywords
Information encountering, geographic information systems, human information behavior, mobile applications.

INTRODUCTION
The academic literature commonly asserts that as much as 80% of all information involves a geospatial component (e.g., Hart & Dolbear, 1988; Meeks & Dasgupta, 2004). Despite the pervasiveness of geographic data in our daily lives, much is not yet understood about how it impacts and shapes information behavior. The 2009 Horizon Report (Johnson, Levin, & Smith) identifies geospatial systems as a key transformative technology for society, predicting a world that will be “geo-everything” within a two to three year time frame (p. 15). There is a significant and timely need to develop a better understanding of human behavior within geospatial information contexts.

Like most information retrieval systems, geospatial web applications are primarily designed to support purposeful information seeking tasks, when a user has a full or partially defined need and is actively pursuing satisfaction of that need. Geospatial applications, though, are typically richly hyperlinked and incorporate a variety of multimedia, presenting opportunities for users to also acquire information in unexpected and unintentional ways. Opportunistic discovery of information (ODI) is a non-directed form of information acquisition in which a user experiences a chance encounter with useful information. It is increasingly recognized as an important and natural means by which individuals acquire information, and one that has historically received insufficient attention in the information behavior literature.

This research explores one specific type of ODI - information encountering (Erdelez, 1997) - as it may occur in today’s common geospatial web environments. In a typical information-encountering episode, a user is initially engaged in a foreground information problem. Their foreground activity may involve active seeking, browsing, or any other type of information behavior. The user unexpectedly comes across information pertaining to a different, unrelated background problem, and chooses to explore it further.

A major assumption of this study is that geospatial web applications support the possibility for this type of unintentional discovery of useful or interesting information. Because the
phenomenon has not been previously explored, it will be examined using grounded theory to inductively develop an understanding of whether and how users may experience what is herein referred to as “geospatial information encountering”.

**Research questions**
The phenomenon of geospatial information encountering has not been previously studied and much is still not understood about geospatial information behavior in general. In order to understand geospatial information encountering episodes to the fullest possible extent, therefore, research questions are broadly posed:

**RQ1:** What are the characteristics of geospatial information behavior in common geospatial web environments?

**RQ2:** Does information encountering occur in geospatial web contexts; if so, how and to what extent?

**RQ3:** How do the identified characteristics of geospatial information behavior shape the nature of geospatial information encountering episodes?

**Frameworks**
These research questions will be explored via a user-centered approach to human information behavior, examining user actions in conjunction with the cognitive and affective dimensions of their geospatial information experiences. Both Dervin’s (1983) Sense-Making and Savolainen’s (1995) Everyday Life Information Seeking (ELIS) theories provide useful context for examination of these questions.

The frequency and nature of information encountering episodes vary across four major dimensions (Erdelez, 1997), including dimensions related to the information user, the information environment, the encountered information, and the need associated with the encountered information. These dimensions provide a highly suitable framework for examining how information encountering differs according to user and context. For example, certain environments like the richly hyperlinked Internet may prove more conducive to information encountering than others (Erdelez, 2000).

Geospatial web applications introduce several unique dimensions to a user’s information behavior. These dimensions include how a user assesses the relevance of geographic information (Raper, 2007) and how they go about exploring their geospatial interests (Mac Aoidh, Bertolotto, & Wilson, 2008). A user’s search experience is influenced by how geospatial information is formatted (Fraser & Gluck, 1999), and user mobility raises a number of temporal, directional, and proximity issues that don’t generally exist in stationary information environments (Mountain & MacFarlane, 2007). Researchers have also identified distinct categories of geospatial information needs (Gluck, 1996) and have developed typologies of geospatial tasks (Muehrcke, 1986). Each of these unique dimensions has been found to shape a user’s geospatial information experiences in general; this proposed study examines whether and how they may also specifically impact the nature of geospatial information encountering events.

The following diagram summarizes how geospatial dimensions can be considered within the context of the information encountering model:

![Figure 1: Proposed Model of Geospatial Information Encountering](image)

**Stages of geospatial information encountering**
The five structural components of a typical information-encountering episode are 1) noticing information related to a background problem, 2) stopping, 3) examining the information, 4) capturing it, and 5) returning to the foreground problem. Per Erdelez (2004), this five-stage model is intended as a representation of a typical complete episode, but not all stages need occur in any individual episode. Her efforts to induce information encountering in a controlled research environment demonstrated that many episodes are incomplete— a user may not notice encountered information, may elect not to stop and examine it, may never return to the initial foreground problem, etc. Each of the five successive stages of a complete IE episode can therefore be evaluated in light of how they are influenced by the geospatial information encountering dimensions summarized in Figure 1, and how these dimensions influence whether or not a user proceeds to the next stage. For example:

**Noticing:** In geospatial contexts, what influences whether or not encountered information is noticed?

**Stopping** In geospatial contexts, what influences whether or not users decide to stop after noticing geospatial information?

**Examining:** How do users examine encountered geospatial information, and what influences how they go about examining that information?
Capturing: How do users capture encountered geospatial information? What influences whether or not they choose to capture encountered information?

Returning: To what extent do users return to their original foreground information task? What influences whether or not they return to the original problem?

METHODOLOGY

Context

ODI is a difficult and elusive phenomenon to research, a fact that may partially explain why it has been understudied and under-addressed in existing models of information behavior (Foster & Ford, 2003). Whereas browsing and other means of information seeking are process-oriented modes of acquisition that can be readily observed in either natural or controlled settings, information encountering is episodic in nature. Information encountering episodes aren’t routine processes; they are distinct, unusual incidents. Further, they are unpredictable, unintentional, and typically short in duration. For all these reasons, they can be challenging for users to recall afterwards (Erdelez, 2004, p. 1014). They are also not easily observed in the field.

Attempts to study information encountering in controlled research environments have proved equally challenging. Despite careful experimental design Erdelez (2004) found that artificially crafted foreground and background tasks, as well as a researcher’s presence, negatively impacted a user’s inclination to notice or pursue encountered information. She acknowledges, “Skeptics may argue that the artificial nature of a controlled research environment presents an insurmountable obstacle for observation of [information encountering] and other natural processes of [opportunistic acquisition of information]” (p. 1023).

For these reasons, the proposed study will employ other empirical methods for studying the phenomenon. A two-phase, mixed-methods study is envisioned. In Phase I, a broad Web-based survey will be applied to elicit quantitative data from a wide range of respondents about their use of geospatial web applications and their experiences using them. This initial data set will be statistically analyzed in order to form an initial, broad understanding of geospatial information behavior in common geospatial web environments (RQ1). The data set will also be used to identify frequent users of geospatial web applications as well as users who may frequently experience geospatial information encountering. Phase I study respondents who display a high degree of use of geospatial web applications and/or a high degree of information encountering in those environments will be selected for in-depth, qualitative study in the second phase. The second phase of the study will consist of multiple exploratory studies, including in-depth focus groups, structured individual interviews, and journals. A subset of respondents to the Phase I survey will also be selected to participate in ethnographic field observation, as well as observation in a controlled research environment.

Subjects

A pilot focus group study was conducted in October, 2010 to develop a baseline understanding of whether and how information encountering may take place during use of geolocational applications. Subjects consisted of a convenience sample of 5 out of 10 doctoral students enrolled in a human information behavior seminar at the University of Missouri - Columbia.

This opportunity presented certain methodological challenges. Participants in a focus group would ideally be selected from among participants in the previously described Phase I, chosen for their high frequency of interaction with geospatial web applications and/or high degree of geospatial information encountering. The convenience sample of study subjects may or may not utilize geospatial web applications to any great extent. Still, it was an unexpected and welcome chance to pilot test focus group questions, and to gain information about current use of and experience with such technologies.

Data Collection

The 1-hour focus group session was recorded via TechSmith’s Morae user testing software. Because other studies have found that subjects cannot always identify services with geospatial features, participants were presented with a brief definition of geolocational applications and were given a one-page document listing representative examples of applications (e.g., Gowalla, FourSquare, Yelp, scvngr). Six broad questions were posed to elicit information about the types of applications used, activities and purpose for which they are used, whether participants could recall information encountering episodes, and thoughts and feelings associated with such events.

FINDINGS

Doctoral students are frequent users of geospatial web applications. Specific applications mentioned included Google Earth, Google Maps, Google Latitude, Facebook Places, Yelp, Urban Spoon, Flickr, and others. Most participants also used GPS navigation applications and devices, and at least one subject used a mobile geocaching application. Participants were particularly enthusiastic about smart phone applications that integrate GPS navigation and real-time social networking, allowing for participant sharing of road conditions (e.g., Waze).

The group exchanged a rich variety of anecdotes relating to their use of geospatial web applications and motivating information problems. They report frequent experiences of encountering unexpected information when using geolocational applications, yet could not describe any individual geospatial information encountering episodes with great detail. This difficulty recalling ODI events has been noted by researchers in other contexts, and suggests that synchronous or near-synchronous research methods
may prove more effective at eliciting details of geospatial information encountering episodes. A relatively new technique, mobile diaries, will be considered as a means for capturing the information encountering experiences of mobile geospatial web users at or close to the time they occur.

SUMMARY
Preliminary findings of the pilot study suggest that information encountering frequently occurs in geospatial web contexts (RQ2), but reveal methodological challenges with researching both geospatial information behavior in general (RQ1) and the characteristics of geospatial information encountering in particular (RQ3). Additional pilot testing and refinement of proposed data collection methods are required to improve the research design prior to any high-volume execution of the study.

REFERENCES


