The Role of Serendipity in Digital Environments

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INTRODUCTION

Serendipity is usually defined in opposition to information seeking. Information seeking is thought of as a goal-oriented search for information to solve a problem or fill an information need (Wilson, 1999). A number of models of information seeking stress the relevance of browsing and exploration in the initial stages of information search (Brand-Gruwel et al., 2009). These models, however, do not elaborate on how browsing and exploration occur, nor do they discuss how these less directed forms of finding information are integrated into all information seeking stages. By contrast, models of serendipity have as their central focus an examination of how information is encountered accidentally without purposeful search. No single definition or model of serendipity exists in the literature and there is no doubt that the concept is elusive and difficult to define.

Despite the difficulty in defining the concept, its significance cannot be overlooked. A recent study demonstrates the relevance of information encountering in how people locate information. Pálsdóttir (2010) examined how Icelanders encounter health information in their everyday lives. In the study, it was surprising that the information people found was not discovered through purposeful search but, rather, stumbled upon in the context of other activities. The results of the study also demonstrated that those who seek information are more likely to also encounter information, suggesting that perhaps both reflect a general orientation toward information gathering. Foster and Ford (2003) have stressed the relevance of serendipity for all disciplinary areas given its role in connection building, discovery,

and creativity. The authors suggest that in the sciences serendipity has been thought of as a product of both mental preparation and an open and questioning mind. They argue that in the humanities serendipity has a role in revealing hidden connections or analogies, and enabling new insights to develop. Martin and Quan-Haase (2013) found that serendipity was central to the work of historians, who reported that the one key resource that they might encounter as a serendipitous find on library shelves or archives could significantly change the outcome of their research.

This article provides a brief overview of the historical roots of the concept of serendipity and it highlights the key elements of what serendipity entails. To provide background on the concept, the article draws from literature in sociology, psychology, information science, and the hard sciences. We then review and contrast the three central models of serendipity in the literature[1]:

- **Erdelez (1997, 1999, 2000, 2004):** A conceptual framework of information encountering, as a type of opportunistic acquisition of information (OAI);
- **Rubin, Burkell, and Quan-Haase** (2010, 2011)*:* A conceptual model of serendipity facets in everyday chance encounters; and
- **Makri and Blandford (2012)***:* A model of serendipitous information encountering.

This overview of models is followed by a discussion of how technology design affects serendipity and the design requirements and alternative information systems that are needed to further support innovation,

creativity, and resource discovery in digital environments. Finally, we draw conclusions for our understanding of the concept of serendipity offline and online as it unfolds in scholarship and everyday life.

BACKGROUND

Harold Walpole coined the term serendipity in 1754 (Merton & Barber, 2004). The word derives loosely from the tale of the *Princes of Serendip*, which chronicles the adventures of three traveling princes whose notable powers of observation and deduction lead them to accurate, insightful, and surprising conclusions. The examples that Walpole chose to illustrate the term made clear that he intended serendipity to entail two things: a) the accidental encountering of information and b) an outcome of the encounter that is the solution to a problem, question, or concern—either pre-existing, or resulting directly from the information itself. Although many found the term evocative and interesting, it languished largely unused until the mid-1900s when it was adopted as an apt descriptor of the process of accidental or unplanned discovery, specifically in the scientific context (Merton & Barber, 2004). In this realm, the word came to refer almost exclusively to discovery emerging out of chance observation (e.g., Andel, 1994; Meyers, 1995; Rosenman, 2002). It is in this context that serendipity came also to require a "prepared mind:" prepared in the sense of having the background knowledge necessary to make use of the encountered information and also of having a pre-existing problem, one that is often not even "top of mind" when the information is encountered (Erdelez, 2000; Heinström, 2006a, 2006b).

The "prepared mind" is critical for connecting new and unexpected information to a pre-existing problem. Background or domain knowledge is crucial in this process: without such knowledge, there is no possibility of making the unexpected connection or seeing the unanticipated solution (e.g., Weisberg, 1999). At the same time, domain knowledge can be constraining, locking the individual into accepted or traditional ways of thinking (e.g., Dane, 2010). In particular, it appears that domain knowledge supports serendipitous insight when attention, or interest, is allowed to wander or be captured by the encountered information. For example, Barber and Fox (1958) document the stories of two scientists, each with the background knowledge required to identify a surprising reaction of rabbits to the injection of a particular drug. One researcher, stalled in other research at the time, noticed and pursued the anomalous observation, while the second, whose primary research program was progressing well, missed the serendipitous discovery.

MODELS OF SERENDIPITY

We focus in this section on three key models of serendipity. The first model places an emphasis on the process orientation of encountering information by chance and how it fits into the context of pre-existing or background problems. The shift from a foreground to background problem underscores the limitation of the human perceptual system: people can only pay attention to one issue at a time, leading to a foreground and background orientation. The second model focuses on elements of chance encounters and how an unsought finding is reframed as serendipitous. The third model combines the elements of the first two, and adds such concepts as connection and insight. Next, each of these models is reviewed and compared across a select number of features.

Erdelez (1997, 2000, 2004): Conceptual Framework of Information Encountering, as a Type of Opportunistic Acquisition of Information (OAI)

Erdelez (1997, 2004) defined the experience of information encountering (IE) as a type of opportunistic acquisition of information in which a user actively seeks information related to one problem and unexpectedly finds information related to another problem. Erdelez (2000) outlined five functional elements, not all of which are necessarily present in an encounter with information. The embedded elements are:

1. **Noticing:** The perception of encountered information;
2. **Stopping:** The interruption of the initial information seeking activity;
3. **Examining***:* The assessment of usefulness of the encountered information;

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