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Exploring Serendipity's Precipitating Conditions

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Abstract. Serendipity is generally characterized as a sagacious, unsought discovery. Innovations and advances in science and engineering such as penicillin and Teflon as a result of interactions with tangible engineered and natural phenomena are often labeled serendipitous. Serendipity also results from more conceptual interactions with information, knowledge, and ideas. But how does serendipity emerge when the discovery is predominantly conceptual? What conditions in the digital environment would help facilitate less tangible but similarly unexpected and fortunate interactions for knowledge workers? The objective of my research is to approach the study of serendipity as a process involving precipitating conditions, interacting internal and external factors that either hinder or facilitate serendipity, to understand how to best facilitate serendipity in a digital, information-rich environment. This research will contribute to an emerging field of study – support for serendipity in information systems – that is striving to make our experiences in digital environments richer and more meaningful.

Keywords: Serendipity, precipitating conditions, information systems.

1 Introduction

Serendipity is an unexpected experience characterized by an anomalous observation and valuable outcome and dependent on an individual's strategic insight [1]. Primarily associated with scientific and engineering discoveries and developments, serendipity also results from more conceptual interactions. Serendipity, in management, for example, sparks ideas and new opportunities that drive strategic decisions [2]. In education, serendipity facilitates new and interesting entries to educational material and learning [3]. Despite research indicating serendipity's significance across a number of fields [4] and the pervasive and persuasive anecdotal documentation of its importance [5], information-rich environments such as digital libraries primarily support targeted search interactions. Absent are features that are intended to guide users to interactions with divergent though potentially useful content. As well, research to date has primarily focused on the need to deliver unexpected, surprising, and novel content to the user, often neglecting other precipitating conditions – factors, for example, influencing the receptivity of users to this potentially serendipitous content such as affect and motivation [6] and affordances in the environment [7].

2 Research Problem and Hypothesis

The process of serendipity in knowledge work (Figure 1) illustrates the movement of an individual through the stages of serendipity. This model, adapted from Cunha's [2] model of the process of serendipity in organizational management has five main elements and unfolds as follows: 1) an individual experiences an information encounter [10] or makes an anomalous observation [1] (the trigger) 2) and an association between the object and the individual's knowledge and experience or a bisociation between ideas is made. The individual 3) follows-up on the association/bisociation 4) and a valued outcome is the potential result. This process, however, is influenced by the fifth element of the process: the convergence of precipitating conditions. Precipitating conditions influence each stage of the process, impacting, for example, whether associations/bisociations and follow-up are dismissed or delayed, leading to an incubation period [8] or *negative serendipity* [9] in which the opportunity for a valuable outcome is taken by someone else.

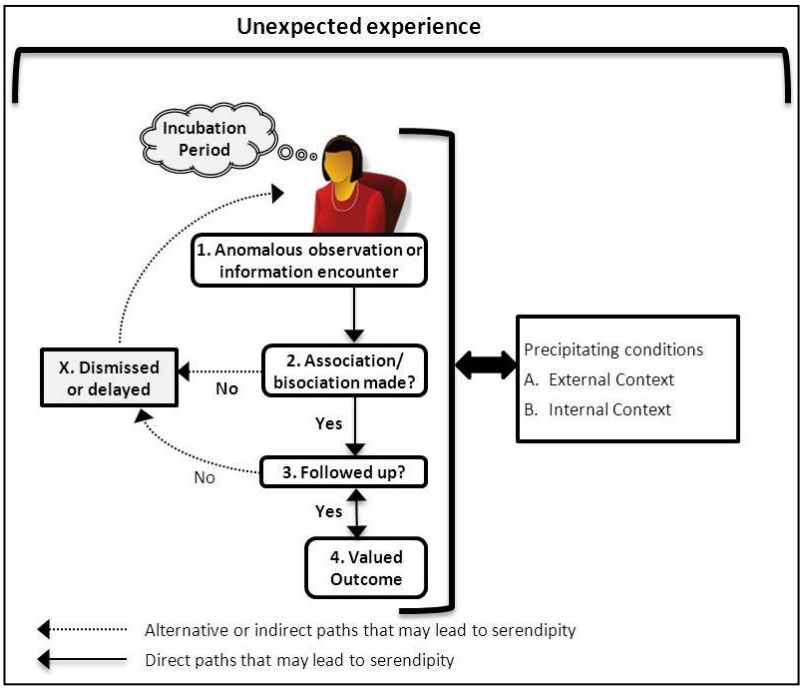

Figure 1 Serendipity in knowledge work (adapted from [2], [8])

Precipitating conditions of serendipity may have a positive or negative impact on the process. They are conditions that influence an individual's ability and inclination to become aware of, respond to, and follow up on a potentially serendipitous experience, and ultimately impact the outcome. Precipitating conditions include A) external and B) internal context. External context may include, for example, the design of an information space such as a library [7], other people who may help spark a bisociation

[8], or an imposed task that leads an individual to ignore useful but not immediately relevant information [10]. Internal context refers to the actions and characteristics of the individual. Internal context includes, for example, misleading preconceptions that may impede serendipity [9], divergent behaviour that leads to information encounters [7], and feelings of frustration at work that prompt follow-up on an anomalous observation [9].

The precipitating conditions that converge to facilitate or hinder serendipity are just beginning to be understood, but an understanding of these factors is critical to the development of digital environments that support serendipity. Given this, how can we better understand how to support serendipity in a digital environment? I hypothesize that serendipity in information search systems may be facilitated through the design of a system sensitive to external and internal context. Some precipitating conditions are hypothesized to exert more influence on the process of serendipity than others: knowledge, motivation, behaviour, task, environment, and other people. Of these, knowledge, motivation, and behaviour may be observed and measured while task, environment, and other people may be controlled and manipulated.

3 Methods and sketch of proposed solution

My research is being conducted in two main stages and with multiple methods:

Phase 1: My objective is to understand the process of serendipity in knowledge work and specifically a better understanding of the precipitating conditions. To date, I have conducted semi-structured interviews with 12 knowledge workers from a variety of fields such as journalism, education, and science. Transcribed interviews were coded using NVivo. Analysis suggests that while precipitating conditions drive serendipity forward, the context is not always positive. There are multiple factors that affect how we move through our days and these factors push and pull us in different directions. For example, similar to Barber and Fox's [9] observation, a frustrated individual may be more aware of anomalous information, more motivated to make unexpected associations and follow-up on them in order to satisfy a current problem or task.

Phase 2: The objective of the second phase is to understand which precipitating conditions enable people to break from normal thought processes in unexpected ways in a digital environment. While there have been some attempts to support serendipity through useful/surprising embedded links [10] and an ambient intelligence system that draws attention to interesting/surprising content [11], there have been few studies exploring which factors of the external context are more likely to encourage serendipity. In this stage I plan to observe participants using different and contrasting information search systems. In this experiment, the interfaces will be tested using a between and within subjects study design. Motivation and knowledge will be measured while user behaviour will be observed. Participants will be given directed and undirected tasks to test their interactions with the systems and compared. Post session interviews will provide a source for understanding information interactions.

One possible direction with regard to interface design is the inclusion of a Twitter widget with tweets engineered to relate to the user's search context. Another possible direction is the development of a scale to measure the user's perception of the potential of a system to facilitate serendipity.

4 Expected contributions

The results of my Ph.D. research will provide guidelines for the development of digital environments to support serendipity. Namely, this research will indicate ways in which some precipitating conditions such as task and other people interact in a digital information search system to facilitate or hinder serendipity. The main goal and potential outcome of my research is to foster creativity in information interaction such that novel connections are made and useful and interesting paths pursued.

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