Measuring Serendipity in the Lab: The Effects of Priming and Monitoring

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Abstract

While the phenomenon of *serendipity* has proven to be a popular research topic, the issue of how to *measure* it effectively is still relatively unexplored. We present an exploratory study that contributes to our understanding of this issue by examining the effect of (1) *priming* people about the concept of serendipity and (2) *monitoring* participants on how they experience serendipity when searching for information in a controlled environment. Our experiments indicate that it is best to keep such controlled experiments as natural as possible: priming participants about serendipity and monitoring them during their experiments seem to have a negative influence on experiencing serendipity, as they are more likely to induce participants to stay on task instead of exhibiting divergent information behavior.

Keywords: Serendipity, measurement, priming, monitoring, experimentation

Introduction

Serendipity has traditionally been studied in naturalistic settings using interviews (Makri & Blandford, 2012; McCay-Peet & Toms, 2011a), yet systems designed to promote serendipity can often benefit from evaluation in more controlled laboratory settings as well. However, little research has been devoted to recording, evaluating, and measuring serendipity in these more controlled settings. The work described in this paper contributes to measuring serendipity in controlled environments by examining the effect of two different factors on experiencing serendipity when performing information seeking tasks: (1) does *priming* people about the concept of serendipity cause them to experience more of it, and (2) does *monitoring* the participants during their information seeking influence how much serendipity they experience? Our goal here is to determine whether we can create certain conditions in the lab that can induce *more* serendipity, thereby making it easier to evaluate serendipity-enhancing systems in such controlled settings. This could be of great benefit, as serendipity has been shown to be difficult to induce, both in controlled (Erdelez, 2004) and natural environments (Sawaizumi, Katai, Kawakami, & Shiose, 2007).

Related work

The first exploration of inducing and measuring serendipity in a controlled laboratory environment was by Erdelez (Erdelez, 2004), who framed serendipity as *information encountering*. Erdelez distinguished between foreground and background information needs when encountering information, with the background needs inducing serendipitous encounters when working on an unrelated foreground task. Through a shared course assignment, she fixed the background need for all student participants in her study and inserted information relevant for this background need into the results lists generated by the search engine used in her study. Students were then asked to use this search engine to perform the

Bogers, T., Rasmussen, R. R., & Jensen, L. S. B. (2013). Measuring serendipity in the lab: The effects of priming and monitoring. *iConference 2013 Proceedings* (pp. 703-706). doi:10.9776/13325

same search tasks. Erdelez found that most students stayed on track and completed the task, with only a handful of students recognizing the serendipity of the planted information.

A more recent foray into the measurement of serendipity is the work by McCay-Peet and Toms (McCay-Peet & Toms, 2011a, 2011b), who developed a measurement instrument for serendipity based on Björneborn's 10 dimensions of serendipity in physical libraries (Björneborn, 2008). They found that the most important indicators for experiencing serendipity were related to enabling connections between objects, introducing variety and unexpectedness, and inducing curiosity.

Serendipity in the Lab

While there are many factors that could influence how participants in a controlled setting experience serendipity, we focus on two particular ones: priming and monitoring. *Priming* is the cognitive effect in which exposure to a particular stimulus influences the response to a later stimulus (Reisberg, 1997). Our question here is whether informing participants that serendipity is a part of the experiment makes them more or less likely to experience it. While one could argue for both a positive and negative effect of priming on serendipity, we hypothesize that priming has a *negative* effect on the number of serendipitous occurrences, because it makes the setting less natural and makes them more aware of the possibility of being distracted.

It is important to keep the laboratory environment as natural as possible in controlled experiments and to remove all possible distractions (Lazar, Feng, & Hochheiser, 2010). One such distraction is formed by the presence of the experimenter. We therefore expect *monitoring* the participant to have a *negative* effect on the occurrence of serendipity. In general, we expected our unmonitored, unprimed participants to experience the most serendipity.

Methodology

Participants

We recruited 20 current and former LIS students for our study. All participants rated their Internet experience as being at least 'average', with 85% (N=17) rating it as 'good' to 'very good'.

Design of the study

We were interested in studying the influence of two independent variables. The *priming* variable had two conditions: 'Primed' and 'Not primed'. In the 'Primed' (**P**) condition participants were introduced to the concept of serendipity before the start of the experiment and asked to be aware of it during their participation. They were *not* informed that serendipity was the main focus of the experiments. Participants in the 'Not primed' (¬**P**) condition were not informed that serendipity was a part of the experiments at all. The *monitoring* variable also had two conditions. Participants in the 'Monitored' (**M**) condition had the experimenter present in the room at all times. After being introduced to the experiment, the participants in the 'Not monitored' (¬**M**) condition were left alone during the information seeking part of each task. The experimenter would then re-enter the room to supervise the relevance/interest judging process. Both variables were tested in a between-subjects design with 5 participants randomly assigned to each of the four possible combinations of the two variables.

Experimental procedure

In the introductory phase of the study—after completing a pre-task demographics questionnaire—participants were informed that they had to complete three search tasks using the native search functionalities of one of two websites, Amazon.com and Digg.com, which were selected because of their expected potential for serendipity. Participants had 12 minutes to perform each task, during which they were required to bookmark relevant and/or interesting articles or products. After each task, participants had 3 minutes to rate the bookmarked pages on these two dimensions—relevance to the work task and personal interest—using a four-point graded scale, similar to André et al. (André, Schrafel, Teevan, & Dumais, 2009). On this scale '0' corresponded to 'not relevant/interesting' and '3' to 'highly relevant/interesting'. After this main phase, they were asked to complete a post-questionnaire about their

previous experience with the two websites and the degree to which they experienced serendipity during their searching.

After each completed experiment the search history and cache of the browser on the computer used in the experiments were cleared. We used Morae[1] to record the interactions of the participants with the computer. Participants were offered to receive a list of the pages they had bookmarked during their sessions by e-mail.

During the main phase, participants were asked to complete two fixed work tasks and come up with a third task representing their own interests, but they were kept unaware that the true focus of the experiment was on serendipity. Task ordering was randomized. Our two cover tasks were chosen to represent both an *informational* and a *transactional* information need[2] (Broder, 2002). In creating our work tasks, we followed Borlund's recommendations for having participants perform *simulated work tasks* (SWT) with realistic cover stories, and using graded, multi-dimensional relevance judgments (Borlund, 2000). The cover stories for our informational and transactional SWTs were the following:

In May 2011, Microsoft acquired Skype, whose software supports free voice and video calling over the Internet. As a dedicated Apple user you are worried about whether this will affect your weekly Skype sessions with your sister living in Brazil. Use **Digg.com** *to find out more about Microsoft's plans for keeping Skype free-of-charge and the future compatibility with Apple products.*

Your best friend is turning 30 and you would like to get him/her a very unique gift of up to $100. You know your friend is very passionate about rock music. Try to find some unique collector's items or rock memorabilia on **Amazon.com** *for the stated $100 budget.*

In line with Borlund (Borlund, 2000), we also asked participants to come up with a task representing their own interests. To prevent them from searching for relevant information beforehand, participants were asked *during* the experiment to come up with an information seeking task of personal interest. The task could either be of an informational or a transactional nature, and had to be carried out using Digg.com or Amazon.com respectively. If a user could not come up with a personal task, they could select one of two prepared backup tasks, so that all users completed three different tasks.

Results

Participants were asked to judge bookmarked pages on both relevance and interest, the latter dimension corresponding to serendipity. We define a bookmarked page (henceforth: hit) as serendipitous if a participant judged it as non-relevant (relevance grade = 0) but interesting (interest grade $\geq$ 2). Combined, our 20 participants found 57 serendipitous hits in total, for an average of 2.85 serendipitous hits per participant.

When we look at the effect priming has, we find some indications that *not* priming participants resulted in more serendipitous hits: primed participants had an average of 2.7 hits, while unprimed users had an average of 3.0 hits (N=10 in both cases). However, this difference is not significant ($t(18)=0.31$, $p = 0.757$). We did find a significant difference in the number of opened Web pages, with unprimed participants opening more pages ($t(18)=1.86$, $p = 0.036$), suggesting that priming participants almost acts like a warning to stay on task.

There are indications that *not* monitoring participants resulted in more serendipity: monitored participants found 2.6 serendipitous hits on average, unmonitored participants 3.1 hits on average (N=10 in both cases). These differences were not significant ($t(18)=0.53$, $p = 0.605$).

Looking at the number of serendipitous hits for the four different conditions, we see the following distribution: participants in the **P**/**M** condition found 2.6 hits on average, **P**/¬**M** participants found 2.7 hits, ¬**P**/**M** 2.6 hits, and ¬**P**/¬**M** 3.4 hits (N=5 in all cases). While we do see an indication that our unprimed,

[1] Morae is usability testing software that can capture audio, on-screen activity, and keyboard/mouse input.
[2] We did not consider navigational needs as we did not expect them to lead to much serendipity because of their shorter and more direct nature.

unmonitored participants experienced the most serendipity—in line with our hypothesis—an ANOVA test revealed no significant differences between these four conditions ($F(3,16) = 0.14$, $p = 0.933$).

We found no significant differences in the number of serendipitous hits for personal tasks vs. assigned tasks. Previous experience with the websites used also did not have a significant influence on the number of serendipitous hits ($F(1,20) = 1.55$, $p = 0.235$).

Finally, an analysis of the Morae recordings and the timestamps of bookmarked serendipitous hits gave some insight into *what* people were doing when they experienced serendipity: in 42 cases participants were searching for information, in 13 cases they were browsing, and in two cases they experienced serendipity already on the frontpage of the websites.

Discussion & Conclusions

In this paper we have presented the results of an exploratory study on the effect of priming and monitoring on experiencing serendipity during information seeking. Our experiments indicate that it is beneficial to keep controlled experiments designed to measure serendipity as natural as possible: priming participants about serendipity and monitoring them during their experiments seems to have a negative influence on experiencing serendipity. A possible explanation for this could be that our participants consisted exclusively of LIS students, who prided themselves on their searching abilities and perhaps stayed on track more than other participants would have. Counter to expectations, tasks of personal interest to the participant did not seem to induce significantly more serendipitous occurrences.

Future work would require a more critical look at our operational definition of serendipity—interesting but non-relevant results—which is likely to be an oversimplification of the concepts. Using a more sophis- ticated measurement instrument as the one developed by McCay-Peet and Toms (McCay-Peet & Toms, 2011a, 2011b) would be a promising improvement. Increasing the size of the study with more variation in participant backgrounds would also be a necessary step in producing more realistic results.

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