Creative Search: Using Search to Leverage Your Everyday Creativity

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ABSTRACT

By highlighting the values of creativity to a society and individuals, we argue the importance of investigating people's daily creativity and the necessity of designing user interfaces to support the creative process. In this paper, moreover, we propose a dissertation study to examine people's creative process in the context of information search. The implications of this research will inform the future design of a novel search interface for supporting people's creativity.

KEYWORDS

Creativity, Creative Process, Information Search

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1 INTRODUCTION

Creativity and innovation are highly valued characteristics in different fields, such as science, commerce, education, and the arts. Sawyer [13] argues that creativity will continue to increase in importance because of increased global competitiveness, shorter product development cycles, decreasing number of jobs that do not involve creativity, and increasing demand for products of creative industries.

In addition to these social values, creativity has been regarded as a universal quality that helps people survive. As Richards highlighted in her seminal paper on everyday creativity, "Throughout our day, whether at home or at work, we humans adapt and innovate, improvise flexibly, at times acting from our 'gut feelings', at times from options we imagine and systematically try out, one after the other. Our creativity may involve anything from making breakfast to solving a major conflict with one's boss." [11, p. 190]. In fact, much previous research has shown that creativity is a process that is trainable [4, 9, 12]. The Stanford d.school[1] is a good example of showing the feasibility of teaching people the design thinking method to help them develop their creative abilities.

[1]https://dschool.stanford.edu

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In the realms of human-computer interaction (HCI) and information science (IS), Shneiderman is one of the earliest scholars who advocated the importance of supporting people's creativity using information technologies. In 1999, he published a paper emphasizing the significance of developing user interfaces that support creativity. In the paper, he described ways that information tools and interfaces could support users during phases in a creative process and proposed a framework for helping to design interfaces to support creative work.

However, to the best of our knowledge, very few efforts have been made to understand the creative process in the context of information search. In White's book, he highlights the importance of supporting creativity and also points out that "searching and information seeking can be creative process" [18, p. 135]. Although prior work has explored ways to support serendipity in the area of information retrieval, it should be noted that the creative process and serendipity are not identical. In other words, inducing serendipity is just one of the possible ways to support the creative process.

In the dissertation research proposed here, a primary goal is to gain a better understanding of the creative process in the context of information search. We are particularly interested in investigating how people use search systems to perform creative tasks in their everyday life and work, and how search systems might better support creative endeavors.

2 RELATED WORK

2.1 Creativity

What is creativity? In the literature, creativity has been mainly defined and investigated through two different lenses: the individualist approach and the sociocultural approach. From the individualist point of view, creativity was referred to "a new combination that is expressed in the world." [12, p. 7] Richards operationally defined creativity using two product criteria: ***originality*** (how rare is the product with a given reference group?) and ***meaningfulness*** (is this product comprehensible to others?) [11]. Most of the researchers advocating the individualist approach hold the belief that everyone has a potential of being creative.

Different from the individualist approach, the sociocultural approach adopts a more strict way to look at creativity. Socioculturalists consider creativity as "the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledge social group" [12, p. 8]. An idea or action can be considered creative only if it solves a tough problem or results in significant works of genius. In the proposed dissertation,

the individualist approach will be adopted to scope and define the "everyday creativity" that we intend to investigate.

2.2 Creativity Process

In many decades of research, psychology research has demonstrated that creativity tends to occur in a sequence of stages. For example, Wallas [17] developed a four-stage model, assuming that the creative process involves four stages: preparation, incubation, illumination, and verification. In the **preparation stage**, individuals define and set up a problem by consciously drawing on their education, analytical skills, and problem-relevant knowledge. During **incubation stage**, individuals take a break from the problem or work consciously on other problems. After taking a break, individuals are very likely to enter the **illumination stage** where they feel a sudden enlightenment. Hypothetically, the illumination phase is very delicate and can be easily disrupted by outside interruptions or the time pressure of generating the merging idea. Following the illumination stage, the fourth is the **verification stage** where individuals evaluate, redefine, and develop their ideas. Inspired by Wallas' system, many variants emerged in the creativity research, such as Amabile's five-stage model [1], Geneplore model [5], Mumford's eight-stage model [9], and Sawyer's eight-stage framework [13].

In the context of HCI and IS, Shneiderman [14] defined a four-phase *genex* framework for "generating excellence", which included: "**collect** (learn from previous works stored in digital libraries, the web, etc.); **relate** (consult with peers and mentors at early, middle and late stages); **create** (explore, compose, evaluate possible solutions); and **donate** (disseminate the results and contribute to the digital libraries)" [14, p. 15].

2.3 Creativity and Search

In addition to the four-phase genex framework aforementioned, Shneiderman advanced to provide several contexts that existing technologies could play a role in supporting creativity [14]. One of the contexts that had been mentioned is to use existing web search engines and digital library interfaces to support creativity. In previous research in IS, there are few studies carried out to investigate how to support creativity using search engines. However, some efforts have been made to investigate and design ways to deliberately induce serendipity. In 2000, Toms [16] proposed four possible approaches to support serendipitous retrieval:

(1) Enhance chance or "blind luck" by a random information node generator;
(2) Use a user profile to enhance the chance that are more likely to meet the user's expectation (using Pasteur principle);
(3) Enhance anomalies and exception by using poor similarity measures;
(4) Support reasoning by analogy.

In a recent theoretical study, by interviewing 14 creative professionals, Makri identified some strategies that the creatives used to enhance the likelihood of serendipity, such as "vary your routine, be observant, make mental space, relax your boundaries, draw on previous experiences, look for patterns, and seize opportunities." [8]

Several systems or tools have been developed to support serendipity in web browsing. For instance, Beale [3] developed two systems for supporting users' serendipity by using ambient intelligence, which can incorporate information about the user's actions and environment.

The first system was a tool for interactive data exploration and the second was a tool that incorporated a user's web browsing interactions to 'look ahead' to find additional pages of possible interest. In a more recent study, Rahman and Wilson [10] have developed a search engine that could match search results with recorded Facebook "Like" data. This novel search system did not re-rank SERP results based on interests specified by participants, but it would highlight results to provide a secondary notion of potential relevance to ranking.

However, some authors have argued that focusing on the "chance encounters" aspect of serendipity will not necessarily result in significant discoveries or support creativity. As André, scraefel, Teevan, and Dumais empathized in their paper, "discovery is never by chance" [2]. A system could increase users' chances of encountering the "dots" of information that might result in discoveries, but knowing how to connect these dots is a different story. Without sufficient domain knowledge and expertise, it could be challenging for people to synthesize and make use of this encountered information.

3 RESEARCH QUESTIONS

The proposed dissertation will address the following research goals:

RG1: Identify the *types* of creative tasks for which people use information searches, and understand their characteristics. Search tasks have been categorized and studied along different dimensions (e.g., fact-finding, comparative, exploratory, etc.) [6]. In this work, we are interested in exploring and understanding the types and range of creative tasks for which people incorporate information searches. As with exploratory search tasks, we anticipate that these creative search tasks may be ill-defined and the searcher may have unclear goals at the beginning of the task. However, there may be other important characteristics and dimensions that are important to understand about these tasks in order to provide search support for them. Some prior research has been conducted to examine ill-defined tasks. Wilson and Elsweiler [19], for instance, developed a new search task scenario, called "causal-leisure searching" to characterize the users who browse information without an explicit information need to solve. However, "causal-leisure searching" tasks and creative tasks are not the same. Only certain types of "causal-leisure searching" tasks are creative tasks. Their relationship is shown in **Figure 1**. In this dissertation, we will investigate the creative tasks that people perform in their everyday life and then identify the creative tasks that search engines can support.

RG2: The second goal of this dissertation is to understand how people use search engines to complete their creative tasks. In previous research, many efforts have been made to study users' searching behaviors and information needs in a variety of contexts and across different types of information seeking tasks. However, little research has been conducted to specifically understand how the information seeking process relates to and is used as part of a creative process. Findings of previous creativity studies have demonstrated that creative tasks require more mental effort

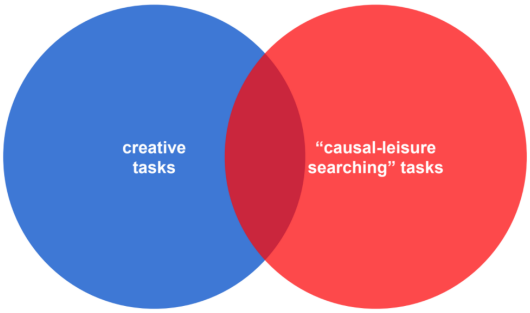

Figure 1: Relationship between creative tasks and "causal-leisure searching" tasks

and different types of thinking skills compared to standard problem-solving tasks [7, 9]. These differences suggests searchers' behaviors may differ when they perform creative search tasks and that it could be valuable to understand these in the context of existing models of information seeking.

RG3: The last goal of our research is to explore ways to design a search interface for supporting people's creativity. In a report from a U.S. National Science Foundation Sponsored Workshop [15], a set of design principles has been proposed for guiding the development of new creative support tools. In the dissertation, we attempt to figure out how to apply these principles to design search interfaces.

4 STUDY DESIGN AND METHODS

The proposed dissertation project involves three phases. Firstly, we will conduct a survey study to investigate the creative tasks that people conduct in their everyday life and situations in which they use search as part of these creative tasks (**RG1**). Based on results of the survey study, secondly, we will select specific types of creative tasks and then design a diary study to investigate how people use search engines to complete these tasks (**RG2**). In this phase, we will recruit participants and ask each to log regular diary entries while they complete a creative task that involves searches. Participants will be asked to record information about relevant activities in their task. For the study, we will also ask participants to use a tool to automatically log their searching behaviors (such as URLs, queries, web pages, etc.). We expect the diary study to provide us a better understanding of users' information needs and their searching strategies in creative tasks. Based on results of the second study, in the last phase, we will develop a set of design guidelines for search system to help support creative search tasks (**RG3**).

5 PROGRESS AND FUTURE PLAN

Using Amazon Mechanical Turk, We have conducted a survey study to investigate the creative tasks that people perform in everyday life. Next, we will analyze the quantitative and qualitative data in this survey to identify the types and range of the creative tasks that information search process are involved.

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