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A Living Lab Approach to Understanding Creative Retrieval in Broadcast Media Production

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ABSTRACT

This paper presents a method to map user needs and integrate serendipitous search behaviors in search algorithm development: the living lab approach. This user-centered design approach involves technology users during technology development to catch unexpected insights and successfully innovate. This paper focuses on the preliminary findings of a living lab case study to answer the question how this methodology reveals fine-grained information about users' serendipitous search behaviors. The case study involves a specific user group, media professionals who work in broadcast television and use audiovisual archives to create audiovisual content, during the development of new search algorithms for a large audiovisual archive. Research insights are based on data gathered during one co-design workshop, and ten in-depth semi-structured interviews with media professionals.

Findings stipulate that these users balance socio-technical constraints and affordances during creative retrieval to (1) find exactly what is sought; and (2) increase the possibility of serendipitous, unforeseen search results. We conclude that modeling these search processes in terms of improvising with constraints and affordances enables an effective articulation and channeling of user-technology interaction insights into new technology development. The paper suggests next steps in the living lab approach to further understand serendipitous search and creative retrieval processes.

Keywords

Serendipity; Living labs; Creative retrieval

1. INTRODUCTION

The idea that technology users can be sources of innovation has led to organized efforts by technology developers and policymakers to include end users and user communities in innovation practices [19]. One of the ways in which end user inclusion in design is sought is through living labs. These labs are organizations that facilitate technology innovation in partnerships between public, private and civic actors. Living labs develop technologies by engaging in an open innovation, user-driven research approach set in real-life experimentation environments in order to embrace the uncontrollable dynamics of daily life. Figure 1 shows the placement of living labs compared to other innovation approaches. The approach uses a myriad of user-centred design methods [6] to map user needs and gain unforeseen user insights. Recent living lab studies stress that to achieve optimal results, users should be included as equal partners throughout technology development and that, to catch unforeseen user ideas and behaviors, attention ought to be paid to how users improvise with technologies-in-the-making [15].

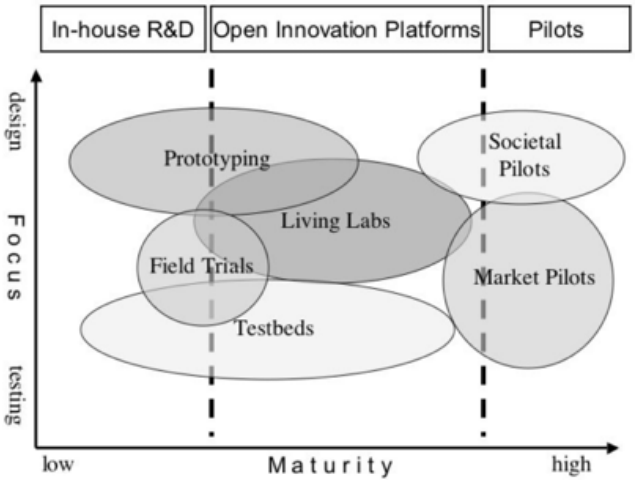

Figure 1: Position of Living Labs as an open innovation platform; included with permission from [4].

This paper presents ongoing research into the application of the living lab approach to develop new search algorithms for a large audiovisual archive. In particular, the paper seeks to unpack user contributions and insights into user needs and search behaviors during the first stage of the development process. The included users are media professionals who make daily use of the archive to create audiovisual stories. The paper investigates how the living lab's capacity to elucidate unforeseen user insights allows for a clear understanding of the role that serendipity plays when these users engage in creative retrieval; retrieving sources from the archive to create new audiovisual stories. The paper thus specifically aims to answer the question how the living lab approach facilitates and explicates the articulation of user-technology improvisation practices, which helps to understand the process of finding unexpected but useful search results and allows these to inform new search algorithm development. Our findings are useful for researchers who seek to implement a user-centered design approach that translates unfore-

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seen user ideas and serendipitous user behaviors into technology development.

2. RELATED WORK

The living lab approach has been applied in Information Retrieval (IR) research to primarily involve users in IR evaluation [3, 16]. Instead of concentrating on IR evaluation with users, the present study focuses on one of the preceeding phases in technology development, namely ideation. In line with user-centered design cases in IR, which indicate that co-developing with users helps refine search goals, problems, and interface design [2, 20], this paper focuses on both identifying user needs as well as understanding factors that constrain user-technology interaction.

Related studies about the needs of audiovisual archive users, such as media scholars and news journalists, provide categorisations of information needs [10, 12] or more technologically-oriented needs such as ease of access especially in relation to time: searching is constrained by time pressures [1]. Bron et al. [5] map the (re)search cycle of media scholars into three phases to support the development of exploratory search systems: exploration, contextualization and presentation. During these phases, information needs change iteratively from vague, via initial search questions to a refined final research question. Search is thus about refinement, and the iterative search process itself contributes to the distillation of research questions.

It is fruitful to relate this interplay between search processes and search goals to McCay-Peet and Toms' research [13] into serendipitous search. They argue that serendipity should not be studied in terms of its triggers and instantaneity, but rather as a holistic process that takes place during active learning, specifically during exploratory search. In the IR literature, serendipity is seen as a paradoxical concept: valuable, yet elusive [8]. In this paper, the elusiveness of serendipity is connected to the living lab premise of harnessing unexpected, serendipitous user ideas and behaviors to innovate. To do so, we ground serendipity by theoretically relating it, as a process, to improvisation.

In organizational theory, the term improvisation is used to describe the unforeseen way in which people navigate with(in) structures. This activity takes the shape of a constant orientation, a mixture of making do and letting go "in response to an unexpected opportunity or challenge" [14]. There are several reasons why improvisation is a useful concept to study how media professionals search for and subsequently use audiovisual sources to create new audiovisual narratives. First, it allows for a description of the route that unfolds as users search in creative terms that move beyond what Hassan et al. [9] would characterize as struggling and exploring. Second, it anchors the unforeseen to (creative) retrieval practices, which shows how the unforeseen gains meaning during audiovisual narrative creation. Third, highlighting improvisations within the digital search environment makes it possible to understand the tacit knowledge these users have of said environment, which may then inform the development of new search algorithms.

3. METHODOLOGY

This research is based on a user-centered living lab methodology that seeks a close collaboration with the foreseen end users of the to-be-developed search algorithms. In the first stage of the research project, qualitative methods [7] are used to map the user context (Figure 2). A grounded theory approach is furthermore used to construct theoretical concepts from the collected data.

This first stage of research has taken the shape of 1 co-design session followed by 10 in-depth semi-structured interviews with media professionals who use the archive, such as news documentation specialists, television editors and digital storytelling practitioners. The co-design session involved 19 project partners: 11 representatives from private and public parties, and 8 representatives from the user group. Together, the partners discussed the project problem and objective: how to develop self-learning search algorithms that take into account professional user needs. During the session, three creative research methods were employed to map the user context and elicit user needs: empathic conversations and explorative play were facilitated and the users engaged in user profiling [18]. These methods were used in subsequent order, within a tight timeframe to ensure that the main problem was actively tackled by sharing ideas in different manners. The more abstract question to describe user needs was translated into one that asked the partners to describe what their ideal outcome of the project would be. They noted down or drew their ideas onto Post-it notes, after which they discussed their ideas within the larger group. The notes were collected and grouped, and reflected on by the group in terms of important themes and features. The second part of the session consisted of a user profiling session; the partners worked in two groups to draw overviews of the different media professionals within the media landscape. The produced drawings, together with the collected Post-its and a transcription of the group discussion, provide a user-generated reflection on and mapping of the characteristics of different (future) users of the to-be-developed search algorithms. The users created 6 user profiles:

- images researchers/curators,
- desk researchers who work for broadcast companies,
- more short-term employed researchers,
- documentations specialists, who aid editorial teams with retrieval activities and also archive and annotate material,
- media innovation specialists who primarily seek to manage projects, content, teams and cross-medial strategies, and
- mediacoaches who aid schools and develop educational concepts.

These user profiles formed the basis of the selection of interview respondents. During the interviews, users described their daily professional archive use and search behavior, elaborated on how they integrate found sources into audiovisual stories and reflected on ideas generated during the co-design session.

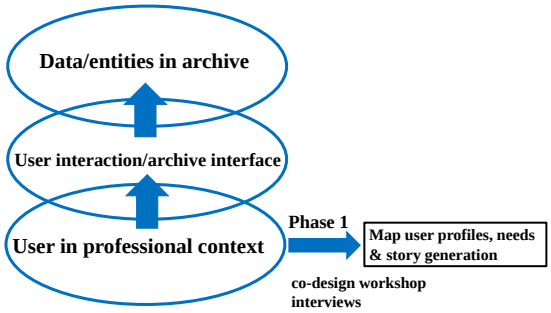

Figure 2: Phase 1 mapping the user context.

4. PRELIMINARY RESULTS

The co-design session allowed for a broad scoping of user needs and search behaviors. Users listed specific ideas to optimize their search processes, such as: the possibility to move beyond a text-based search engine to an image-based one, using keyframes to quickly identify similar images, or alternatively, using text-based

search to find direct quotations within sources. In terms of enhancing search processes, users expressed the need to be able to upload annotations to the archive and view annotations of peers; user-generated annotation would allow for quick comparisons and decision-making ("what does my colleague use when compiling a news item, and how do I want to create an item about a similar news story?"). Users also suggested visualizing relations between found materials and the search query, to be able to quickly review the context of a specific topic or theme. The need to be agile was of utmost importance, due to extremely tight timelines associated with the profession. At the same time, the need to find the unexpected also came to the fore; materials need to be found quickly but should also be surprising (Table 1).

These insights formed the basis of the subsequent interviews. Taken together, preliminary results indicate that media professionals describe their search behavior as directly influenced by time constraints and by the type of materials sought (video, audio, photographs, found using keywords such as person, broadcaster or date). Their information needs are informed by profession type, professional contexts (work/team environment), and type of audiovisual product that needs to be created. The interviewed users perceive their search behavior as an iterative process during which they continuously consider whether a source aligns with the constraints and affordances of their foreseen end product (television show, news item or documentary). These are:

(1) time (for research as well as the duration of the final product, e.g., 30 seconds or 25 minutes);
(2) the format and genre of their product;
(3) the target audience;
(4) the budget; and,
(5) their personal interest.

Figure 3 summarizes these insights, of phases in the development of the audiovisual story, set against phases in their information-seeking behavior. It is an iterative process, and unfolds in the context of voiced constraints and affordances.

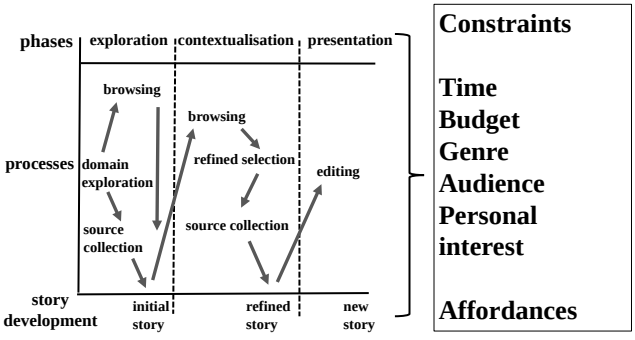

Figure 3: Overview of story development with associated search processes. Arrows show possible sequences (adaptation of Bron et al.'s model of the phases in media studies research).

The finding that users try to find sources that are directly relevant as well as surprising suggests that, in searching, users seek to elicit serendipity, or "the meaningful experience of chance encounters" [11]. These user expects that unforeseen and as-yet-unkown audiovisual sources will enrich their audiovisual products by allowing the telling of new stories. This expressed need to find both expected and unexpected sources can be translated into a user need for the digital search environment of the archive to afford serendipitous retrieval [17]; a fuzzy search approach, which supports user improvisation.

What is interesting is that users stress their craftiness in finding fitting sources by seeking, on the one hand, audiovisual materials that exactly fit their query, but also, on the other hand, sources that are on the margin of what would be exactly relevant. Users note a tension between finding "cliché" sources to, for instance, create a news report about sensitive subjects, and a need to use "fresh" material to keep audiences interested. This insight is not genre-specific: whether creating a news item, quiz question or documentary, users continuously explore the boundaries of what they term the collective memory of the viewer. It is within this exploration that users need serendipity, and seek in a "fuzzy" manner to find unforeseen sources.

This play with affordances and constraints, inviting serendipitous search results, is what we refer to as *creative retrieval*. Creative retrieval, finding sources by improvising with affordances and constraints of both the foreseen audiovisual end product and the search possibilities of archives, is an iterative process and geared at producing stories. The users' voiced reflections on this process explicate how they use their tacit knowledge to realize creative retrieval.

5. CONCLUSION AND NEXT STEPS

This paper explores what insights about users' serendipitous search behaviors can be gleaned from the first phase of a user-centered living lab approach, when the objective of the living lab is to involve media professionals during the development of new search algorithms. The living lab approach seeks to elicit unforeseen user ideas and behaviors to enhance product innovation. Likewise, our research objective is to analyze the role played by serendipity and unforeseen search result generation in order to develop search technology that complies with, and supports, media professionals' search needs and behaviors. Preliminary research outcomes suggest that users seek audiovisual materials in line with a number of affordances and constraints, which are informed by the to-be produced audiovisual product as well as by contextual socio-technical elements. This produces a search practice that can be characterized as improvisational: a play with structures, guided by processes of making do and letting go. It is within this improvisational practice that media professionals aim to find two types of search results: sources that exactly fit the search query as well as sources that are serendipitous, useful yet not foreseen.

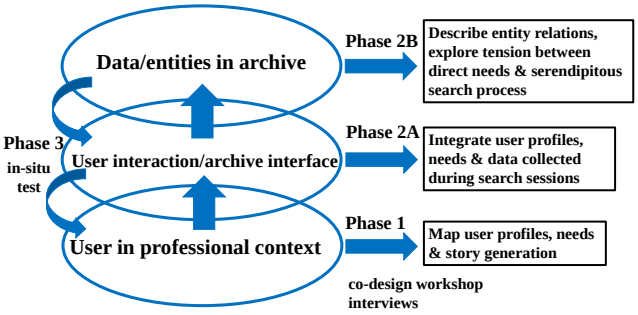

Figure 4: Next steps.

The next steps of the research aim to more fully grasp this improvisational search practice. In the next research phases (Phase 2A and 2B in Figure 4), data is collected about user-archive interactions via additional interviews, observations, and click-behavior analysis. In parallel with this, the archive data is studied to analyze how to technically translate user insights into algorithm development. In the final stage (Phase 3) an in-situ living lab is to be realized within

Table 1: Users' information needs and search behavior

User profile	Information need	Search behavior
Image researcher/curator	Content needs to fit topic, story, program genre and time limit. Needs an entertaining, surprising twist.	In accordance with an experience-based procedure that starts with a broad topic exploration; based on editorial team meetings and current events.
Documentation specialist	Content needs to correspond with very specific search queries of (news)editors.	Defined procedure (own archive first); sources found in text-based system; based on exact annotation.
(Desk) researcher	Content needs to be located fast; based on topic, program genre; surprising content needed for historical programs, less surprising for news broadcast.	Described as "mean and lean"; high time pressure; search based on entities, broadcaster, broadcast date.
Innovation specialist	Content needs to be found and presented it in a meaningful manner; draw viewers in via surprising stories/media use.	Find and coordinate editorial teams consisting of search experts to optimize processes.
Mediacoach	Content for media education needs to improve pupils' media skills.	Selecting appropriate material, in line with educational vision.

the audiovisual archive to test the new algorithms and elicit an even more fine-grained understanding of the iterative creative retrieval process. By combining these methods, the living lab approach will provide more definitive conclusions about the role that improvisation plays when media professionals engage in creative retrieval, as well as allow for an evaluation of the extent to which the living lab approach supports successful user-centered innovation practices.

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