



## Accidentally Successful Searching: Users' Perceptions of a Digital Library

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# Accidentally Successful Searching: Users' Perceptions of a Digital Library

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## ABSTRACT

People usually search information by using queries that are targeted to match the wording of the documents in the collections. However, during their search processes they may discover some useful pieces of information they did not expect. Serendipitous searching occurs when people search for information, but during their search process discover unexpected results. One key aspect of serendipity is chance encountering, which means the accidental and unexpected encountering with useful information. In this paper we address to the chance encounters, search success and search interests of information seekers using a national digital library called Finna. This study shows that chance encountering and search success increase with user satisfaction and that digital libraries can support information encountering.

## Categories and Subject Descriptors

• **Information systems ~ Search interfaces** • Information systems  
~ Digital libraries and archives

## 1. INTRODUCTION

Serendipity means making happy and unexpected findings by accident [10]. In the present study, we focus on to what extent the evaluated search service is providing the happy accidents or coincidents called *chance encounters*. We study the chance encounters, user satisfaction and search intents based on a large survey of Finna users.

Finna is a Finnish national digital library search tool providing one access point to the heterogeneous materials of several libraries, archives, and museums in Finland (<https://finna.fi/>). Finna's potential user base is very wide. Due to its heterogeneous content and wide user base, it is not certain how the service can fulfil the needs of users. This paper aims at fulfilling part of this gap by reporting findings from Finna user survey on the users' perceptions on chance encountering. In this research, we seek to answer the question: *Does Finna support chance encountering?*

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We study user patterns, searching in terms of search intents and success, and the chance encounters across the user groups.

## 2. CHANCE ENCOUNTERS

People may find information even when they are not deliberately seeking any. Serendipitous information discovery comprises two aspects. Firstly, the unknown and unpredictable element that is encountering with some unexpected information. We call accidental information encountering *Chance encounters*.

Second aspect is the synthesizing of the unexpected information into the existing knowledge structure [2]. In order to fully exploit the happy coincidents during searching, some kind of insight or connections to existing knowledge should be made [8]. However, one may argue that information encountering with search tools does not occur solely by accident, because searching is already taking place and the person is directing the activities towards the finding. Nevertheless, the idea that people encounter something that was unexpected during searching still exists. According to Bawden [3] a prepared mind is favoring serendipitous discovery, and that this precondition helps to perceive the connections due to the exposure to chance encounters.

We focus on the first aspect on serendipitous searching, namely on the respondents' perceptions on the chance encounters. This is understood as a precondition for serendipitous discovery.

## 3. FINNA

The present study focuses on the user perceptions of the Finna interface. The Finna search interface provides one access point to the heterogeneous materials of several archives, libraries, and museums in Finland. The project for building Finna has been going on for over six years, and the service was first launched to the public in October 2013. The complexity of Finna service is derived both from the wide user base and from the differing cataloguing practices of participating organizations. Furthermore, information needs of different user groups should also be considered, because they may radically vary [1].

Finna user groups has been studied previously by Kautonen [6] and in an in-depth study by Kautonen [5] on one artist's information journey with Finna. It revealed that serendipity played a big role in her work and that Finna offered gaming-like experience that contributed substantially to her work. This study adds to these by studying the perceived change encounters of all user groups.

## 4. THE SURVEY

The data were collected via an online questionnaire during four weeks in October and December 2014 for the first national Finna user study. The survey was targeted to the users of all Finna's interfaces, i.e., the national [finna.fi](https://finna.fi/) and individual organizations' views. The questionnaire module was embedded on the software platform so that it appeared automatically on every interface's view

as a pop-up window. Users were given an option to close the pop-up window or to continue with the questionnaire.

National Digital Library Usability Group designed the survey. This group consisted of representatives from organizations who had joined or planned joining Finna. The National Library of Finland coordinated the work, and built the online questionnaire, and collected the data. The participating organizations promoted the questionnaire.

The answers to the questionnaire were collected mostly by multiple choices but there were some open questions that allowed the respondents freely to reflect their opinions. We selected questions from the sections 1., 2. and 4. (See Figure 1.)

|   |
|---|
| <p><b>Using Finna</b></p> <p><i>Why are you using Finna?</i></p> <ul style="list-style-type: none"> <li>I'm searching for certain material</li> <li>I'm searching for information on an interesting topic</li> <li>Just browsing</li> <li>Other reason</li> </ul> <p><i>For what purpose are you searching for information/material?</i></p> <ul style="list-style-type: none"> <li>Work</li> <li>School assignment</li> <li>Studies</li> <li>Hobbies of leisure</li> <li>Something else</li> <li>I'm not searching for particular information/material</li> </ul> <p><i>Did you find what you were looking for?</i></p> <p>Yes / No / I wasn't searching for particular information/material</p> <p><i>Did you find anything else of interest?</i></p> <p>Yes/No</p> <p><b>Evaluating Finna (1 fully disagree-5 fully agree)</b></p> <ul style="list-style-type: none"> <li>Finna is easy to use</li> <li>Finna is useful</li> <li>I'm able to find what I'm looking for in Finna</li> <li>Using Finna saves time</li> <li>It is enjoyable to use Finna</li> </ul> <p><b>Background information</b></p> <p><i>How often do you use Finna?</i></p> <ul style="list-style-type: none"> <li>Daily</li> <li>At least once a week</li> <li>A few times a month</li> <li>About once a month</li> <li>Less than once a month</li> <li>I'm using it for the first time</li> </ul> <p><i>Which group do you belong to?</i></p> <ul style="list-style-type: none"> <li>Pupil</li> <li>Student</li> <li>Employee</li> <li>Stay-at-home mother/father</li> <li>Pensioner</li> <li>Other</li> </ul> |
|---|

Figure 1. Selected questions.

## 5. METHODS

We used Chi Square for testing the statistical significance, because of the non-normal distributions of the data. Nonparametric Spearman's rank correlation coefficient was used to measure the strength of association between the indicators in the User satisfaction variable.

### 5.1 Variables

The key variables are described briefly below.

**Frequency of use** is based on the question *How often do you use Finna?* The options *Less than once in a month* and *About once in a month* were collapsed.

**Task type** variable was created from the question: *For what purpose are you searching for information/material?* Options *School assignment* and *Study* were collapsed into the *Study* category. Also, the options *Something else* and *I'm not searching for particular information/material* were collapsed into the *Other* category.

**User satisfaction** is a composite variable created by combining the five indicators in the section *Evaluating Finna*. Spearman's rank correlation coefficient shows, that all the indicators of user satisfaction correlate moderately (Table 1). This indicates that the indicators measure the same behavior, and thus support the creation of the composite variable. The values for the composite variable *User satisfaction* were recoded as *Low or Very low*, *Neutral*, *High*, and *Very high*.

**Search intent** is based on the question: *Why are you using Finna?* Provided options were: *I'm searching for certain material*; *I'm searching for information on an interesting topic*; *Just browsing*; and, *Other reason*. These were recoded as *Known Item*; *Topical*; *Exploratory*; and, *Other*, respectively.

**Search success** is created from question: *Did you find what you were looking for in Finna?* with the options *Yes*, *No*, and, *I wasn't searching for particular information/material*. This last option was encoded as *Non-specific*.

**Chance encounter** is based on question: *Did you find anything else of interest?* Options were *Yes* or *No*. The idea is that they found something else that they were not purposefully seeking for.

**User groups** were created from the options in question *Which group do you belong to?* We created three groups 1. *Student*; 3. *Employee*; and 3. *Other*. The first group *Student* comprises *Pupil* and *Student* categories from the original options, and similarly, *Stay-at-home mother/father*, *Pensioner* and *Other* were collapsed into one category *Other*.

## 6. RESULTS

### 6.1 Respondents and use patterns

The respondents were all the users of Finna (N=3229). Since the Finna is open to everyone and contains heterogeneous material the potential user population is wide. We used complete-case analysis resulting in a sample size of N=3037.

The size of the user groups varied. *Student* is the largest group (60.7%, n=1842) and is twice as large as the *Employee* group. *Employee* group (32.1%, n=974) consists of researchers, librarian, archivists, journalists and other kinds of knowledge-workers. Smallest group *Other* included e.g. pensioner (7.3%, 221). *Students* visit Finna most often, *Employees* and *Others* groups less ( $\chi^2=(8, N=3037)=339.16, p<.000$ ). 15.4% of all users used Finna for the first time, mostly it was used weekly.

The distributions of task type follow the expected task types of user groups ( $\chi^2=(6, N=3037)=2041.09, p<.000$ ). *Students* use Finna mostly for study purposes (93.2%), *Employees* for working (48.8%) and *Others* (45.2%) for leisure activities. However, *Employees* and *Others* show more varied tasks by reporting that they are using Finna for *Study* tasks with the shares of 19.3% and 17.6%, respectively. Furthermore, while the *Students* use the Finna almost only to study purposes, 22.1% of *Employee* group reported using the tool also for leisure tasks.

## 6.2 Search success and intents

The overall Search success with Finna was very high. Of all respondents, 76.9% (n=2335) stated that they found what they were searching for. Only 9.7% (n=295) were unsuccessful, and 13.3% were not able to assess whether they were successful or not.

The distribution of all *Search intents* was uneven. Most of the *Search intents* were *Known item* searches (64.4%). The share of *Topical* searches was 16.6% and of *Exploratory* 11.5% of all *Search intents*.

*Search success* and *Search intents* were also analyzed across the user groups. *Students* were very successful in their searches ( $\chi^2=4$ ,  $N=3037$ )=47.23,  $p<.000$ ). Most of them reported that they found what they were searching for. The share of successful searches ranged across the groups from group *Other* with 69% success rate to *Students* with 81%. Of all respondents 10% reported that their searches were unsuccessful and 13% were not able to assess success due to the exploratory nature of their searching.

We studied the distribution of *Search intents* across the user groups. Respondents used Finna mainly for *Known item* searches (64%) ( $\chi^2=6$ ,  $N=3037$ )=124.32,  $p<.000$ ). This was the most common search intent type across all user groups whereas the proportion of topical search intentions ranged from 21.3% (in group *Other*) to 19.6% (group *Employee*). The share of non-directed *Exploratory* search intents ranged from 8.7% (*Students*) to 11.3% (*Employees*). In the group *Other*, there was as many *Topical* as *Exploratory* intents.

Also, we examined the *Search success* across *Search intent* types to find out if some of the *Search intent* types was more successful than the others. Of *Topical* search intents 77.2% (n=389) were successful, whereas *Exploratory* searches were successful only in 35.1% of the searches (n=122) ( $\chi^2=6$ ,  $N=3037$ )= 1055.52,  $p<.000$ ). The most successful search intent type was *Known item* with success level of 87.8% (n=1663). However, of the *Exploratory* searches, 60.6% (n=211) reported *Non-specific* success, which means that they were not able to assess whether their searching was successful or not. The *Known item* type is closed ended. This means that searcher is able to find a “correct answer” to intents of this kind, but exploration is vaguer, and it is more difficult to assess if the goals of the searching have been reached.

## 6.3 User satisfaction

User satisfaction is a composite variable created from five separate indicators. Spearman’s rank correlation coefficient shows, that all the aspects of user satisfaction (*Ease of Use*, *Usefulness*, *Findability*, *Saving Time*, *Pleasantness*) correlate moderately. The correlations are shown in Table 1. The correlations indicate that all the aspects measure similar phenomenon, and support combining the aspects into one. *User satisfaction* was analyzed across the *Frequency of use* categories and across the user groups. Firstly, *User satisfaction* was assessed *High* across all *Frequency of use* categories ( $\chi^2=12$ ,  $N=3037$ )=111.23,  $p<.000$ ) and secondly, in all user groups ( $\chi^2=6$ ,  $N=3037$ )=23.67,  $p=.001$ ). Only 3.3% of all users evaluated *User satisfaction Low or very low*, whereas 20.4% evaluated it *Very high* and 19.2% *Neutral*.

Next, we studied how *Search success* varies across *User satisfaction* levels. The share of *Search success* increases significantly with the *User satisfaction*. ( $\chi^2=6$ ,  $N=3037$ )=322.121,  $p<.000$ ). In the cases when *User satisfaction* was assessed low, the proportion of *Search success* was less than half (48.5%), whereas when *User satisfaction* was assessed as *Very High*, the majority of searches was successful (89.7%).

**Table 1. Spearman’s rank correlation coefficients of the User satisfaction indicators.**

|              | Ease Of Use | Usefulness | Findability | Saving Time |
|--------------|-------------|------------|-------------|-------------|
| Usefulness   | .512**      |            |             |             |
| Findability  | .542**      | .501**     |             |             |
| Saving Time  | .545**      | .539**     | .555**      |             |
| Pleasantness | .680**      | .500**     | .541**      | .688**      |

\*\*  $p<.01$  (two-tailed)

## 6.4 Chance encounters

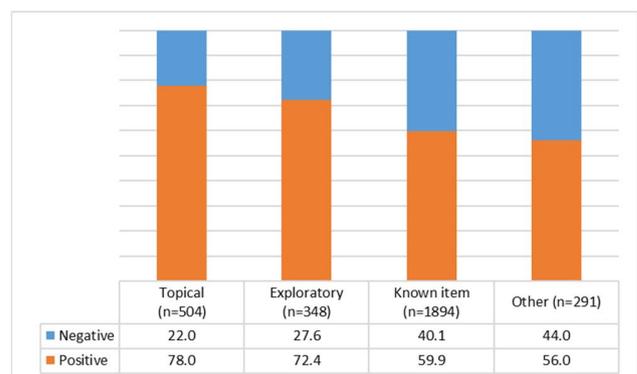
We studied the share of *Chance encounters* across the user groups, *Search success*, *Search intents*, *Task types* and *User satisfaction* levels. Chance encounters were reported by 64.2% (n=1943) of all respondents.

Firstly, we examined the shares across the user groups. The share of *Chance encounters* was 73.3% in the *Employee* group. In the group *Other* up to 76% reported chance encountering, whereas among the *Students* the share was only 57.7% ( $\chi^2=2$ ,  $N=3037$ )=81.83,  $p<.000$ ).

Secondly, *Chance encounters* were studied across *Search success* categories. The highest proportion of chance encountering (67.7%) occurs in the *Non-specific* search success category ( $\chi^2=2$ ,  $N=3037$ )=8.276,  $p=0.016$ ). These seem to be the searchers who did not have a well formed, focused search tasks and therefore could not assess the success. Interestingly, unsuccessful searchers reported change encountering (57.2%). These searchers failed to reach their original goal, but nevertheless found something else useful in Finna.

Figure 2 shows the accounts of *Chance encounters* across *Search intents*. Of *Topical* intents, 78% account for chance encounters, and of *Exploratory* searching 72.4%. The *known item* and the *Other* intents have slightly smaller shares.

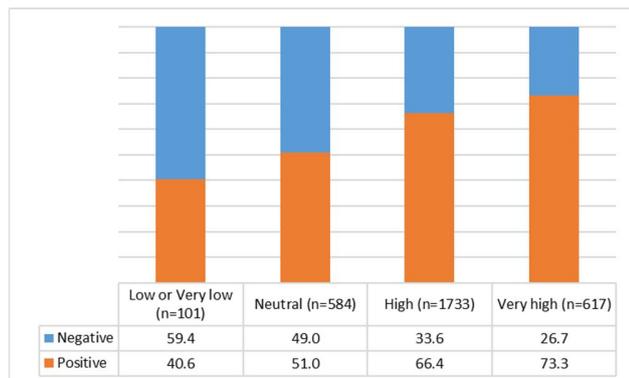
The distribution of chance encounters varies across the motivating tasks. In *Leisure* tasks the share of chance encounters was 20.4% higher and in *Work* tasks the share was 15.6% higher than in *Study* tasks, in which the share was 58.2% ( $\chi^2=3$ ,  $N=3037$ )=85.67,  $p<.000$ ). If drilling into the positive accounts of Chance encounters (n=1943), the distribution across task types shows that over a half of them (58.2%) occur in *Study* task type.



**Figure 2. Chance encounters across Search intents (n=3037; %).**

Lastly, we analyzed how the *Chance encounter* is distributed across the varying levels of *User satisfaction*. The proportion of the positive accounts of change encounters increases with the user

satisfaction level (see Figure 3.) ( $\chi^2=4$ ,  $N=3037$ )=94.627,  $p<.000$ ). The share of the positive accounts of chance encounters ranges from 40.6% on the *Low/Very Low* level of the *User satisfaction*, to 73.3% on the *Very high* level. It seems that the chance encountering affects the positive opinions about Finna.



**Figure 3. Chance encounters across User satisfaction levels. (n=3037; %).**

## 7. DISCUSSION

The study indicates that Finna supports chance encountering by exposing searchers to heterogeneous materials in a digital library. This survey gives a very positive view of the evaluated Finna interface.

Students were the most frequent users of Finna. Almost half of them used it weekly. This huge proportion of frequent users is caused by some university libraries offering a tailored Finna interface to their customers. Students searched Finna almost solely to study purposes. Employees used it for work and for leisure and study activities. Pensioners and others used it mostly for leisure but also for other purposes. This “other” includes also the familiarizing oneself with the service.

All user groups searched mostly for known items. This indicates more OPAC use [7]. The share of known-item searches is in line with earlier findings, that the share of known-item searches is between 33 and 67 percentages [10].

Searchers were mostly successful with their searches. However, in exploratory tasks the success rate was lower. This is due that the searchers were not able to assess the success of the underlying task because their mental model of the task and its goals may be unclear [4, 9]. The known-item searches, which were the most common type, were assessed successful. It is easier to know whether the goal was reached or not in these kinds of close ended tasks. However, this indicates, that at least for the exploratory searching, searchers would benefit from support in conceptual exploration [9].

Chance encounters occurred mostly in exploratory and topical tasks. Searching in exploratory mode is more open minded, cf. [8], and maybe they were aiming to build an understanding about the underlying task [9].

### 7.1 Limitations

As a web questionnaire suffering from the typical deficiencies related to them we are not sure to what extent the results are generalizable. The population is undefined and the sample may be biased towards a self-selective sample and student population and

we do not know the level of non-response. Also, surveys give a flat reflection of the real world. However, despite all the limitations, we believe that the perceptions and opinions of this large group cannot be studied economically otherwise. We selected a web questionnaire by its economic and accessibility reasons.

Surveys and questionnaire studies do not fully reflect the underlying motivations of the searchers. An open-ended question would designate the specific information that was serendipitously discovered. The functionalities of the service that prompt the serendipitous discovery are a possible topic for future research.

## 8. CONCLUSION

We analyzed a large user survey with over 3000 respondents on their perceptions of a Finnish national digital library Finna. We studied the user patterns, searching and user satisfaction, and to what extent Finna supports chance encountering finding. The service was frequently used and the searches were successful. Both the level chance encountering and search success seemed to increase with user satisfaction rates. Further, this study shows that Finna – and similar digital libraries providing heterogeneous material – can support chance encountering.

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