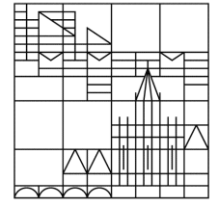


Universität  
Konstanz  
Bibliothek



# **KonSearch Usability Study**

**Evaluation of the new literature search engine of  
the University of Konstanz**

**Helena Luca**

**Graduate Library Trainee**

**Translated by Atlas Translations**

**October 2011**

## Abstract

This report describes the background, methods and results of a usability evaluation, which was conducted in the summer semester of 2011 in the course of the introduction of the *KonSearch* literature search engine at the University of Konstanz. The new search engine is based on the Resource Discovery Service *Summon* by the company Serials Solutions. It aims to offer the users of the University of Konstanz Library an effective, efficient and satisfactory search for academic information, which should at the same time be easy and intuitive to use and correspond as far as possible to the search habits and preferences of the users. The usability study was performed in collaboration with the *Human-Computer Interaction* working group in the Faculty of Computer and Information Science at the University of Konstanz. Different usability research methods were used: a focus group and an online survey, a summative and a formative user test as well as an eye-tracking study. Students from the University of Konstanz were selected as test subjects. The results of the evaluation suggest that the new search engine has a relatively high usability. Specific problems concerning the search with KonSearch were also identified, and this report demonstrates specific recommendations for action to solve these.

## List of contents

Abstract .....	II
List of contents .....	III
List of illustrations.....	IV
List of tables .....	VI
<b>1 Introduction .....</b>	<b>1</b>
<b>2 Libraries, Users and Search Tool.....</b>	<b>3</b>
2.1    User orientation and user research in libraries .....	3
2.2    Search behaviour studies .....	4
2.3    Library catalogues and search engines.....	6
<b>3 KonSearch Usability Study.....</b>	<b>9</b>
3.1    Preliminary remarks .....	9
3.1.1    Principles of usability research .....	10
3.1.2    Context of use of KonSearch .....	14
3.1.3    Areas of interest and research questions.....	15
3.2    Sample survey and methods used in Usability Study .....	16
3.2.1    Sample survey .....	17
3.2.2    Asking Users .....	19
3.2.3    Summative User Test .....	21
3.2.4    Formative User Test.....	23
3.2.5    Eye-Tracking .....	25
3.3    Results of the Usability Study .....	27
3.3.1    Asking Users .....	27
3.3.2    Summative User Test .....	32
3.3.3    Formative User Test.....	36
3.3.4    Eye-Tracking .....	44
3.4    Consolidation and interpretation of results .....	59
<b>4 Summary .....</b>	<b>70</b>
<b>Bibliography.....</b>	<b>73</b>
<b>Appendix .....</b>	<b>76</b>

## List of illustrations

<b>Illustration 1: System Usability Scale (SUS)</b> .....	<b>11</b>
<b>Illustration 2: After Scenario Questionnaire (ASQ)</b> .....	<b>13</b>
<b>Illustration 3: Test subject recruitment notice</b> .....	<b>18</b>
<b>Illustration 4: Set up of eye-tracking study</b> .....	<b>26</b>
<b>Illustration 5: Requirement categories sorted according to importance (asking users)</b> .....	<b>29</b>
<b>Illustration 6: Comparison of fulfilment of requirements of KonSearch &amp; OPAC (asking users)</b> .....	<b>30</b>
<b>Illustration 7: Requirements of the category ‘sorting of results’ sorted according to importance (asking users)</b> .....	<b>31</b>
<b>Illustration 8: Duration of task performance&amp; number of mouse clicks (summative user test)</b> .....	<b>33</b>
<b>Illustration 9: SUS evaluation for OPAC &amp; KonSearch (summative user test)</b> .....	<b>36</b>
<b>Illustration 10: Illustration of narrowing down according to publication date (formative user test)</b> .....	<b>38</b>
<b>Illustration 11: Save icon (formative user test)</b> .....	<b>39</b>
<b>Illustration 12: Location of saved entries in KonSearch (formative user test)</b> .....	<b>39</b>
<b>Illustration 13: RSS feed in KonSearch (formative user test)</b> .....	<b>40</b>
<b>Illustration 14: Input problems with the search with KonSearch (formative user test)</b> .....	<b>41</b>
<b>Illustration 15: Recommendations for the entry of search terms (formative user test)</b> .....	<b>41</b>
<b>Illustration 16: Sort function in KonSearch (formative user test)</b> .....	<b>42</b>
<b>Illustration 17: Availability display in KonSearch (formative user test)</b> .....	<b>42</b>
<b>Illustration 18: Link resolver intermediate page (formative user test)</b> .....	<b>43</b>
<b>Illustration 19: Heat map showing the viewing fields of the KonSearch home page (eye-tracking)</b> .....	<b>45</b>
<b>Illustration 20: Fixation on viewing fields on the home page (eye tracking)</b> .....	<b>46</b>
<b>Illustration 21: Heat map showing the viewing fields of the KonSearch results list (eye-tracking)</b> .....	<b>47</b>
<b>Illustration 22: Fixation on viewing fields in the list of results (eye-tracking)</b> .....	<b>48</b>

<b>Illustration 23: Heat map showing the viewing fields in the advanced search (eye-tracking) .....</b>	<b>49</b>
<b>Illustration 24: Fixation on viewing fields in the advanced search (eye-tracking) .....</b>	<b>50</b>
<b>Illustration 25: Fixation when searching for a specific title in the list of results (eye-tracking).....</b>	<b>52</b>
<b>Illustration 26: Duration of completion of search for a specific title in the list of results (eye tracking).....</b>	<b>53</b>
<b>Illustration 27: Assignment of meaning of icons .....</b>	<b>54</b>
<b>Illustration 28: Completion time of search for specific KonSearch functions (eye-tracking) .....</b>	<b>55</b>
<b>Illustration 29: Fixation on viewing fields when refining search (eye-tracking) .....</b>	<b>56</b>
<b>Illustration 30: Use of search filters (eye-tracking).....</b>	<b>57</b>
<b>Illustration 31: SUS evaluation for individual test subjects (eye-tracking) .....</b>	<b>58</b>
<b>Illustration 32: SUS evaluation for KonSearch (eye-tracking) .....</b>	<b>59</b>
<b>Illustration 33: Recommendation for improvement of the captioning of the input field .....</b>	<b>61</b>
<b>Illustration 34: Recommendation for improvement of the highlighting of availability .....</b>	<b>62</b>
<b>Illustration 35: Recommendation for improvement of the highlighting of the sort function .....</b>	<b>62</b>
<b>Illustration 36: ASQ evaluation for different task types (summative and formative user test) .....</b>	<b>63</b>
<b>Illustration 37: ASQ evaluation for the search for an eBook (summative and formative user test) .....</b>	<b>64</b>
<b>Illustration 38: Recommendation for improvement of the structure of the graphic for narrowing down according to publication date .....</b>	<b>65</b>
<b>Illustration 39: Recommendation for improvement of RSS feed.....</b>	<b>66</b>
<b>Illustration 40: Recommendations for improvement for the function ‘preserve search settings’ .....</b>	<b>66</b>
<b>Illustration 41: Recommendation for improvement of the saving of results .....</b>	<b>67</b>
<b>Illustration 42: SUS evaluation (summative user test and eye-tracking).....</b>	<b>69</b>

## List of tables

<b>Table 1: Verbalisation of the SUS</b> .....	<b>12</b>
<b>Table 2: Research questions in the KonSearch Usability Study</b> .....	<b>16</b>
<b>Table 3: Profile of the test subjects in the focus group</b> .....	<b>20</b>
<b>Table 4: Profile of the test subjects in the summative user test</b> .....	<b>22</b>
<b>Table 5: Profile of the test subjects in the formative user test</b> .....	<b>24</b>
<b>Table 6: Profile of the test subjects in the eye-tracking study</b> .....	<b>25</b>
<b>Table 7: Ranking of requirements in the individual categories (asking users)</b> .....	<b>28</b>
<b>Table 8: Number and seriousness of interaction problems (summative user test)</b> .....	<b>34</b>
<b>Table 9: ASQ evaluation for KonSearch &amp; OPAC (summative user test)</b> .....	<b>35</b>
<b>Table 10: ASQ evaluation for selected tasks (formative user tests)</b> .....	<b>37</b>
<b>Table 11: ASQ evaluation (formative user test)</b> .....	<b>44</b>
<b>Table 12: Most important requirements of a literature search tool</b> .....	<b>60</b>
<b>Table 13: Consolidation of the ASQ evaluations (summative user test and formative user test)</b> .....	<b>68</b>

## 1 Introduction

Information research in academic libraries has changed drastically in recent decades: book or card catalogues are now extremely rare; today library users do not even have to use the library premises for their research. Access via the home page and the online catalogue (abbreviated to OPAC = Online Public Access Catalogue) of a library usually represents the first contact between a library and its users, when they are searching for information and media. It is therefore possible to search for information via the Internet irrespective of time and location. But as if that were not enough, another change is taking place, which is currently presenting libraries with new challenges: web search engines are beginning to rival the OPACs of academic libraries. A majority of users prefer the simple and fast search via Google etc. to the more complex catalogue searches, which means at the same time that the search behaviour of the users is influenced by the act of searching for information with web search engines.

One possible reaction of libraries is to try to change the search behaviour of users when searching for academic information. This is already an established method in the form of information literacy courses in many university libraries, although the effects on the actual search behaviour and the level of accessibility of the relevant target groups remain open to discussion. On the other hand, libraries can change the search tools that they provide for their users to suit their habits and preferences. That would in concrete terms mean adapting the search options, the results display, etc. to the current web search engines.

Thus the University of Konstanz library has, after intensive preliminary discussions in the summer of 2010, decided to purchase *Summon*, a web-based Resource Discovery System of the company SerialsSolutions. The aim is to connect Summon with the printed collections of the online catalogue as well as with the electronic collections of the library to create an additional new and easier to use search tool for the library users: *KonSearch*, the literature search engine of the University of Konstanz. The restriction to a single access point, via which all physical and electronic collections of the library can be searched, the simple refinement of search results and their sorting via relevance ranking are only some of the changes targeted by the acquisition of Summon.

One question that arose repeatedly in the preliminary stages of the implementation of KonSearch however, was how these changes would impact on the users. In order to adapt search tools in libraries to the search behaviour of their users, it is advisable also to examine how they will cope with the functionalities of the new online search and how satisfied they are with it. For this purpose a usability study for the evaluation of KonSearch was conducted as part of library traineeship in the University of Konstanz Library. It was organised and implemented in collaboration with the *Human-Computer Interaction* working group in the Faculty of Computer and Information Science at the University of Konstanz.

This final report on the project aims now to summarise the background, methods and results of the study.

The first question addressed is why libraries react to changes in the search behaviour of users at all. A fundamental user orientation forms the basis for this, as well as for evaluations of old and new search tools by library users. Then the specific changes in the search behaviour of users of academic libraries are more closely determined from previous studies. The focal point in this regard concerns the consequences of these changes on the search tools provided by libraries. Then the usability study itself is described. First of all the organisational background, principles of usability research as well as the specific questions of the study are explained in more detail. Then the sample survey and method used in the study are described. As four different usability research methods are used for the evaluation of KonSearch, each with different key points for study, these are described in detail in succession. Then the descriptive analysis of the study is depicted separately for each individual method. Finally the results are consolidated and interpreted with regard to the underlying questions as well as possible recommendations for action.

The most important points are then summarised again in the concluding section.

At this point I would like to thank all those members of the *Human-Computer Interaction* working group who took part in the evaluation and in particular: Prof. Dr. Harald Reiterer, the head of the working group, Stefan Dierdorf and Svenja Leifert, the *Usability Engineering:Evaluation* course leaders in the 2011 summer semester, as well as those who took part in this course, Tobias Baube, Anja Fauth, Christoph Gebhardt, Torsten Hädrich, Markus Hankh, Eike Kleiner, Laura Lorenz, Sebastian Marwecki, Alexander Nagy, Thomas Ramm, Felix Schmidt, Benjamin Thiel and Johannes Zagermann, who have put a lot of time and commitment into this study.

Thank you also to the participants from the *University of Konstanz Library*, in particular the *Catalogue Restoration* working group: Birgit Fischer, Petra Hätscher, Ralf Hafner, Kerstin Keiper, Adalbert Kirchgäßner, Oliver Klingsöhr, Oliver Kohl-Frey, Isabell Leibing, Günther Rau, Anke Rautenberg, Claudia Schädler and Gudrun Schwarz.



## 2 Libraries, Users and Search Tools

### 2.1 User orientation and user research in libraries

The implementation of search engine technology for information research in academic libraries is not an end in itself, but rather can be seen as a reaction to specific changes in the library landscape. However, the registration of these changes and the resultant necessity for reorganisation cannot be taken for granted. If one considers the change in the function of libraries, which can be clearly gauged from its definition at various times, it becomes clear that libraries in the past did not always have a strong user orientation, even though this is a fundamental condition for the recognition of these environmental changes. Ewert and Umstätter describe the change in libraries as a development away from the concept of “Collection and storage place for books” (Ewert/Umstätter 1999, p. 958; translation by Atlas Translations) to that of a “[...]place which collects, arranges and makes available published information *for the user* from archival, economic and synoptic points of view” (ibid.; p. 966; emphasis by H.L.; translation by Atlas Translations) This definition is still relevant today and makes the users of libraries rather than the books the centre of attention.

But the development of a fundamental user orientation in libraries can be seen over time, not only in terms of definition, but also in reality. Wilmsmeier describes two phases of intensive user research in German libraries, which were characterised by different accompanying circumstances (cf. Wilmsmeier 1999, p. 281 et seq.): The wave of user studies conducted at the end of the 1960s was influenced by the fact that the academic approach was focused strongly on the methods of empirical social research. At the same time a relatively favourable financial situation also enabled the practical implementation of these methods in the area of libraries. Conversely, a number of reductions and cuts at the same time as the growing requirements of the ‘digital age’ formed the framework for the second phase of more distinctive user research, which began at the end of the Nineties and continues to the present day. A feature of this is that management concepts in the area of private industry penetrated into the public sector and into the libraries under slogans such as ‘New Public Management’ or ‘New Management Model’. The basic idea of this was for the most part, that a higher quality of service as well as an increase in efficiency should be achieved by consistently focusing on the needs of the users.

Again today, German libraries attach great importance to establishing their user-friendliness / their service provision / their focus on service and the like, not only internally, but also in order to communicate them to others. This is clear from many mission statements published on library homepages (cf. Raabe 2009, p. 16 et seq.) It must however be noted that an actual user orientation does not develop from the description in a mission statement, but only through specific actions focused on this. An important element with regard to the user orientation of

libraries is for example the search tools provided by them. In particular the OPAC of a library represents for many users the first contact interface with the library. In view of this, the tendency to conduct studies into search behaviour on the one hand and evaluation of search tools on the other is understandable.

Both must of course be observed in context, as search tools are used as an aid in the search for information. If therefore they are not suitable for achieving the goals followed by the library users in their search for information, it is unlikely that they will be used in the future.

But if a library actually performs its tasks *for the user*, it will be interested in determining information about their search behaviour and in designing search tools in such a way that they give satisfaction to the users in the search for academic information. How this works in reality will be described in the following sections by means of a short summary of current studies into the search behaviour of users of academic libraries as well as the consequences of these studies with regard to search tools.

## 2.2 Search behaviour studies

In recent years a great number of reports have been published on studies that deal with the behaviour of library users when searching for information. The following summary does not claim to be complete. It aims to present, as an example, key results of selected studies into the search behaviour of users with regard to the use of specific search tools used primarily in the search for electronic information.

The large-scale study 'SteFi' (= studying with electronic academic information) of the Federal Ministry for Education and Research (Klatt et al. 2001) examined the use of electronic academic information in higher education. A written survey of almost 3000 students as part of this research project showed that when searching for academic information, students most frequently searched by browsing the Internet (cf. *ibid.*, p. 10 et seq.). Web search engines in particular serve here as an information source, although the students find it hard to assess the quality of the search results obtained. "The students as users of electronic academic information obviously concentrate [...] on easily accessible search engines in the Internet, instead of exhausting the range of electronic academic information relevant to them" (*ibid.*; p. 11).

A logfile analysis of the OPAC of Freiburg University library (Hennies/Dressler 2006) showed that most of the search requests of users are limited to a basic search strategy predetermined by the design of the system. Therefore the standard search mode is usually used and no changes are made to the pre-set search fields and operators (cf. *ibid.*, p. 7). Most search requests are made via a single search field and consist of only one search term. A look at the headings accessed in the list of results showed that a title that does not appear in the top ten results is only very rarely selected (cf. *ibid.*, p. 10 et seq.).

In a study by the Online Computer Library Center OCLC (Calhoun et al. 2009) the expectations of library users with regard to online catalogues as well as their actual use behaviour were examined. Focus groups and online surveys were used for this. The results of the examination (cf. *ibid.*, p. 11 et seq.) clearly show that in addition to the search itself, the availability of and access to information is very important to the users. A direct combination of search results and full texts is for example very useful in the case of electronic media. Furthermore the users would like to arrive as easily as possible at an evaluation of the quality of the search results. Supplementary materials such as lists of contents and summaries as well as a relevance ranking and a clear availability display can contribute to this. The most frequently used search strategy is the simple keyword search, which is mostly used for a thematic or explorative search. In this respect the users would like options to narrow down the number of results. If the search target is a very specific title, however, the advanced search is used in preference.

A study by the British Joint Information Systems Committee JISC (Wong et al. 2009) also deals with the search behaviour of students and researchers, which was examined by means of observations and in-depth interviews. It was shown that the users with greater experience in searching for academic information also prefer to use 'internal' search tools such as library catalogues and databases. Inexperienced users on the other hand prefer to search using 'external' tools such as the Internet search engines Google or Yahoo (cf. *ibid.*, p. 19 et seq.). With regard to the evaluation of the search results the users seem to trust the external sources such as Google: "There appears to be a sense of trust and belief that external resources provided by Google and Google Books are reliable and relevant, and have quality materials" (*ibid.*, p. 21). Google is therefore the most frequently used when searching for electronic information on the Internet (cf. *ibid.* p. 24). One reason given for this is that internal search tools do not always afford the simple and direct access to the located media that is ascribed to Google. In addition the users seem dissatisfied and overwhelmed by the fact that the different search tools differ greatly in their functionalities and requirements of use (cf. *ibid.*, p. 37 et seq.).

The results of this study as well as eleven other studies were compared and consolidated in a meta study (cf. Connaway / Dickey 2010). The common features of the results (cf. *ibid.*, p. 26 et seq.) include in particular the fact that search engines such as Google today represent the first access point in the search for information and the search behaviour of the users is characterised by the keyword search used there. However, the options for accessing specific information are increasingly deemed more relevant than the pre-set search itself, hence the authors state: "[A]ccess is the biggest issue" (*ibid.*, p. 29). Speed and comfort are also key criteria in the choice of search tools. The users feel that these are more likely to be found through direct electronic access than through the use of a physical library. Nevertheless, when faced with large amounts of results there is a need for search engine functionalities, which for example help to evaluate the relevance of search results: "This is both an access issue [...] and a usability issue"

(ibid., p. 35). The quality of the information and thus also of the metadata still plays a large part as well.

The most recent of the studies presented here (Connaway/Dickey/Radford 2011) deals with the influence of ‘convenience’ – that is to say comfort / simplicity<sup>1</sup> – on information-seeking behaviour. By means of a secondary analysis of the data in two studies by the Institute of Museum and Library Services the authors come to the conclusion:

“Convenience is thus one of the primary criteria for making choices during the information-seeking process. Convenience includes the choice of the information source (is it readily accessible online or in print), the satisfaction with the source (does it contain the needed information and is it easy to use), and the time it will take to access and use the information source.” (ibid., p. 27 et seq.)

Consequently they recommend that libraries, their systems and user interfaces should be structured in such a way that they resemble familiar web services. Libraries should also ensure that their services are easy to access for the user and that it is easy to learn how to use them (cf. ibid., p. 28).

The user behaviour that is demonstrated in the results of these studies sets new challenges for libraries. Users associate with web search engines a simple operation and a direct accessibility to information, which is also perceived as being of a high quality. Thus web search engines represent for the users an alternative to library search tools such as OPAC and databases and are even being used more frequently than these. This in turn means that even when using library search tools, users implement search strategies to which they are accustomed from web search engines, so that mostly only a few key words and no operators are used in a single search field. It is therefore the case, “that the search engines [...] teach the users ‘bad’ search habits” (Lewandowski 2010, p. 88; translation by Atlas Translations). The question is therefore how libraries react to these accepted facts about user behaviour, in order to continue to be able to fulfil the claim that they are performing their duties *for the users*.

### 2.3 Library catalogues and search engines

Essentially, libraries choose one of two possible strategies in their reactions to the user behaviour described (cf. Kohl-Frey 2011, p. 6 et seq.): the teaching of information literacy and the reorganisation of the library search tools used when seeking academic information. Whilst the teaching of information literacy aims to clarify problems and challenges for users in the search for academic information, and to indicate strategies to overcome them, the reorganisation

---

<sup>1</sup> With regard to the information search convenience can best be translated by the expression ‘Informations-leichtigkeit’ (cf. Kohl-Frey 2011).

of the search tools strives towards an approximation of the web search engines favoured by the users to facilitate the search itself. Or put another way: teaching information literacy aims to make users aware of and therefore change their search behaviour, whereas the reorganisation of the search tools aims to adapt these tools to the actual user behaviour. The focus of what follows is on the description of the latter strategy, i.e. the development of library search tools<sup>2</sup>. In this regard however, it must not be overlooked that only a combination of both strategies can be evaluated as an appropriate reaction to the results described, as the library users concerned must be taught how to use the 'new generation' of search tools.

The library OPAC serves as a collection of as many media as possible, which the library provides for the users. The library holdings are described using metadata, which in turn is drawn up by librarians in accordance with specific rules and can be searched through. Problems are evident here in particular with regard to the constantly growing proportion of electronic items: On the one hand (electronic) essays and eBooks are as a rule not entered in the OPAC. In order to search for these the users usually have to use additional search tools such as databases. On the other hand it is usually not possible to search any of the full texts with the OPAC, which would be useful for a thematic search. Subject headings are provided in the metadata, which aim to describe the content more clearly, but the users are often not aware of these. Instead of using them for a search, frequently only a keyword search is used, as the users are accustomed to doing when they use the prevalent web search engines.

To counteract these problems, catalogue enrichment and federated search systems are for example used in libraries (cf. Kostädt 2008, p. 102 et seq.). OPACs are enriched primarily by scanned tables of contents, which are rendered searchable by means of optical character recognition (= OCR) programmes. They also have the advantage for the user that they are directly available as a file through a link in the OPAC. Federated search systems on the other hand make it possible to simultaneously search different information sources with a single search request. So for example several catalogues, but also academic databases may be searched, in which essays and eBooks are indexed. However the response time of these systems is relatively long in contrast to the web search engines. In addition, sometimes no duplicate control is performed, so that a result is shown several times in the list of results, if it is indexed in different sources. Just as with sorting by date instead of by relevance this does not correspond with the expectations and search behaviour of the users, who usually take note only of the first results in a list.

In order to combat these problems, more and more libraries are now relying on search engine technologies (cf. *ibid.*, p. 105 et seq.). Here the basic aim is to provide the user with a search tool that is just as easy to use as web search engines (only one search field) and provides high-

---

<sup>2</sup> Kostädt 2008 gives a good summary of this.

---

quality search results in the shortest time. This is achieved by combining the different data in a single index prior to searching, rather than waiting until during the search of the different sources. Moreover, options are provided to include full texts in the search as well as a ranking of the results according to relevance. The outcome of a search therefore usually consists of a very large number of results, which is produced in a short time by the system. Then the results can be reduced by a refinement of the search using specific search facets (= selection criteria). Kostädt names FAST Data Search, Lucene and Xapian as the most important search engines, on which these library proposals are based (cf. *ibid.*, p. 105 et seq.). By means of these search engine technologies, new search tools have been developed by libraries themselves, such as in the case of BASE (Bielefeld), HEIDI (Heidelberg) or KUG (Cologne). However, libraries increasingly tend nowadays to buy finished products<sup>3</sup> together with index, which are sometimes hosted not by the library itself but by the search engine provider. This is for example also the case with the Konstanz literature search engine.

Each individual case must be examined to see whether the measures described to adapt the library search tools to the changed expectations and behaviours of the users are actually successful. User research also plays a large part in this respect however. Very frequently, for example, evaluations of search tools by library users are used to assess their quality. In addition to the many satisfaction surveys conducted with the online catalogue or the search engine (cf. e.g. Nienerza/Sunckel 2011 or Regensburg University library 2009), it is usability studies that can be applied here as well. One such study was conducted in the course of the introduction of the literature search engine KonSearch in the University of Konstanz library, and is reported in the following sections.

---

<sup>3</sup> For a summary of the different products, see the reviews in SerialsBlenkle/Ellis/Haake 2009, Mayfield et al. 2008 and Stevenson et al. 2009 as well as the Ekins/Koster home page 2011.

### 3 KonSearch Usability Study

#### 3.1 Preliminary remarks

In February 2010 the internal working group Catalogue Restoration of the University of Konstanz library came together for the first time, in order to advise about measures to reorganise the Konstanz online catalogue. The possible alternatives compared and assessed by the working group included catalogue extensions, a new federated metasearch (previously the Elektra system was used) or an additional search tool based on search engine technology. Ultimately the decision was made a few months later in favour of the web-based Discovery Service *Summon* of the company Serials Solutions<sup>4</sup>, i.e. a search engine solution. Despite the difficult circumstances due to the closure at the same time of large sections of the library as a result of the discovery of asbestos within the building, the plans to implement Summon continued apace. At the end of 2010 the name of the new literature search engine for the University of Konstanz was fixed: it was christened *KonSearch*.

During the extensive preparatory work that preceded the launch of the beta version of KonSearch on 2 May 2011, the participants repeatedly attempted to take into account the point of view of the library users. In order to structure these attempts even more systematically, the writer of this report decided at the beginning of 2011 to make an evaluation of KonSearch by library users the subject of her training project. A usability study appeared very suitable for this purpose and the opportunity to work with the *Human-Computer Interaction* working group of the Faculty of Computer and Information Science at the University of Konstanz provided added impetus. On the one hand, the working group has at its disposal a special usability laboratory and has already gathered a great deal of experience in the conduct of usability studies, and on the other hand it had already worked together with the library several times on other projects.

The *Usability Engineering: Evaluation* course established the framework for the joint project, which was carried out in the summer semester of 2011. The course aimed in a lecture to provide the students with the basic methods of usability research, which they were then to apply practically in an accompanying exercise to implement their own usability study. The integration of KonSearch as an example meant that the students were faced with a situation akin to what they would come across later in the reality of their professional capacity. In the role of the “client”, the library consulted the *Human-Computer Interaction* working group, in order to support the introduction of a new search system by means of an accompanying usability evaluation. This realistic approach and the fact that the participants themselves are users of the library and therefore had an interest in the topic, was responsible for the firm commitment that the students gave to the day. It was however important that they did not design their own study

---

<sup>4</sup> Detailed information about Summon can be found on the company’s home page: <http://www.serialsolutions.com/discovery/summon/> (as at: 25.08.2011)

completely autonomously, but took into account the theoretical principles of usability research on the one hand and the specific context of use of KonSearch on the other hand as well as the area of interest and particular specifications of the library.

### 3.1.1 Principles of usability research

The term *usability* cannot easily be translated into German, as it is a combination of two English words: ‘to use’ and ‘ability’. Perhaps the most accurate and most frequently used German translation is ‘Gebrauchstauglichkeit’<sup>5</sup>, but even this term requires further explanation.

The expression is used in the area of human-computer interaction, in particular in software ergonomics. In this respect usability is considered to be a quality factor of a system for interaction with the user. Studies for the usability of a system therefore usually have the purpose of changing the system, so that the quality of the interaction can be subsequently optimised. The standard ‘9241: ergonomics of human-system-interaction’ (previously: ‘Ergonomic requirements for office work with visual display units’) of the International Organisation for Standardisation (ISO) describes usability as the “extent to which a product can be used by specified users in a specified context of use, to achieve specified goals with effectiveness, efficiency and satisfaction” (DIN EN ISO 9241-11, p. 4; translation by Atlas Translations). This definition also served as a principle for the usability study discussed here.

When considering the usability of a system all individual marginal conditions must be taken into account accordingly, in particular users, context of use and aims of use. Effectiveness, efficiency and satisfaction are named as elements that constitute the usability of a system with regard to these specific conditions<sup>6</sup>. For a usability study it is also necessary first of all to define the respective users and context of use of the system as well as the aims of use. Then a study design must be developed on this basis, which permits the effectiveness and efficiency of the system as well as user satisfaction with regard to these special conditions to be measured.

This interpretation of the term implies that usability is a context-sensitive concept. According to statements about the individual usability of a system, a comparison of the usability of different systems is not however easily possible, if different marginal conditions are taken into account at any one time. Nevertheless tests were conducted to develop a scale for usability, which on the one hand aims to cover as completely as possible all three dimensions of usability and on the other hand can be consulted in order to compare the usability of different systems. An example of this is the *System Usability Scale* (SUS) (cf. Brooke 1996), which was developed as early as

---

<sup>5</sup> The German Institute for Standardisation also uses this designation for example.

<sup>6</sup> This concept of usability is however regarded critically (cf. Hassenzahl/Beu/Burmeister 2001) and partially extended, by for example the components Joy of Use or hedonistic quality (cf. *ibid.* p. 70 et seq.) or the components learnability and measurability (cf. Ferré et al. 2001, p. 22).



1986 by the Digital Equipment Corporation and has proved to be a reliable<sup>7</sup> usability scale (cf. Bangor/Kortum/Miller 2008, p. 581 et seq.; Sauro/Lewis 2009, p. 1615). It uses a scale to show what the users each subjectively think about the usability of a system. The SUS consists of ten items in the form of positive and negative statements, which relate to the interaction with a system. They are formulated so generally, that the SUS can be used on every system. The practical approach is structured in such a way that after using the system, users rate their agreement or disagreement with the statements by using a five-point Likert scale<sup>8</sup>.

### Illustration 1: System Usability Scale (SUS)

Items:	Strongly disagree				Strongly agree
	1	2	3	4	5
1. I think that I would like to use the system regularly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I found the system unnecessarily complex.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I thought the system was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I think that I would need the support of a technical person to be able to use the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I found the various functions in this system were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I thought there was too much inconsistency in the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I would imagine that most people would learn to use this system very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I found the system very cumbersome to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I felt very confident using the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I needed to learn a lot of things before I could get going with the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Source: Compiled by the author, based on Brooke 1996, p. 192.**

Then the System Usability Scale is calculated (cf. Brooke 1996, p. 194), and the result is a score between 0 and 100. The greater this is, the higher the usability of the system is rated. However it must be considered that the SUS first of all represents the usability that an individual user assigns to the system. It is therefore also necessary to determine the average SUS of as large a number as possible of users of the system. As the SUS also enables a comparison of different systems, the interpretation should take into account that in studies that use the SUS to determine

<sup>7</sup> A measuring tool is referred to as 'reliable' if it gives the same results for repeated measurements (cf. Häder 2010, p. 109). Reliability also means the dependability of a measuring tool.

<sup>8</sup> A 'Likert' scale is frequently used to measure the personal attitude to a specific object or fact (cf. Häder 2010, p. 100 et seq.). It consists of several items in the form of statements, which relate to different aspects of the object or fact and are formulated as very positive or very negative. The survey subjects must show their agreement or disagreement with these statements using a graded scale (usually five levels, sometimes seven). The different numerical values of the individual items are then added up to give a score, which represents the attitude of the survey subjects.

the usability of a system, an average score of 70 is generally awarded (cf. Bangor/Kortum/Miller 2008, p. 577). Therefore the usability of a system can only be classified as above average if it is above this score. An SUS of below 50 is however interpreted as unacceptable (cf. *ibid.*, p. 592).

In order to gain a more tangible impression of the usability of a system, Bangor/Kortum/Miller examined which SUS score corresponds to different verbal assessments (Bangor/Kortum/Miller 2009). In this respect it is clarified as well that an SUS score of over 50 can be interpreted as acceptable and over 70 as good.

**Table 1: Verbalisation of the SUS**

<b>Adjective:</b>	<b>Average SUS:</b>
<b>Worst imaginable</b>	12,5
<b>Awful</b>	20,3
<b>Poor</b>	35,7
<b>OK</b>	50,9
<b>Good</b>	71,4
<b>Excellent</b>	85,5
<b>Best imaginable</b>	90,9

**Source: Compiled by the author, based on Bangor/Kortum/Miller 2009, p. 118.**

In addition to the SUS the *After Scenario Questionnaire* (ASQ) was developed with the aim of making the usability of a system measurable (cf. Lewis 1991, p. 78). As is clear from the name, this questionnaire is used after the performance of a scenario-based<sup>9</sup> user test with the system to be evaluated. It consists of three items in the form of statements about the performance of tasks using the system, which aim to cover all important dimensions of usability. Here also the survey subjects express their agreement with the statements by means of a scale, which unlike the SUS consists of seven levels.

<sup>9</sup> Scenario refers to the best realistic description of a typical use situation

**Illustration 2: After Scenario Questionnaire (ASQ)**

Items:	Strongly agree							Strongly disagree
	1	2	3	4	5	6	7	
1. Overall, I am satisfied with the ease of completing the tasks in this scenario.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Overall, I am satisfied with the amount of time it took to complete the tasks in this scenario.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Overall I am satisfied with the support information when completing the task.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

**Source: Compiled by the author, based on Lewis 1991, p. 79.**

Here the first statement concerns the effectiveness and the second statement the efficiency of the system. The satisfaction with the system interaction is determined with all three items. The aspect of support or help with the performance of tasks in the third statement does not correspond with the dimensions of usability in accordance with the ISO standard, but is nevertheless considered by Lewis to be an important factor of influence on the evaluation of the usability of a system (cf. *ibid.*, p. 79). The ASQ is rated as reliable and valid and can be analysed by calculating the average of all three answers (cf. *ibid.*, p.80 et seq.). The score determined in this way is thus between 1 and 7 and represents a scale for the usability that the system has with regard to the scenario examined. If subsequently an average for the ASQ scores of different scenarios covered by the system is established, a scale for the usability of the entire system can be calculated.

In addition, however, to the determination of a scale such as the System Usability Scale and the After Scenario Questionnaire methods<sup>10</sup> of usability evaluation are used, which focus more closely on the inclusion of the individual framework conditions and exposure of concrete interaction problems. They can be divided into analytical and empirical methods (cf. Sarodnick/Brau 2011, p.199 et seq.). With analytical methods the usability of a system is evaluated by experts<sup>11</sup>. These procedures, such as for example cognitive walkthrough and heuristic evaluation, have the advantage that a relatively small expenditure is necessary to perform them. Experts also usually know, on which interaction components of the system to focus most closely. That can however also contribute to a narrowing of the perspective, so that not all problem fields may be exposed. Empirical methods on the other hand enable a closer consideration of the actual end users, who in this respect evaluate the particular system, which corresponds more closely to the usability concept described. Examples of these methods are

<sup>10</sup> A good summary of the methods of usability research is given for example by Lazar/Feng/Hochheiser 2010, Nielsen 1999, Sarodnick/Brau 2011, Tullis/Albert 208.

<sup>11</sup> Experts can include both specialists in both the field of usability research and the area in which the system is used, e.g. the library staff in the case of an OPAC.

user questionnaires, usability tests or eye-tracking. However they have the disadvantage that their practical implementation is relatively expensive, as for example they have to be conducted in a special usability laboratory because of the technical resources required. This is partly offset by the fact that generally only about five test subjects are enough to identify some 80% of the relevant interaction problems (cf. e.g. *ibid.*, p.167; Virzi 1992, p.460; 462; 466).

The implementation of these methods as an integral part of usability engineering has the aim of evaluating a system, in order then to implement measures to improve its quality. In this regard the system when evaluated may only be at the prototype stage (on paper or as test version) or may already be fit for use. It makes sense, however, to remedy foreseeable difficulties in the interaction with the system as early as possible. Nevertheless repeated checks should still be made over time to ascertain whether any new problems exist, if the available resources permit it. The KonSearch usability study was conducted when the system was still at the beta version stage. However, in order to be able to address the overall issue of the usability of KonSearch it was necessary first of all to describe the specific context in which KonSearch is to be used and then against this background formulate more specific research questions, which can be studied using usability research methods.

### **3.1.2 Context of use of KonSearch**

ISO standard 4291-11 names as elements of the context of use the “user, tasks, equipment (hardware, software and materials) as well as the physical and organisational environments in which the product is used” (DIN EN ISO 9241-11, p.4). With regard to KonSearch these elements must now be determined more closely.

All users of the University of Konstanz library must potentially be considered to be users of KonSearch. In addition to students, teachers and researchers, this also includes local citizens. But the group primarily targeted by KonSearch consists of the members of the University of Konstanz, which is already evident in the addition of ‘The literature search engine of the University of Konstanz’ to the name. Again the students of the university are the focal points with regard to the tasks that can be performed with KonSearch. As the designation ‘literature search engine’ already implies, the aim is to use KonSearch to find academically relevant information, which can then be included in the process of academic work. In section 2.2 it was described that with increasing experience in searching for academic information, the use of more specific search tools provided by the library such as academic databases is intensifying. Inexperienced users such as students at the beginning of their studies, however, increasingly use Internet search engines such as Google, Yahoo or Bing to search for academic information. KonSearch enables this user group to access information from most of the sources provided by the library (OPAC, databases etc.) simultaneously via one single access point, which should

indirectly increase the use of these resources by students. The equipment that is relevant in the use of KonSearch, consists of a PC with keyboard, mouse, Internet access and a browser software. The physical and organisational environments, in which the use of KonSearch takes place, are however difficult to define, as KonSearch can theoretically be used from any location. It must however be said that the library and the computer rooms within the University of Konstanz as well as the students' homes represent typical environments. It is also possible that other people are often present during use, at least on the premises within the university.

### 3.1.3 Areas of interest and research questions

The concept of usability described corresponds very well to the questions of user perspective, which arose repeatedly during the preparations for the introduction of the literature search engine KonSearch. As usability explicitly includes the consideration of the relevant users and the context of use of a system, the concept is in harmony with the fundamental aim of obtaining information about the viewpoint of the library users with regard to the introduction of KonSearch.

With respect to the general usability concept the research question of the usability study was: Can different requirements, which the users of the University of Konstanz library have in their literature search, be fulfilled with effectiveness, efficiency and satisfaction? Or does the system have specific faults that make it difficult to use? In this case, of course, options to remedy the faults must be demonstrated. Overall then this was a question more of the qualitative determination of specific interaction difficulties than of the quantitative determination of scales to measure the usability of KonSearch. In order to examine this more general question using the methods of usability research, it was broken down into more specific subsidiary questions.

The library was first of all interested in determining the specific requirements and expectations that the library users generally have of a search tool used to search for academic information. In this connection it should also be seen whether KonSearch is able to fulfil these expectations. In addition the study aims to resolve the issue of whether KonSearch fulfils different information requirements. Interest here lies primarily in two types of search requests, the targeted search for a specific bibliographical reference and the explorative or thematic search<sup>12</sup>. It must also be examined whether KonSearch is suitable to perform these different search requests with effectiveness, efficiency and satisfaction. A special search request, which was prominent because of the objective of making the electronic media items easier to find with KonSearch, was the search for eBooks. The library also asked itself whether specific interaction problems occur in the literature search with KonSearch. If that is the case, recommendations to solve

---

<sup>12</sup> Lewandowski assigns different information needs to both search types. Thus the targeted search for a specific bibliographical reference is based on a specific information need, but the explorative or thematic search is based on a problem-oriented information need (cf. Lewandowski 2010, p. 92 et seq.).

these problems must wherever possible be determined. Also of interest was the effect of the optical structure of KonSearch. It must be examined whether specific design elements strongly attract the attention of the library users and thus detract from other important content. In general, it should also be ascertained, how satisfied the library users are with KonSearch overall and with its individual functions and how high the usability of KonSearch can be classified. Although the aim of KonSearch is not to replace the existing OPAC but to supplement it, it seemed useful when examining these questions to compare the two systems as well. Thus the following research questions were formulated:

**Table 2: Research questions in the KonSearch usability study**

1.	Which requirements/expectations do the library users have of a literature search engine? Does KonSearch fulfil these requirements/expectations?
2.	Does KonSearch fulfil different information needs? Are different search requests performed with effectiveness, efficiency and satisfaction with KonSearch?
3.	Can electronic media items, in particular eBooks, be searched and found satisfactorily with KonSearch? What is the usability of KonSearch with regard to this special search?
4.	Which interaction problems arise when searching with KonSearch? How can they be solved?
5.	What is the effect of the design of the search interface? Are there elements that very strongly attract the attention of the users?
6.	How high is the usability of KonSearch overall? How high is it with regard to individual functions?
7.	To what extent can KonSearch be distinguished from the online catalogue that already exists with regard to these questions?

**Source: Compiled by the author**

The areas of interest of the library articulated with these questions also had effects on the methods used in the study, as not every research question can be answered by using a particular method of usability research. Therefore, after the description of the sample survey, the next section presenting the study methods also explains which questions were addressed, and with which method they were addressed.

### 3.2 Sample survey and methods used in usability study

In order to obtain as comprehensive a picture as possible of the usability of KonSearch as well as any problems with its application, and to examine the questions described above, several methods were used to evaluate the system. The primary aim of the study was not to make a purely quantitative statement about the usability of KonSearch, as might for example be possible by means of the SUS. It aimed rather to consider the specifics of KonSearch and expose tangible interaction difficulties with the different methods.<sup>13</sup> Also, because the library users were the focal point of interest, empirical methods were chosen for the study (see section

<sup>13</sup> An exception here is the online questionnaire, which actually aimed to reach as many students as possible. However this is described separately in section 3.2.2.

3.1.1). These were 1. a focus group and an online questionnaire, which were combined in the ‘Asking Users’ method, 2. a ‘summative user test’, 3. a ‘formative user test’ and 4. ‘an eye-tracking study’. These methods were distributed over four project groups, which each consisted of between three and five participants from the course *Usability Engineering: Evaluation*.

As specific requirements of the relevant test subjects were partly connected with the application of the different methods, the structure of the sample survey should first be explained in the following section. This is then followed by the presentation of the individual study methods with each of the questions examined.

### **3.2.1 Sample survey**

The students at the University of Konstanz were selected as potential test subjects considered for the study and thus supposed to constitute the population. They make up the largest group of library users and are the primary target group which KonSearch wishes to reach. In order to recruit participants for the study and thus take the sample survey from the population, no random selection was taken, which is why the results are not strictly speaking representative of the whole student population at the University of Konstanz. On the one hand the use of a random selection would have been too expensive to be applied as part of the study that was only going to last one semester. On the other hand a random selection with regard to the aims of the study did not appear necessary, as the focal point was not to make as representative as possible a statement about the usability of KonSearch, but to expose specific interaction problems. The test subjects were therefore deliberately selected for the sample survey and this was done in several stages.

In order first of all to recruit volunteers to take part in the study, several communication routes were chosen: in addition to notices within the university (see illustration 3, p. 21) people were also made aware of the study by entries in the blog on the library home page as well as on the Facebook pages of the books divisions. To compensate for expense a payment of €8 per hour was also promised by the *Human-Computer Interaction* working group.

Illustration 3: Test subject recruitment notice



**Teilnehmer gesucht!**


Ziel: Evaluation einer Suchmaschine  
 Was muss man tun? Ausprobieren, Rumspielen und ein paar Fragen beantworten.

 **Dauer: ca. 1 - 1,5 Stunden**

 **8 € / Stunde**

 **www.soscisurvey.de/uee**

**8 € / Stunde**



www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

www.soscisurvey.de/uee

Source: Illustrated by the project groups

[Translation of illustration 3:

Looking for Participants! € 8 per hour

Aim: Evaluation of a search engine

What do you have to do? Try it out, play about a bit, answer a few questions.

Duration: approx. 1 – 1.5 hours

€ €8 an hour

? www.soscisurvey.de/uee]

As a result a total of 78 students volunteered to take part in the study. From these about ten test subjects were then selected by means of a screening questionnaire (see appendix 1) for each of the four project groups. This procedure was necessary, as the project groups had specific requirements of the test subjects, some of which differed from group to group and some of which were the same for all groups.

For example it was important for all project groups to find relatively heterogeneous test subjects for the study. Only in this way was it possible to ensure that, despite the small number of candidates, relevant interaction problems could be identified, which may concern only one sub-group of the population and are therefore dependent on a specific variable.



Criteria by which the respective test subjects were distinguished were in this case gender, course of study and duration of study. One selection criterion that was significant for the practical performance of the study, was the mother tongue of the participants. As all questionnaires, task descriptions etc. were formulated in German and mistakes due to linguistic misunderstandings were to be ruled out, German as mother tongue was a requirement in the selection of the test subjects. The aim was to try not to use any information or computer science students as test subjects for the study, as they would not only have been users of the system but also experts.

The requirements of the project groups varied depending on the method used and the relevant area of interest. Thus the test subjects for the eye-tracking study should not if possible have had any experience with KonSearch, as one of the aims was to study the initial optical impression of the system. For the summative usability test it was important that the test persons, in addition to having experience with the existing OPAC, had also already accumulated experience in searching with KonSearch, given the aim to compare both systems according to requirements that were as identical as possible. For the formative usability test however, the ideal was for the test subjects to have as varied a level of experience as possible with regard to KonSearch, which in turn was conducive to the heterogeneity of the participants in the study. Furthermore, for the eye-tracking study it was a technical requirement that the test persons did not wear glasses, as otherwise it would not have been possible to track their gaze.

The test subjects concerned were subsequently contacted by the separate project groups. They were informed in general about the relevant study and offered a time to perform the study. After a few negative replies, the number of test subjects was reduced to six or seven for each study method. Thus a total of 25 students took part in the study<sup>14</sup>.

### 3.2.2. Asking Users

One project group applied the *Asking Users* method. The key questions here were which requirements the students at the University of Konstanz have of a literature search system in general and how well KonSearch and the existing OPAC fulfil these expectations and for which aspects this is not the case. Thus research questions 1 and 7 were studied. By integrating the specific requirements to enable a search via all publication forms (i.e. print media and electronic media) by means of a single system and in order to be able to filter the list of results according to content type (e.g. eBook), the third research question was also addressed.

A multi-stage procedure was chosen to answer these questions using the Asking Users method. First of all the project group itself drew up a list of possible requirements of a literature search system, which was then divided into different requirement categories: search, refinement of

---

<sup>14</sup> This also does not however apply to the online questionnaire (see Fn.13), which is described in section 3.2.2.

search, sorting of search results, presentation, personalisation and notification, exchange and cooperation, help.

This categorisation then served as an introduction for the focus group introduced at the next stage. This consists of a thematic discussion in a small group of test subjects, which is usually moderated by means of a conversation thread, but otherwise is not very standardised and serves to explore the facts. In this case the aim was to determine the requirements of the students of a search system on the basis of the categories compiled. The focus group consisted of six students, who differed from each other with regard to the criteria of gender, course of study and duration of study and thus constituted a heterogeneous group:

**Table 3: Profile of the test subjects in the focus group**

Age	Gender	Course of Study	Intended Degree	Number of Semesters
21	Male	Mathematical and Financial Economics	Bachelor degree	2
21	Female	Philosophy	Bachelor degree	2
24	Male	Literature-Art-Media	Bachelor degree	6
29	Female	English, French	State examination	10
26	Male	Information Technology	Doctorate	1
25	Male	Information Engineering	Masters	3

**Source: Compiled by the author**

The implementation of the focus group gave the test subjects first of all the opportunity to become acquainted with KonSearch and its functionalities in an exploration phase. For this phase, they were given exemplary search tasks, but it was not obligatory to perform them. During the exploration the test persons were asked to make notes about what they like, what worries them or what they do not understand and what they think is missing from KonSearch. Then on the basis of these notes and in open dialogue they discussed which requirements the participants have of a literature search system and whether KonSearch or the existing OPAC fulfil these requirements. The requirements determined were then assigned to the previously developed requirement categories (see appendix 2).

On the basis of the preliminary considerations, the category plan and the requirements mentioned by the students, the final stage was to develop an online questionnaire. The purpose of this was to find out what significance is attached to the individual requirements and the

categories. The survey subjects were asked to sort the requirements of each separate category according to their importance and to put the requirement categories themselves in order of importance (see appendix 3). Thus the aim was not to evaluate the importance of a requirement or of a category using a scale, but for the survey subjects to create a ranking order. The reason for this was the fear that otherwise all requirements would simply be classified as very important (the so-called ‘ceiling effect’). When creating a ranking order the survey subjects each had to decide which aspect is more important than another for them personally. The sorting of the requirement categories came last, so that the content of the separate categories could be made clear beforehand to the survey subjects by analysing the respective requirements. For the presentation of the different requirements and categories a random order was created, in order to avoid any possible influencing of the survey subjects.

Invitations to take part in the online questionnaire were sent by mailing list to all students at the University of Konstanz. In order to ensure a high response rate the chance to win a book token worth € 25 was mentioned, which was provided by the *Human-Computer Interaction* working group and raffled among all survey subjects. However the response cannot be said to be very high, probably due to the timing of the questionnaire at the end of the summer semester, a time when a lot of exam papers were being written at the university. Thus only 479 students began the survey, of which 327 completed it in full, i.e. approx. 3.5% of all students. Because of the set schedule, however, it was not subsequently possible to introduce a recall process, and so this relatively small sample survey had to suffice. It was therefore unfortunately not possible to achieve the aim of generalisability. Nevertheless it does at least give some indication of trends for a classification of the importance of the relevant requirements and requirement categories.

### 3.2.3 Summative user test

One project group performed what is known as a *summative user test*<sup>15</sup>. The aim of this method is a quantitative comparison of two systems, which can be performed either by objective measurement scales or by subjective user assessments. Often an old and a new system are compared in this respect and this study also attempted to contrast KonSearch and the existing OPAC. The specific purpose was to answer the question of which of the two search systems has a higher usability, which involves a study of research questions 6 and 7. However the performance of the test also addressed questions 2 and 4, with regard to whether KonSearch fulfils different search requests and whether specific interaction problems arise. The search for an eBook was considered as a possible search request, and thus research question 3 was integrated into the study as well.

---

<sup>15</sup> This method is referred to as the ‘deductive test’ by Sarodnick/Brau (cf. Sarodnick/Brau 2011, p. 163 et seq.).

The practical performance of the summative usability test took place in the usability laboratory of the *Human-Computer Interaction* working group. A total of seven people took part in the study, who constituted a heterogeneous group with regard to the criteria of gender, course of study and duration of study:

**Table 4: Profile of the test subjects in the summative user test**

Age	Gender	Course of Study	Intended Degree	Number of Semesters
55	Male	History, Politics	Doctorate	N/A
24	Female	Literature-Art-Media	Masters	10
21	Male	Politics and Administrative Science	Bachelor degree	2
25	Male	Linguistics, English Language and Literature	Masters	4
29	Male	Literature-Art-Media	Bachelor degree	4
23	Female	Life-Science	Masters	10
22	Male	Sociologie, Administrative Science	Bachelor degree	5

**Source: Compiled by the author**

After a few personal questions the test participants were set eight tasks in succession both on paper and on the PC, which they were asked to solve using KonSearch and OPAC (see appendix 4). The tasks were set in the form of short scenarios, which each described different typical search situations. This aimed to test the different functionalities of KonSearch: the basic search, the narrowing of the list of results, the search for an eBook, the advanced search and the narrowing down according to a topic. In order to monitor learning effects, three test subjects performed the tasks firstly with KonSearch and then with OPAC and the other four did the exact reverse. In addition it was noted that the tasks for KonSearch and for OPAC were not completely identical. At the same time however they had to be very similar, in order to ensure comparability. Using pre-tests the tasks were repeatedly checked and improved. Whilst performing the tasks the test persons themselves as well as their screen actions (movements of the mouse, clicks, text input) were recorded. A written statement of consent for this was obtained from each test subject prior to the test. The test persons were also encouraged to comment on their actions and to express their thoughts out loud, a technique known as *Thinking Aloud* (cf. Sarodnick/Brau 2011, p.170 et seq.). These comments were in turn recorded. Also the participants were observed by a member of the project group. He timed how long it took to

perform a given task and made notes about whether interaction difficulties arose or whether the test subject deviated from a previously established ideal method of solving the task. After every task performed, a questionnaire was also completed, which aimed to determine the usability of the system with regard to the performance of this specific task. The ASQ was used for this purpose (see section 3.1.1). After all eight tasks had been performed, there was an evaluation of the usability of the system overall, both for KonSearch and for OPAC, for which purpose the SUS was used (see section 3.1.1). In addition a final interview enabled further discussion about the individual search strategies of the test persons and to address any difficulties that might have arisen. Subsequent to the performance of the summative usability test the video and audio recordings, the notes, the questionnaires and the interview were evaluated and compared for KonSearch and OPAC.

### 3.2.4 Formative user test

A test known as a *formative user test*<sup>16</sup> was performed by one project group. This method focuses on the qualitative evaluation of a single system, which is therefore studied in very great detail. In this case KonSearch was evaluated exclusively. The aim of a formative usability test is to expose interaction difficulties and if at all possible determine recommendations to optimise the system. Thus it was primarily research question 4 that was studied using this method. However, in the practical implementation, different information needs were also taken into account, assigning the tasks to be performed to different task types (explorative search, targeted search, refinement of search, other functions and other). They were formulated in such a way as to each describe different typical search situations. One of these research questions was the search for an eBook, and so the search was checked for electronic items. The test persons also evaluated the usability of the overall system. In addition, therefore, questions 2, 3 and 6 were also studied.

A total of six test subjects took part in the formative user test, who constituted a heterogeneous group except for their intended degree:

---

<sup>16</sup> This method is referred to as the 'inductive test' by Sarodnick/Brau (cf. Sarodnick/Brau 2011, p. 163 et seq.).

**Table 5: Profile of the test subjects in the formative user test**

Age	Gender	Course of Study	Intended Degree	Number of Semesters
19	Male	Biology	Bachelor degree	2
21	Male	History	Bachelor degree	4
24	Female	Linguistics	Masters	3
21	Male	Biology	Bachelor degree	2
21	Female	Slavonic Studies, Economic Sciences	Bachelor degree	4
20	Male	Biology	Bachelor degree	2

**Source: Compiled by the author**

First of all the test persons were asked for some demographic data and had the opportunity to try out KonSearch in a short exploration phase. Then, just as in the summative user test, the test subjects were set different tasks, which described typical search situations and were performed on the PC in the usability laboratory (see appendix 5). These tasks were divided into different categories: tasks about the explorative search, the targeted search for a specific medium, the refinement of the search, the use of specific additional functions of KonSearch as well as other tasks. For the test participants the tasks were formulated in such a way that different tasks had to be performed on each day within a fictitious scenario of the three-day-long completion of an assignment on the Gallic War. The tasks themselves were set for the participants on paper and on the PC and were to be performed using the *Thinking Aloud* technique, i.e. the expression of thoughts out loud and commentary on the procedure. The test persons and their screen actions were recorded (a written statement of consent was obtained for this from each of them) and they were also observed by a member of the project group, who made notes. At the end of each task the student participants were also asked to use the ASQ to evaluate the completion of the tasks. Finally a further survey of the test subjects was conducted about the search overall, and this mainly took into consideration the individual procedures and the occurrence of any specific problems as well as possible solutions.

Finally the project group evaluated the recordings and notes, compiled detailed descriptions of the specific interaction problems and developed improvement recommendations to remove the interaction difficulties determined.

### 3.2.5 Eye-Tracking

Another method used by a project group is known as *eye-tracking*. The German translation of this expression is ‘Blickverfolgung’ and it involves determining where exactly the test subjects are looking and when they do this. Thus this method was very useful for studying the fifth research question regarding the effect of the design of KonSearch. Specifically it was determined whether there are specific ‘eye-catchers’ on the home page, in the list of results and in the advanced search of KonSearch, that is to say whether certain elements exist, which very strongly attract the attention of the users. The time needed by the test subjects to find specific functions of KonSearch was also measured. However, the eye-tracking method also addressed other questions. It was examined whether the lists of results of KonSearch and the existing OPAC have a different optical effect on the test subjects and whether different functions in KonSearch are located where the test persons expect them to be. The project group also integrated the use of search facets, in particular with regard to the search for an eBook. It was also examined, whether the meanings of the icons used to represent the relevant material type (e.g. eBook) of a medium in the list of results correspond to the expectations of the users. Research questions 1, 3 and 7 were therefore also studied.

A total of six test subjects took part in the eye-tracking study. Unfortunately they did not constitute a very heterogeneous group with regard to the relevant criteria but it was necessary to accept the lack of heterogeneity because of the particular requirements of the test persons – they must not wear glasses and must not have had any experience with KonSearch:

**Table 6: Profile of the test subjects in the eye-tracking test**

Age	Gender	Course of Study	Intended Degree	Number of Semesters
24	Female	Economis Sciences	Bachelor degree	6
24	Male	Law	State examination	7
22	Female	Biology, English, Philosophy	State examination	6
21	Female	Law	State examination	4
21	Female	Philosophy	Bachelor degree	2
22	Female	French, German	State examination	5

**Source: Compiled by the author**

The practical performance of the eye-tracking study was of all the methods the most expensive and like the user tests it had to be performed in the usability laboratory. A special hardware

with two cameras was used, which were trained on the eyes of the test subjects and were able to register their viewing direction (see illustration 4, p. 30). Thus it was possible to record where exactly the test participants are looking on the screen and where their gaze wanders over time.

#### **Illustration 4: Set-up of eye-tracking study**



**Source: Picture taken by project group**

For the eye-tracking study some personal details were first of all obtained. Then the hardware was adjusted, which had to be done afresh for each test subject. Then the actual study could begin. Here also the test subjects were set different tasks (see appendix 6), which they were asked to solve on the PC, and during which their gaze was recorded. After the tasks they were asked to reply to a few supplementary questions. Finally the test persons were asked to evaluate the eye-tracking study using the SUS.

Subsequent to the study, the project group evaluated the eye-tracking data, which was in the form of so-called 'heat maps' and showed the average fixation time on specific graphic elements. The replies and assessments of the test subjects were also subject to evaluation.



### 3.3 Results of the usability study

At this point, having described the methods, it is now necessary to describe the results for each of the four methods used individually. A detailed description is given of the results of the studies. They are then consolidated and interpreted and improvement options deduced separately in the following section.

#### 3.3.1 Asking Users

The project group for the 'Asking Users' method performed two studies linked to one another, a focus group and an online survey, the results of which are presented in succession.

In preparation for the focus group the project group drew up a category plan, which was to be used to categorise the requirements of a search system determined in the focus group. The individual categories were:

- search
- refinement of search
- sorting of search results
- presentation
- personalisation and notification
- exchange and cooperation
- help

The focus group then assigned the aspects discussed by the test subjects to these categories. The different statements were however often not formulated as specific expectations of a literature search system, but took the shape of positive and negative statements about the test search with KonSearch, as well as comments about surprising or missing functions. From these statements made by the test persons, the project group deduced specific requirements. For example, one test subject said that the colouring of KonSearch is not attractive, and this was assigned to the category 'presentation'. From this comment the project group deduced the requirement 'adjustable layout'. The result of this procedure was a listing of all mentioned requirements, sorted according to the categories already drawn up (see appendix 2). The next stage of the evaluation was to examine whether the relevant requirements of KonSearch or OPAC are fulfilled and whether both systems fulfil the requirements or neither.

On the basis of the resulting list of requirements of a literature search system the online questionnaire was then drawn up. Its purpose was to sort the requirement categories as well as the specific requirements within a category of the students according to their importance and rank them accordingly. Only the assessments of the 327 students who completed the online questionnaire were used in the evaluation. The following table shows the three highest ranked requirements and the lowest ranked requirement of each category:

**Table 7: Ranking of requirements in the individual categories (Asking Users)**

	<b>Search</b>	<b>Refinement of search</b>	<b>Sorting of results</b>	<b>Presentation</b>	<b>Help</b>	<b>Exchange &amp; cooperation</b>	<b>Personalisation &amp; notification</b>
<b>1<sup>st</sup></b>	Advanced search options (search explicitly for author, year of publication etc.)	Topic	Title	Preview of a result (additional information, abstract etc.)	Frequently asked questions (FAQ)	Review / comment on media	Search settings can be defined and saved (lanuges, specialist areas etc.)
<b>2<sup>nd</sup></b>	Search via all publication forms (books, eBooks, articles etc.) in the same application	Locally available items at University of Konstanz	Author	Display of number of results	Context-sensitive help (e.g. display of help texts, if you move the mouse over an element)	Assess media	View list of media previously viewed or borrowed
<b>3<sup>rd</sup></b>	Simple and clear access point (a single search as with Google)	Content type (book, article, eBook etc.)	Relevance	Display of results as a list as in Google	Detailed help texts	Index / tag media	Search results can be permanently saved
...							
<b>Last</b>	Display of results during input (Search-as-you-type)	Course equipment	Shelf mark	Optimised presentation on smartphones	Navigation in system by keyboard	Extend recommendations over social networks (e.g. like button etc.)	Layout can be adjusted (change colours, move elements etc.)
<b>Overall number of requirements per category</b>	9	9	6	9	6	5	10

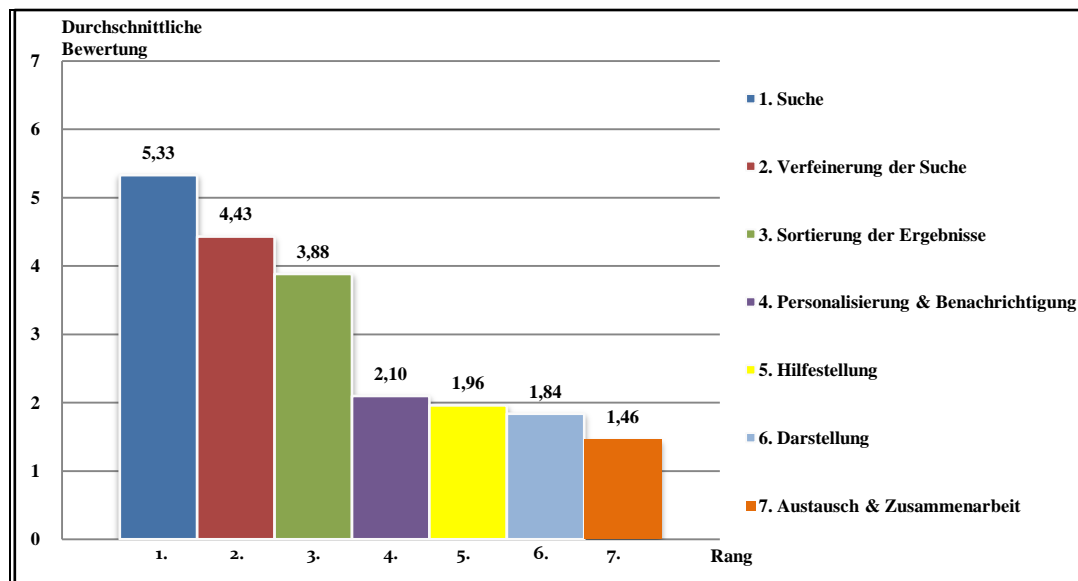
**Remarks:**

This shows ranking positions selected for each category based on sorting of individual requirements by the test subjects according to average scores.

N = 327

However the result for the sorting of the requirement categories is shown as follows:

**Illustration 5: Requirement categories sorted according to importance (Asking Users)**



[Key to illustration 5:

Durchschnittliche Bewertung = average score

Suche = search

Verfeinerung der Suche = refinement of search

Sortierung der Ergebnisse = sorting of results

Personalisierung & Benachrichtigung = personalisation & notification

Hilfestellung = help

Darstellung = presentation

Austausch & Zusammenarbeit = exchange & cooperation

Rang = ranking]

**Remarks:**

Average score = number of categories – average ranking awarded

N=327

Kendall's  $W^a = 0.496$

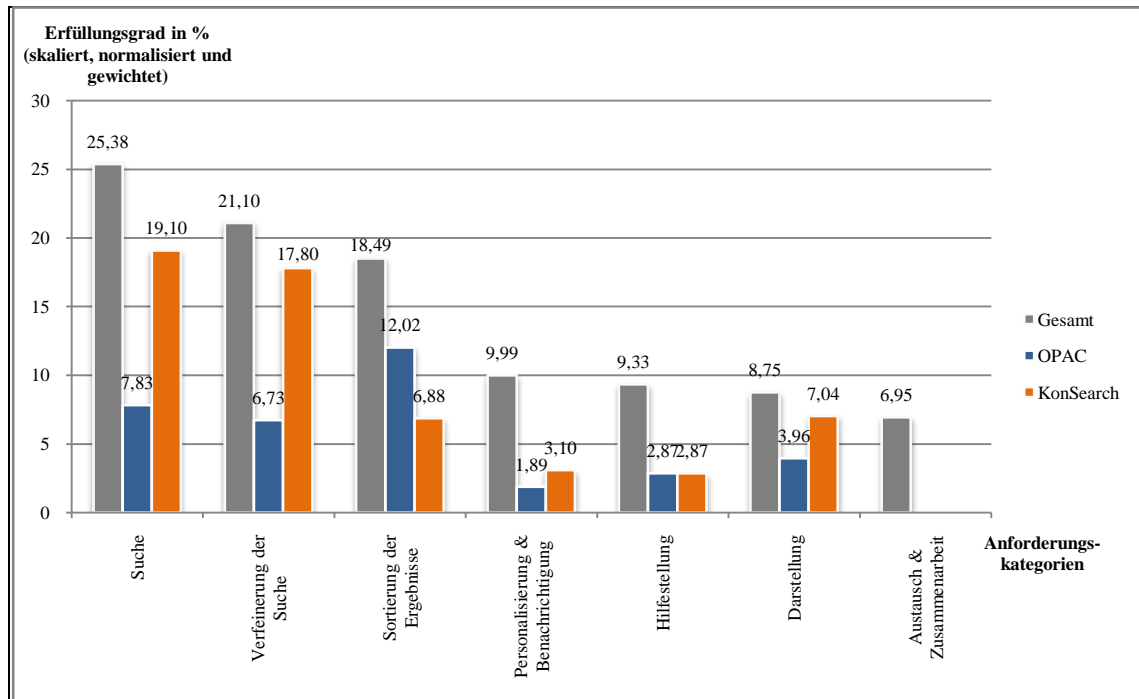
Sign. < 0.001

It can clearly be seen from the graph that in particular the three categories 'search', 'refinement of search' and 'sorting of search results' are given a very high importance. On the other hand, the category 'exchange & cooperation' was rated by the survey subjects as the least important. The requirement rated as the most significant for a literature search system in the category ranked as most important is therefore the option of an advanced search.

This requirement is fulfilled by KonSearch and the existing OPAC, which both offer an advanced search function. In contrast to this only KonSearch fulfils the second placed requirement of the most important category 'search', as only this system permits a search via different publication forms such as books, articles, eBooks etc.

Also in the overall comparison of the requirements within the individual categories, which are fulfilled by KonSearch and by OPAC, KonSearch mostly performs better and has a higher level of fulfilment overall than OPAC:

**Illustration 6: Comparison of fulfilment of requirements by KonSearch & OPAC (Asking Users)**



[Key to illustration 6:

Erfüllungsgrad...gewichtet = level of fulfilment in % (scaled, standardised and weighted)

Gesamt = total

Anforderungskategorien = requirementcategories

Suche = search

Verfeinerung der Suche = refinementofsearch

Sortierung der Ergebnisse = sortingofresults

Personalisierung & Benachrichtigung = personalisation&notification

Hilfestellung = help

Darstellung = presentation

Austausch & Zusammenarbeit = exchange&cooperation

#### Remarks:

The level of fulfilment shows the extent to which both search systems fulfil the requirements of the different categories. In order to calculate it, the categories were weighted according to their ranking, then standardised against each other and scaled on the total score. Therefore a level of fulfilment of 100% would signify the complete fulfilment of all requirements for all categories.

If the results of the individual categories are added up, the result is:

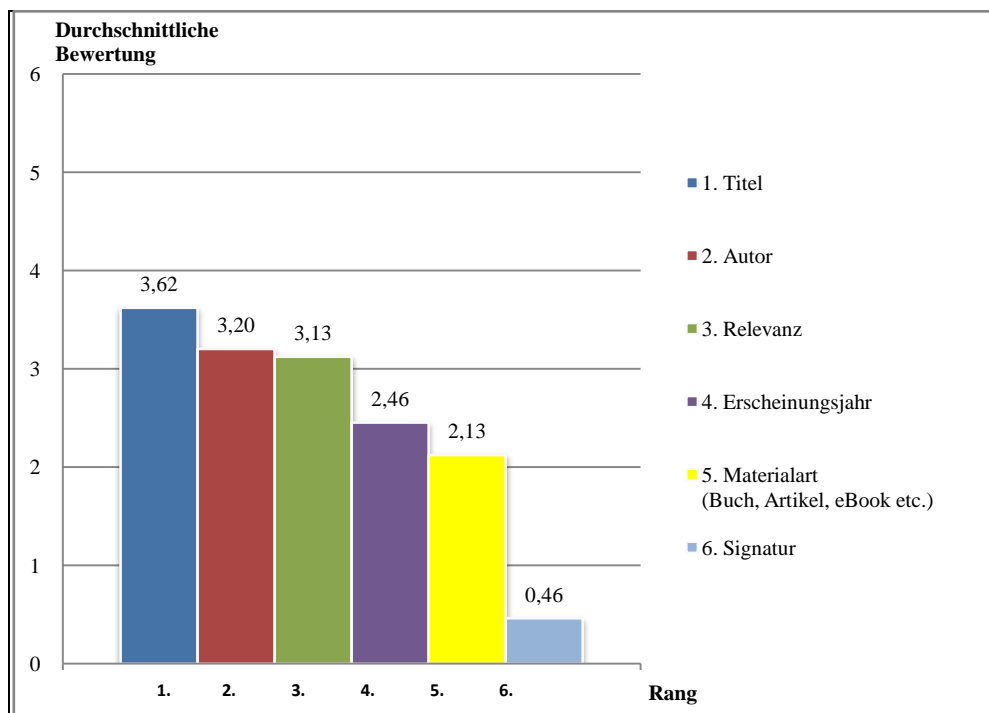
Level of fulfilment for KonSearch overall: 56.79%

Level of fulfilment for the OPAC overall: 35.3%

N = 327

With regard to the requirement category rated least important – exchange & cooperation, however, neither KonSearch nor OPAC fulfil the requirements of the survey subjects. In the category rated as third most important, the sorting of results, however, OPAC fulfils the requirements of the survey subjects better than KonSearch. Within this category the requirements of sorting according to title, author and relevance were ranked as the most important:

**Illustration 7: Requirements of the category ‘sorting of results’ sorted according to importance (Asking Users)**



[Key to illustration 7:

Durchschnittliche Bewertung = average score

Titel = title

Autor = author

Relevanz = relevance

Erscheinungsjahr = year of publication

Materialart... = content type (book, article, eBook etc.)

Signatur = shelf mark

Rang = ranking]

**Remarks:**

Average score = number of categories – average ranking awarded

N = 327

Kendal  $W^a$  = 0.368

Sign. < 0.001

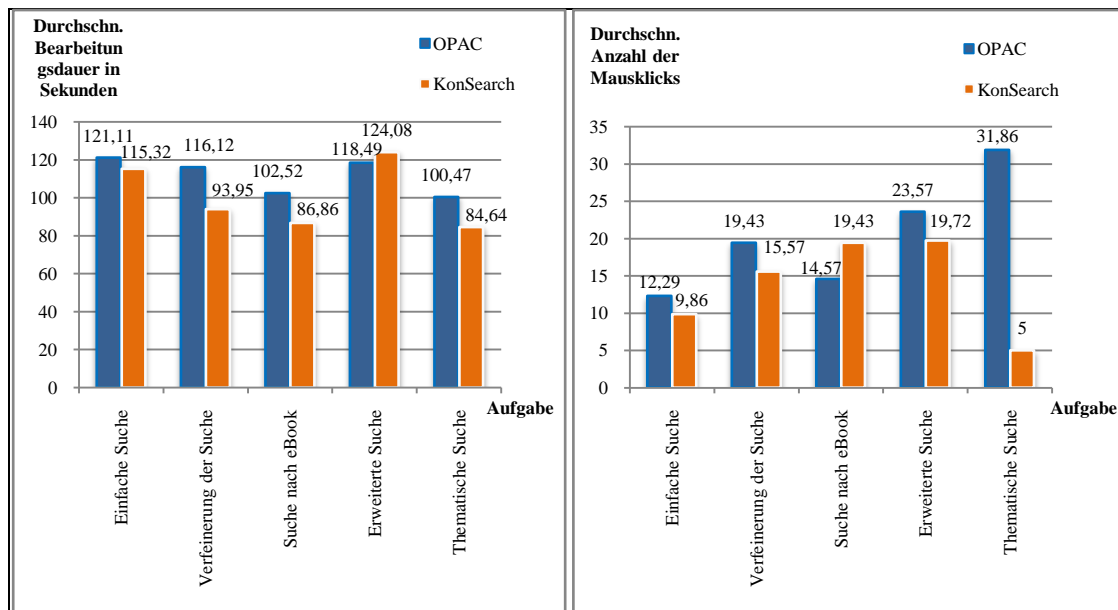
In this category KonSearch fulfils only the requirements with regard to sorting according to relevance and year of publication, whilst OPAC enables sorting according to title, author, year of publication and shelf mark. However it must be stressed that overall KonSearch fulfils the requirements in the categories rated most important better than OPAC.

### **3.3.2 Summative user test**

The main purpose of the summative user test is to compare both the KonSearch and OPAC systems with regard to possible interaction difficulties. Test subjects were recorded and observed performing different tasks. Individually these were a basic search, the refinement of a search, the search for an eBook, an advanced search and a thematic search. Different data were also collected for each task: the time taken to complete the tasks and the number of mouse clicks required, the number and difficulty of the interaction problems and the ASQ. At the end of the study the test subjects were also asked about the usability of the system as a whole by means of the SUS.

The average time taken to complete the tasks and the number of mouse clicks required gives an indication of the effectiveness of the relevant system:

### Illustration 8: Duration of task performance & number of mouse clicks (summative user test)



[Key to illustration 8:

Durchschn...Sekunden = average duration of task performance in seconds

Einfache Suche = basic search

Verfeinerung der Suche = refinement of search

Suche nach einem eBook = search for an eBook

Erweiterte Suche = advanced search

Thematische Suche = thematic search

Aufgabe = task

Durschn...Mausklicks = average number of mouse clicks]

#### Remarks:

This shows the average time and the average number of mouse clicks required to perform different searchtasks.

N = 7

It is clear that on average less time and fewer mouse clicks were required for the performance of almost all tasks with KonSearch. For the task relating to the refinement of a search in particular the difference between the two systems with regard to the time taken to perform the task is very large. Its performance with KonSearch was clearly faster. However, there is a very big difference in the number of mouse clicks, particularly for the thematic search. Significantly more mouse clicks were required when completing the task with OPAC.

In addition to these efficiency scores, scores were also collected for the effectiveness of the systems. This concerns the number and intensity of the errors made by a test subject when doing the relevant tasks:

**Table 8: Number and difficulty of interaction problems (summative user test)**

		No Problems	Minor Problems	Major Problems	Failure
<b>Basic search</b>	OPAC	5	2	-	-
	KonSearch	4	1	-	2
<b>Refinement of search</b>	OPAC	6	1	-	-
	KonSearch	3	3	-	1
<b>Search for an eBook</b>	OPAC	-	1	3	3
	KonSearch	5	2	-	-
<b>Advanced search</b>	OPAC	3	4	-	-
	KonSearch	4	2	1	-
<b>Thematic search</b>	OPAC	-	1	1	5
	KonSearch	6	1	-	-

**Remarks:**

- No problems:** The test person successfully completed the task without difficulties or inefficiencies.
- Minor problems:** The test person completed the task, but made a short detour. He made one or two minor errors, but quickly remedied these and so was able to complete the task successfully.
- Major problems:** The test person successfully completed the task, but had some major problems. He had to make a lot of effort and made a long detour, although he did successfully complete the task.
- Failure:** The test person gave the wrong answer or gave up before solving the task, or the moderator had to move on to the next task before successful completion.

The clearest differences in the results shown are for the tasks concerning the search for an eBook and the thematic search. The high number of major problems and failure when the task was performed with OPAC was in contrast to the high number of tasks performed with KonSearch where no problems or only minor problems arose. It is however remarkable that there were failures in the search with KonSearch for the tasks concerning the basic search and the refinement of the search. Clearer reasons for this can be seen by analysing the recording of the test subjects who failed: For the basic search the test subjects were set the task of identifying the book searched for in the list of results. Two test subjects using KonSearch failed to do this. However for the refinement of the search the main problems were with the entry<sup>17</sup> of specific search criteria into the input field. If these were separated by a comma and no space, this resulted in a different list of results from if they were separated by a comma and a space or only by a space. Consequently one test subject failed to solve this task.

The results for the number and intensity of the interaction errors largely correspond with the ASQ score for the evaluation of the usability of both systems:

<sup>17</sup> The errors do not relate to the subsequent narrowing down of search results, which was the main point of this task.



**Table 9: ASQ evaluation for  
KonSearch & OPAC (summative user test)**

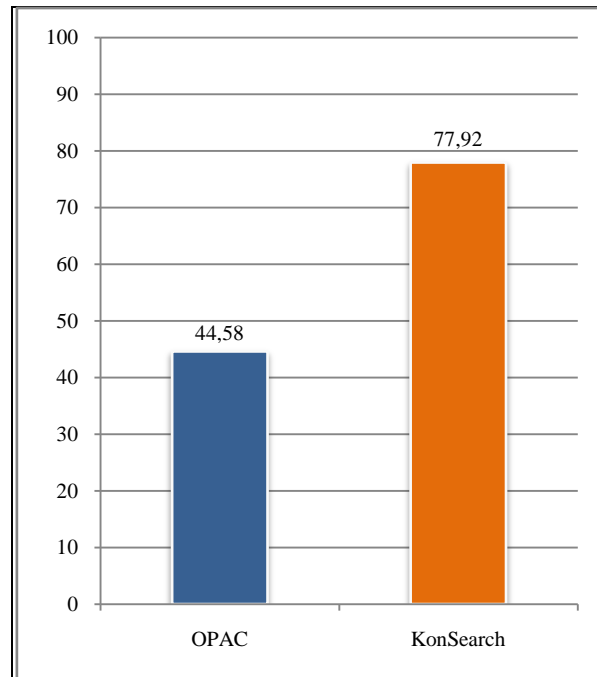
	OPAC	KonSearch
<b>Basic search</b>	2,66	3,14
<b>Refinement of search</b>	2,62	2,57
<b>Search for an eBook</b>	4,38	2,48
<b>Advanced search</b>	2,62	2,43
<b>Thematic search</b>	4,81	2,24
<b>Average:</b>	3,42	2,57

**Remarks:**

Each score represents the average for the three ASQ questions and the average of the test subjects surveyed. The best imaginable score would be 1.0 and the worst 7.0.

Thus the evaluation of the systems with regard to the performance of the task concerning the basic search is more positive for OPAC than for KonSearch, as two failures occurred here as described. For the refinement of the search KonSearch performs only slightly better than OPAC. One problem that may well be responsible for this became clear during the final survey of the test subjects. A frequent criticism was that the response time of the system with regard to the updating of the list of results after selecting a narrowing criteria is much too high when compared to that of OPAC. The evaluation of the search for an eBook and the thematic search do however show a clearly higher usability for KonSearch than for OPAC. On average over all tasks the score of 2.57 for KonSearch is more positive than 3.42 for OPAC. This finding of a higher usability for KonSearch is also consolidated by the results of the SUS:

**Illustration 9: SUS evaluation for OPAC & KonSearch (summative user test)**



**Remarks:**

Each value represents the average score of the test subjects surveyed. The best imaginable score would be 100 and the worst 0.

N = 7

This evaluation shows that OPAC clearly performs worse than KonSearch with regard to usability. Its usability according to Bangor/Kortum/Miller must be rated as 'weak', whilst that of KonSearch is between 'good' and 'excellent' and can be rated as above average (see section 3.1.1).

The results of this quantitative comparison of the two discovery systems is well supplemented by the qualitative evaluation of the formative user test, which is described in the next section.

### 3.3.3 Formative user test

The main object of the formative user test is to examine whether interaction problems arise for different search requests when using KonSearch, and if so, what these problems are in particular and how they can be remedied<sup>18</sup>. For this purpose mainly qualitative data from the observation and recording of the test subjects was used. The technique of Thinking Aloud was very useful in this respect, as the comments of the test persons provided further explanations for observed interaction difficulties. In addition to this qualitative data, after each task the ASQ was used to survey the test subjects, in order to record their subjective assessment from a quantitative perspective as well.

<sup>18</sup> The improvement options are presented in the summary of results in section 3.4.

The results of the ASQ for different tasks to be performed give an initial impression of their evaluation by the test subjects:

**Table 10: ASQ evaluation for selected tasks (formative user test)**

Task	ASQ	Type of task	Description of task
1.1	1,00	Explorative search	Search for topic ‘de bello gallico’
1.3	1,00	Refinement of search	Narrowing down to content type ‘books’
1.4	1,51	Other functions	Sorting according to ‘year of publication’
1.5	1,06	Other functions	Printing of list of results
2.1	1,06	Targeted search	Search for specific book
2.4	2,28	Other functions	Saving of result
2.5	3,33	Targeted search	Search for specific eBook
2.7	1,50	Targeted search	Search for specific ISBN
2.8	1,50	Other functions	Selection of a citation format and email dispatch
3.1	1,83	Explorative search	Narrowing down to ‘academic publications’
3.2	1,11	Refinement of search	Narrowing down to topic ‘history’
3.3	1,11	Refinement of search	Narrowing to year of publication ‘from 2010’
3.4	2,00	Other functions	Use of preview function
3.5	1,78	Other functions	Preservation of search criteria
3.7	2,11	Other functions	Use of RSS feed
3.8	2,00	Refinement of search	Narrowing to material type ‘film’

**Remarks:**

For the ASQ scores the average of the evaluations of all survey subjects was established.

A selection of the most important tasks is represented, which also contains the most prominent ASQ scores.

For a summary of the ASQ scores for all tasks see appendix 7.

Different task types were assigned to the tasks followed by a short description of the task.

The worst scores determined by the ASQ relate to the targeted search for a specific eBook (3.33), the saving of a specific result (2.28) and the use of the RSS feed (2.11). The evaluation of the recordings and interviews also clearly reflected specific interaction problems in these areas.

For the search for a specific Book the test subjects were given the information that the expression ‘historical news’ appears in the title and that the year of publication is 1785. It was therefore necessary to narrow down the search for *historical news* to the content type *eBook* and the year of publication 1785. To do this some test subjects used the advanced search, but they had difficulties with this. An initial specific problem identified concerns the narrowing down according to content type: in the advanced search this narrowing option is not entitled ‘content type’ as in the results display, but has the designation ‘format’. However it was not clear to the test subjects what exactly is meant by ‘format’. The designation of this filter category is therefore inconsistent. For the test subjects who tried to solve the task with regard to the options for refinement of the search in the list of results, two other problems arose: On the one hand the configuration of the search filters was described as not clear enough, as the multitude of

possible search narrowing options made it difficult for the test subjects to find the appropriate filter. On the other hand the narrowing down according to date of publication in the list of results was criticised. Here one has the option of a manual input in special fields or the use of a diagram, in which the number of potential results for different years is indicated and can be selected:

**Illustration 10: Illustration of narrowing down according to date of publication (formative user test)**



[Key to illustration 10:

Erscheinungsdatum = date of publication

Alle = all

Bis = until

Aktualisieren = update

Löschen = clear]

2007 bis heute = 2007 to present

**Remarks:**

An example is shown of narrowing down according to the year of publication 2007 to present.

The test subjects could not work with this illustration. The reason given for this was the lack of captions in the illustration, in which the individual years themselves are not given. Some test subjects also found the illustration generally unnecessary, as a text entry would have been sufficient, and the illustration was called a 'graphic gimmick'.

The second worst ASQ score was on average awarded to the task concerning the saving of a specific result. The specific problems here were on the one hand that it was not easy for the test subjects to find the save icon. There is a small file, which appears at the top right of the screen for each result when moving the mouse over the entry:

### Illustration 11: Save icon (formative user test)



[Key to illustration 11:

TextemitErläuterungen = texts with explanations

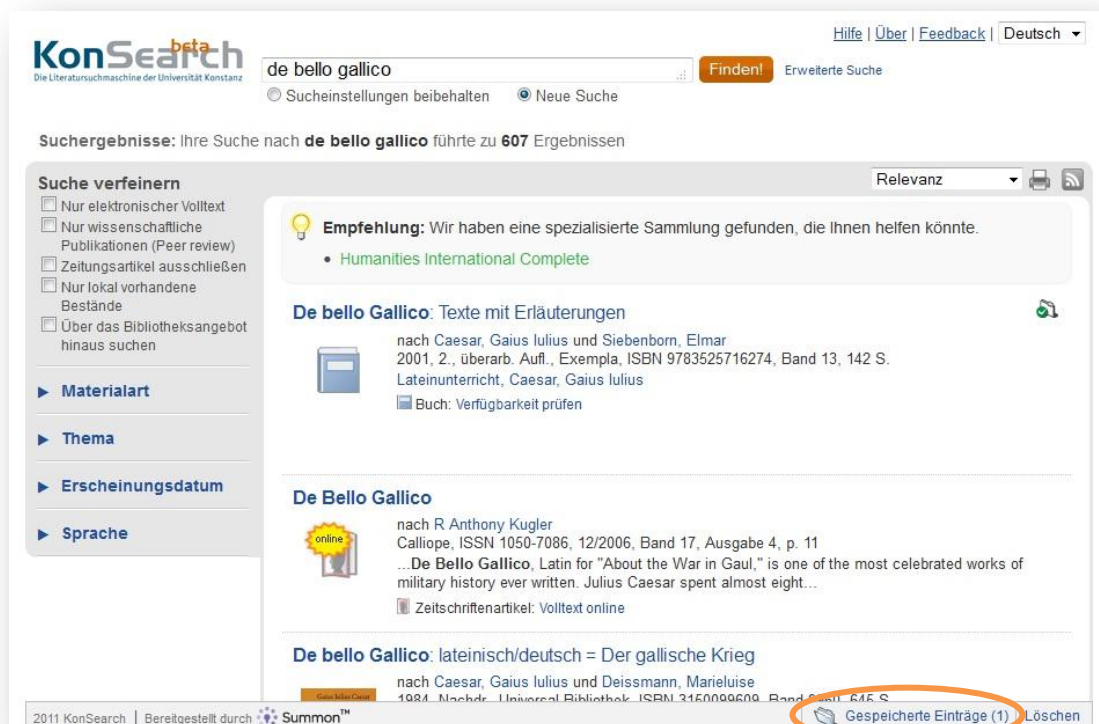
überarbAufl...142 S = revised edition, copy, ISBN 9783525716274, volume 13, pp142

Lateinunterricht = Latin lesson

Buch: Verfügbarkeit prüfen = book: check availability]

The test subjects did not associate this icon with the saving of an entry, as verified by the statement of one test person: "It is [...] not a plausible icon. [...] Everyone is familiar with a diskette from Word." But it was not only the icon but also the location where an entry is saved that the test subjects could not trace. It is located at the bottom right in a separate list at the edge of the browser window:

### Illustration 12: Location of saved entries in KonSearch (formative user test)



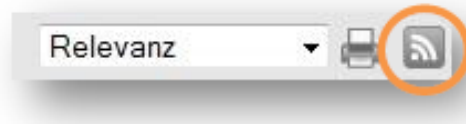
[Key to illustration 12:

Gespeicherte Einträge = saved entries]

In this case also the statement made by a test subject clearly shows that they did not expect the saved entries to be in this place: “If you shop online, the shopping basket is never at the bottom.” (translation by Atlas Translations) The location of the saved entries is therefore difficult for the test subjects to trace, as it does not correspond to their search habits with other systems.

The third lowest ASQ score was achieved by the task concerning the use of the RSS feed. The RSS feed function enables people to be informed about entries that are added to the results of a search carried out (e.g. a current journal article). The task for the test subjects was to find an option that would inform them about new search results for a topic. They found this very difficult, mainly because only two of the six test subjects knew anything at all about RSS feeds. The problem however was also that the function could not be found. There are two possible reasons for this: On the one hand the colour of the RSS feed icon is responsible and on the other its caption. On most web pages the RSS icon is coloured orange, but with KonSearch it is grey:

**Illustration 13: RSS feed in KonSearch (formative user test)**



If one moves the mouse pointer over the symbol it turns blue and a small text appears: “RSS 2.0 – current search feed”. But the test subjects who were unfamiliar with the RSS feeds could not do anything with this instruction.

In addition to these interaction problems, which were also reflected in the ASQ scores, the project group for the formative user test also identified yet more difficulties, which arose during the search with KonSearch. Even the entry of the search terms did not prove straightforward for all test subjects. Often the criteria, according to which the search had then to be narrowed, were included as search terms. This returned no suitable results or no results at all, as presumably only specified meta data fields are taken into account for the basic search.

### Illustration 14: Input problems with the search with KonSearch (formative user test)



[Key to illustration 14:

Suchergebnisse ... 0 Ergebnissen = Search results: Your search for historic news ebook 1785 did not match any documents

When asked, the reason given for the input was that it was easy to enter all possible terms into the search field with Google and other search engines. Thus the discovery system does not correspond to the experience that the test persons have already had with other search engines.

Another problem was that the function 'preserve search settings' was not used by the test subjects. If one wishes to search for other key words but wants to keep the same search refinements as in the previous search, this option can be clicked on and is located directly below the search field. The advantage of this is that not all search refinements have to be reset later. Its non-use is connected with another function of KonSearch: When entering text in the search field, a list opens with suggested words which obscures the option 'preserve search settings':

### Illustration 15: Recommendations for the entry of search terms (formative user test)



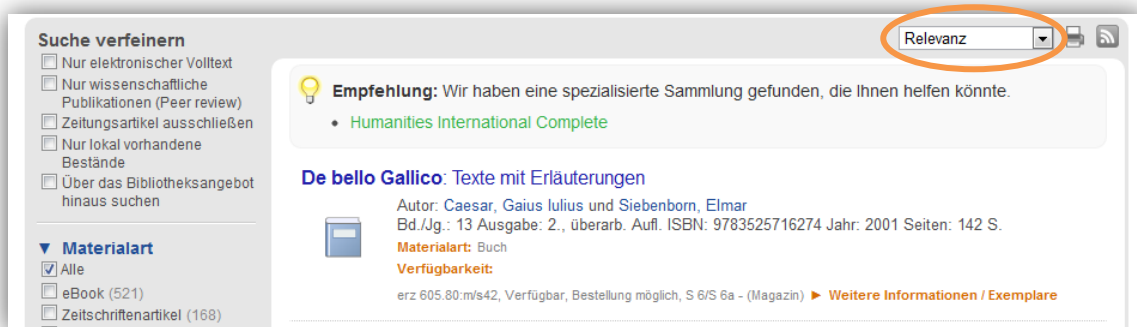
[Key to illustration 15:

Wählen ... Liste = select a term from the list

It is therefore not surprising that the search settings are not preserved after the entry of a search term, as the function is no longer visible. With regard to the recommended search terms it must also be noted that for the German version of KonSearch the search terms and their description come from the English Wikipedia.

There were also problems with the sorting of the search results in the results display, as the sort function was simply ignored.

**Illustration 16: Sort function in KonSearch (formative user test)**

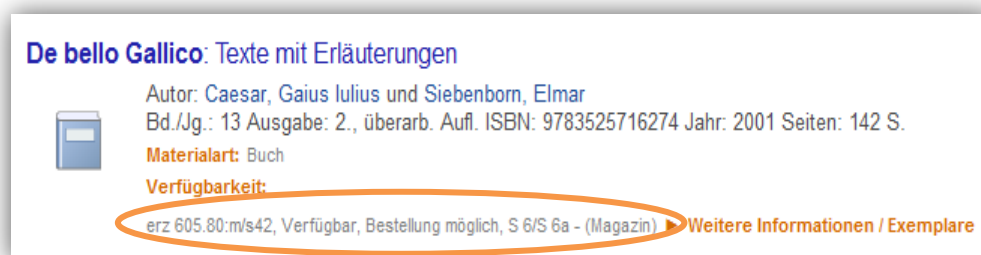


[Key to illustration 16:

Relevanz = relevance

When asked, the reason given for not using the sort function was that it was simply not noticed by the test subjects because of the lack of caption. Poor visibility was a reason for a further interaction difficulty. The availability display of a physical book in the library stock could only be identified by the test subjects with difficulty.

**Illustration 17: Availability display in KonSearch (formative user test)**



[Key to illustration 17:

Verfügbarkeit = availability

verfügbar = available

Bestellungsmöglich = available to order

WeitereInformationen = further information

Exemplare = copies]



The statement made by one test person explains this problem: “Everything that is grey in the Internet is useless information”. The information about availability is therefore simply ignored. A final problem was identified with the transfer of KonSearch into other systems. Such a transfer is necessary for example, if a specific title needs to be bookmarked via OPAC, an eBook can only be used on the website of the supplier or an essay is only available from a specific database. Sometimes in the course of this transfer a link resolver intermediate page is indicated, on which all information about the selected title is shown again:

### Illustration 18: Link resolver intermediate page (formative user test)



[Key to illustration 18:

Suchergebnis = search result

Suche verfeinern oder Kriterien ändern = refine search or alter criteria

Deutsch = German

Zitat...speichern = citation: send as email or export/save citation

Zugang zum Volltext = access to full text

Lizenziertes Zeitraum ... bis heute = licence period 01.09.1990 to present

Links zum Inhalt = links to content    Artikel = article    Zeitschrift = journal

Ressource = resource

Weitere Volltext-Optionen = further full text options

Suche nach Volltext-Zeitschriften ... Konstanz = search fulltext journals (A-Z list) of University of Konstanz

Titel...Wörter = title contains all words

Suche = search]

Here it is necessary to click again on the articles (or the eBook) that one would like to view. When and why it was necessary at all to take this intermediate step was, however, not clear to the test subjects.

By observing and surveying the test persons, difficulties were exposed in particular with the following interactions:

- Narrowing of results according to content type and date of publication
- Saving of results
- RSS feed
- Entry of search terms
- Preserve search settings
- Recommendations for search terms
- Sorting of list of results
- Availability display
- Transfer to other systems

In conclusion the average ASQ rating of the different task types to be performed as well as the average score overall provide another overview of the overall impression of the test subjects of KonSearch:

**Table 11: ASQ evaluation  
(formative user test)**

Type of search	ASQ
Explorative search	1,42
Targeted search	1,96
Refinement of search	1,31
Other functions	1,58
Other	1,31
<b>Average:</b>	<b>1,52</b>

**Remarks:**

Each score represents the average of the test subjects surveyed. The best imaginable score would be 1.0 and the worst 7.0.

This shows that the refinement of the search in particular was rated as very positive. The survey subjects also gave a better rating to the explorative search than to the targeted search. Overall the usability of the system achieved a very good score.

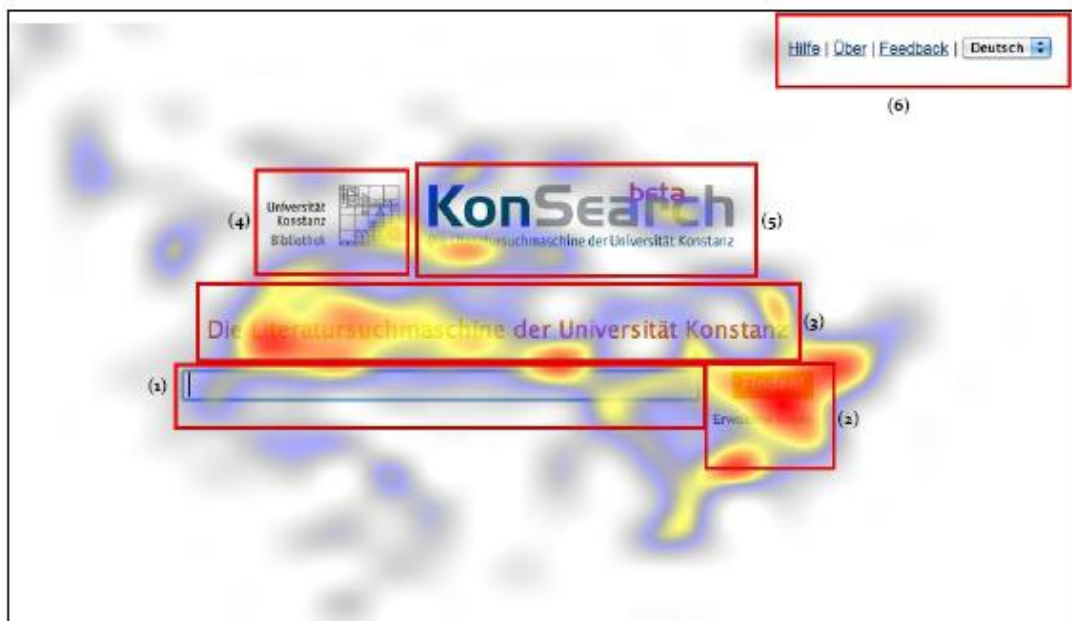
### 3.3.4 Eye-tracking

In the eye-tracking study the main focus was put on the study of the graphic layout of KonSearch. It was examined, whether specific design elements particularly attract the attention of the users, whether different aspects of the design correspond to the expectations of the users and whether the different graphic layout of the lists of results of KonSearch and OPAC has an

impact on the search. The SUS was also used to determine the usability of the system as a whole.

The study of the ‘eye-catchers’ was restricted to different content fields on the home page, in the list of results and in the advanced search display, on which the gaze of the test subjects could fall. The empty field without text, illustrations etc. was also taken into consideration here. On the home page (see illustration 19, p. 53) the relevant viewing fields were (1) the search input field, (2) the Find button, (3) the description text ‘The literature search engine of the University of Konstanz’, (4) the university logo, (5) the KonSearch logo and (6) the field Help/Feedback etc.. The average length of time for which the test subjects were fixed on the different viewing fields was measured. The heat map of the home page gives a first clue as to how long the relevant fields were viewed for. Red signifies a long time, whereas blue signifies a short time:

**Illustration 19: Heat map showing the viewing fields of the KonSearch home page (eye-tracking)**



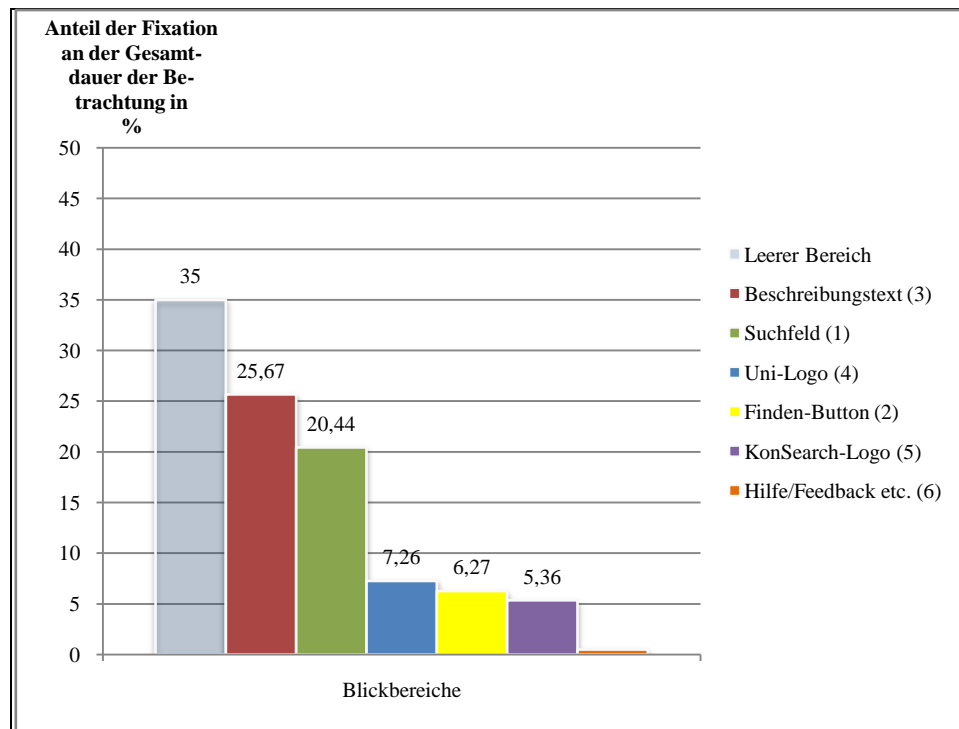
[Key to illustration 19:

Hilfe = help      über = about      Deutsch = German  
 Finden = Find  
 ErweiterteSuche = advanced search

It can be seen here that smaller viewing fields tend to be coloured red, as the gaze of the test subject is entirely focused on one place, whilst in the larger fields it wanders more and therefore the colour here tends to be blue.

The average fixation on a field in proportion to the total viewing time enables an even more detailed comparison of the different viewing fields:

**Illustration 20: Fixation on viewing fields on the home page (eye-tracking)**



[Key to illustration 20:

Anteil..in % = Fixation in proportion to total viewing time in %

Leerer Bereich = emptyfield  
 Beschreibungstext = descriptiontext  
 Suchfeld = search field  
 Uni-Logo = university logo  
 Finden-Button = Find button  
 KonSearch-Logo = KonSearch logo  
 Hilfe/Feedback etc. = help/feedback etc.

Blickbereiche = viewing fields]

**Remarks:**

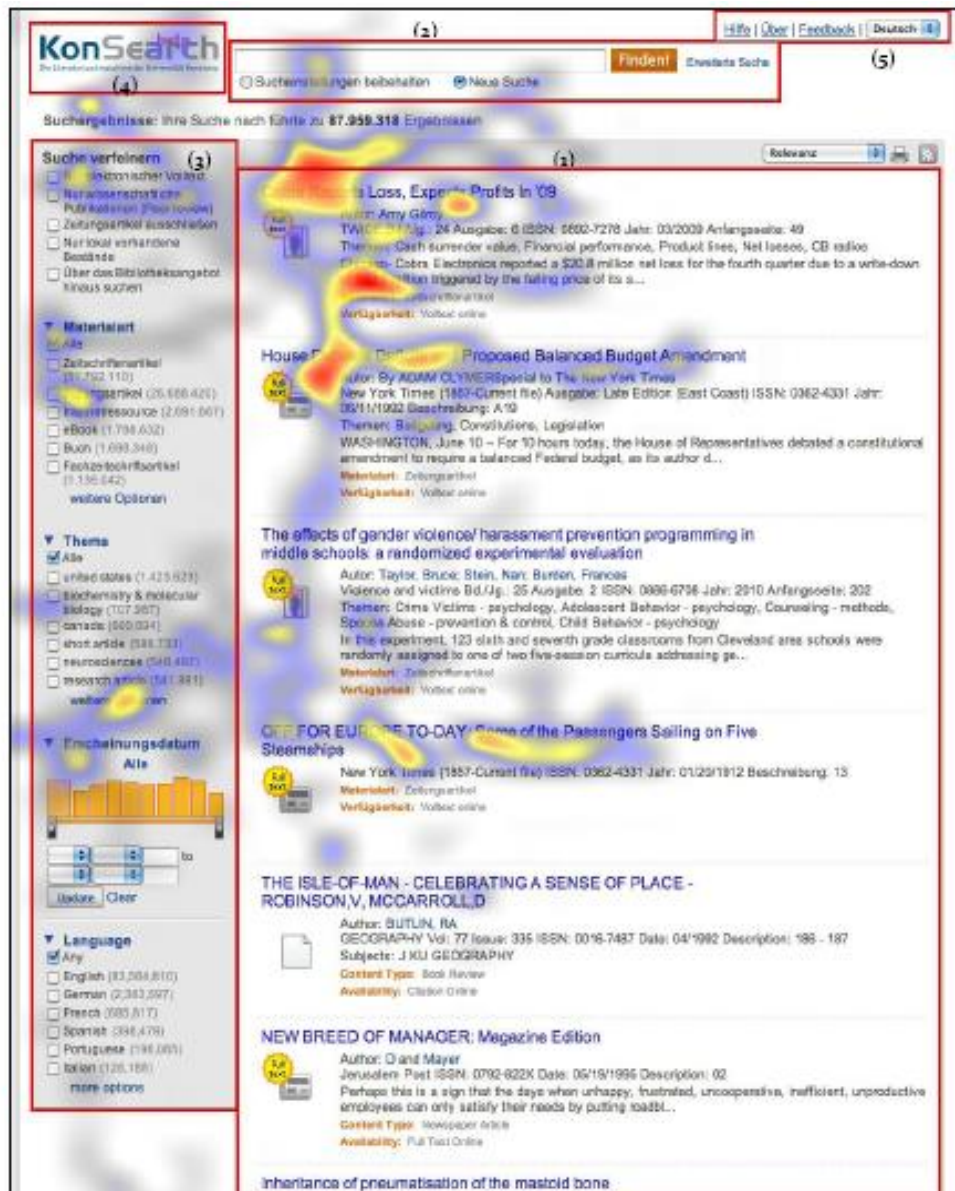
**This shows the proportion of the total viewing time spent viewing specific fields in %.**

**N=6**

The description text and the search field in particular have a relatively high fixation proportion. These are therefore the fields that overall were viewed most intensively by the test subjects on the home page. On the other hand the test persons did not fix their gaze on the help/feedback etc. field at all. Both logos have a relatively low fixation.

The list of results of KonSearch (see illustration 21, p. 56) was divided into the viewing fields (1) results display, (2) search field and Find button, (3) search facets, (4) KonSearch logo and (5) help/feedback etc. The viewing intensity can be illustrated here also by means of the heat map.

**Illustration 21: Heat map showing the viewing fields of the KonSearch results list (eye-tracking)**



[Key to illustration 21:

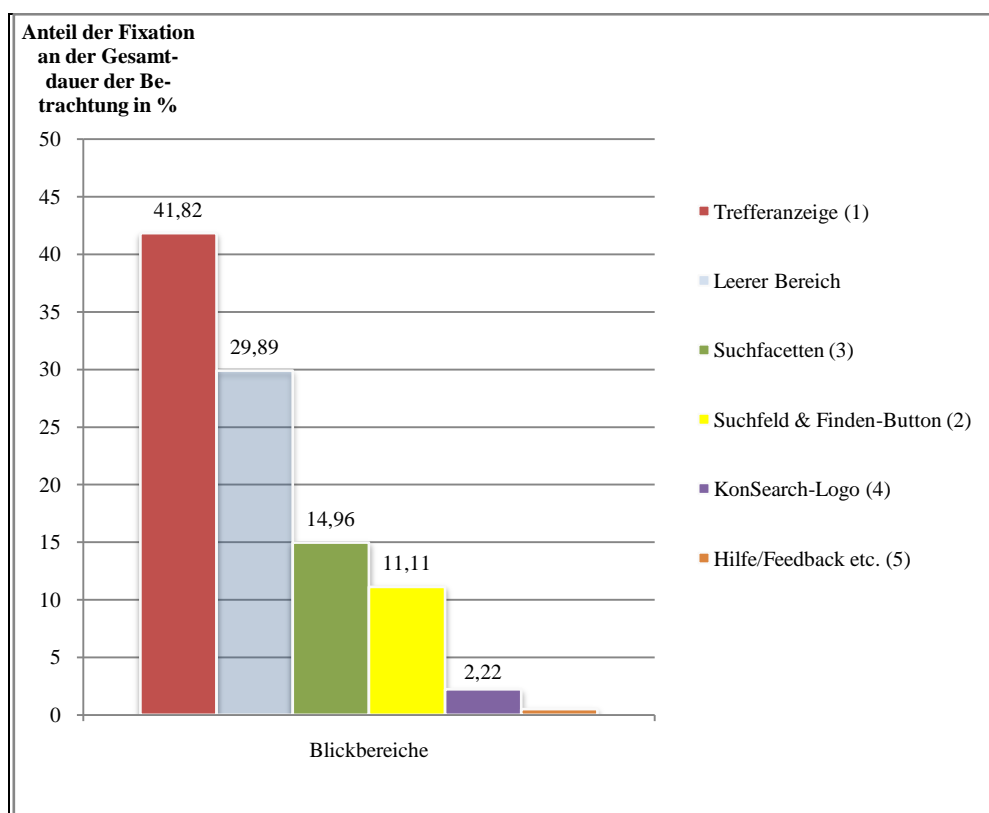
- Hilfe = help
- über = about
- Deutsch = German
- Finden = find
- ErweiterteSuche = advanced search
- Sucheinstellungenbeibehalten = preserve search settings
- NeueSuche = new search
- Suchergebnisse...Ergebnissen = search results: Your search for ...returned...results
- Relevanz = relevance
- Sucheverfeinern = refine search
- Nur...Volltext = electronic full text only
- Nur...review = academic publications only (peer review)
- Zeitungsartikel... = exclude newspaper articles
- Nur...Bestände...locally available items only
- Über...suchen = widen search beyondlibrary content

Materialart = content type  
 Alle = all

Zeitschriftenartikel = journalarticle  
 Internetressource = web resource  
 Buch = book  
 Fachzeitschriftenartikel = academic journal article  
 Thema – topic  
 Erscheinungsdatum = date of publication  
 Alle = all]

The relative proportion of average fixation on the viewing fields confirms the first impression of the heat map, that the results display is the most intensively viewed field:

**Illustration 22: Fixation on viewing fields in the list of results (eye-tracking)**



[Key to illustration 22:

Anteil..in % = Fixation in proportion to total viewing time in %

Trefferanzeige = results display

LeererBereich = empty field

Suchfacetten = search facets

Suchfeld & Finden-Button = search field and Find button

KonSearch-Logo = KonSearch logo

Hilfe/Feedback etc. = help/feedback etc.

Blickbereiche = viewing fields]

**Remarks:**

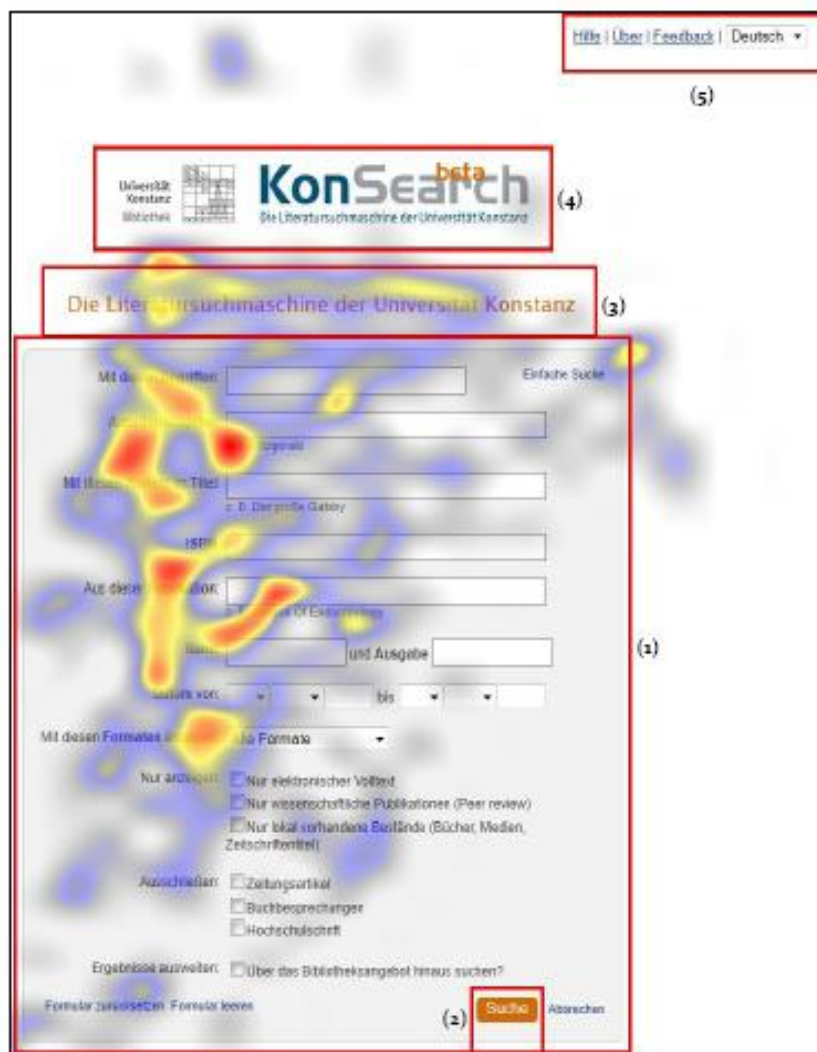
This shows the proportion of the total viewing time spent viewing specific fields in %.

N=6

As with the study of the home page, it is also clear here that the help/feedback etc. field was not viewed by the test subjects. The logo also has a relatively small fixation proportion when viewing the list of results.

The subdivision of the advanced search (see illustration 23, p. 59) produced the viewing fields (1) search criteria, (2) Search button, (3) description text, (4) KonSearch- & Uni-logo as well as (5) help/feedback etc.. The heat map for the advanced search shows the intensity with which these fields are viewed:

**Illustration 23: Heat map showing the viewing fields in the advanced search (eye-tracking)**



[Key to illustration 23:

Hilfe = help      über = about      Deutsch = German

Mit diesen Begriffen = with these terms      Einfache Suche = basic search

Autor/Herausgeber = author/publisher

Mit diesen Wörtern im Titel = with these words in the title

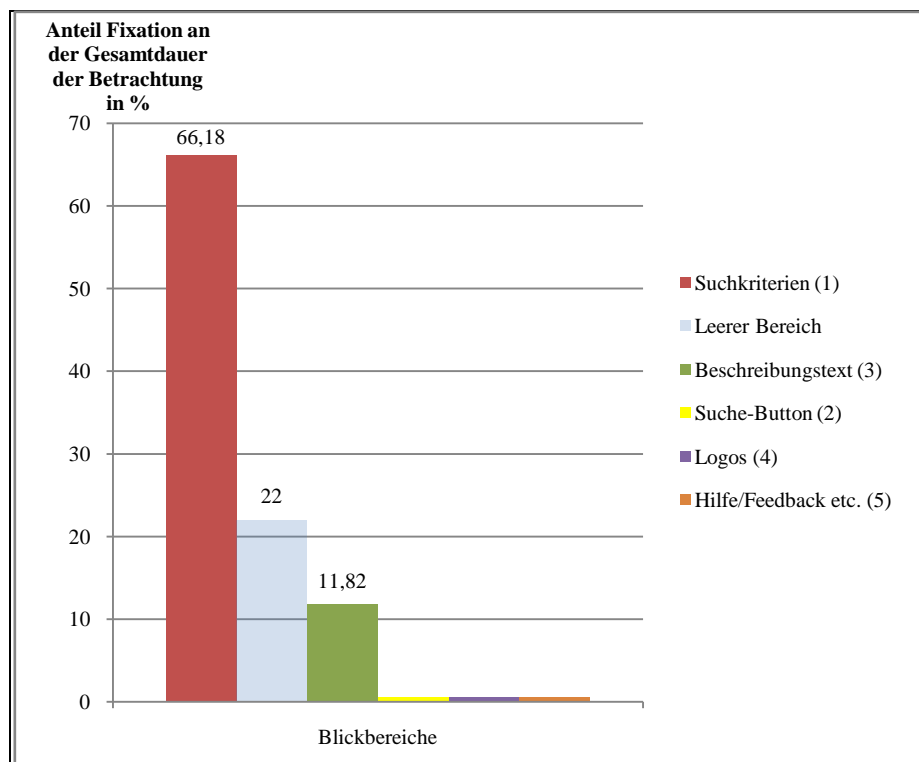
Aus dieser Publikation = from this publication



Band = volume und Ausgabe = and edition  
 Datum von...bis = datefrom...to  
 Mit diesen Formaten anzeigen = display in theseformats Alle Formate = all formats  
 Nur anzeigen = onlydisplay  
 Nur elektronischer Volltext = electronic fulltextonly  
 Nur wissenschaftliche Publikationen = academicpublicationsonly  
 Nur lokal vorhandene Bestände (Bücher, Medien, Zeitschriftentitel) = locally available items only (books, media, journaltitles)  
 Ausschliessen = exclude  
 Zeitungsartikel = newspaper articles  
 Buchbesprechungen = book review  
 Hochschulschrift = thesis  
 Ergebnisse ausweiten = widenresults  
 Über das Bibliotheksangebot hinaus suchen = widen search beyond library content  
 Formular zurücksetzen/Formular leeren = rest form/clear form  
 Suche = search  
 Abbrechen = end]

In this case also the evaluation of the average fixation confirms the impression obtained by the heat map, that the search criteria and the description text were viewed most intensively:

**Illustration 24: Fixation on viewing fields in the advanced search (eye-tracking)**



[Key to illustration 24:

Anteil..in % = Fixation in proportion to total viewing time in %

Suchkriterien = search criteria

Leerer Bereich = empty field

Beschreibungstext = description text



Suche-Button = Search button  
Suchfeld = search field  
Logos = logos  
Hilfe/Feedback etc. = help/feedback etc.

Blickbereiche = viewing fields]

**Remarks:**

**This shows the proportion of the total viewing time spent viewing specific fields in %.**

**N=6**

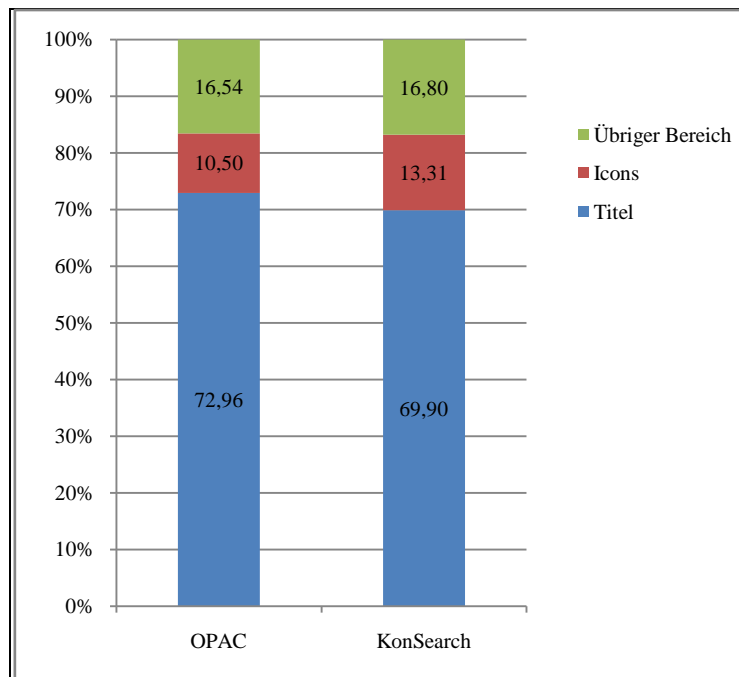
In addition to the help/feedback etc. field, neither of the Search button and logos fields were viewed by the test persons.

Overall, with regard to the evaluation of the viewing intensity of the home page, list of results and advanced search it can be stressed that the help/feedback etc. field was completely ignored by the test subjects. In the comparison of the fixation proportions of the different viewing fields it has a score of 0 every time. All the characteristic fields, i.e. search field, results display and search criteria, however, have a relatively high fixation proportion.

The list of results was not only tested for eye catchers but also examined by means of a comparison between OPAC and KonSearch. The test subjects were shown manipulated screenshots of the lists of results for both systems, in each of which the title of one book did not correspond to the other results. The test persons were asked to identify this book. Here too the average fixation proportion was determined, and the relevant fields here were the icons in the list of results, the titles in the list of results as well as the field 'other'.

A comparison of the average fixation shows that the proportions of viewing time of the different fields for OPAC and KonSearch are relatively equal:

**Illustration 25: Fixation when searching for a specific title in the list of results (eye-tracking)**



[Key to illustration 25:

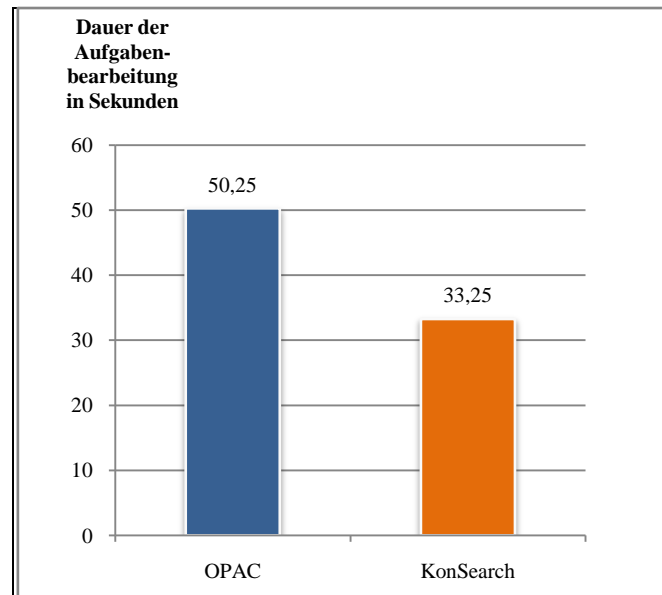
übriger Bereich = 'other' field  
Titel = titles]

**Remarks:**

This shows the proportions of the total viewing time spent viewing specific fields in %.  
N=6

For both systems the titles in the list of results were viewed considerably longer than the icons, but with KonSearch the icons were viewed a bit longer than with OPAC. However a clearly greater difference is evident when one looks at the completion time required:

**Illustration 26: Duration of completion of search for a specific title in the list of results (eye-tracking)**



[Key to illustration 26:

Dauer...Sekunden = task completion time in seconds

übriger Bereich = 'other' field

Titel = titles]

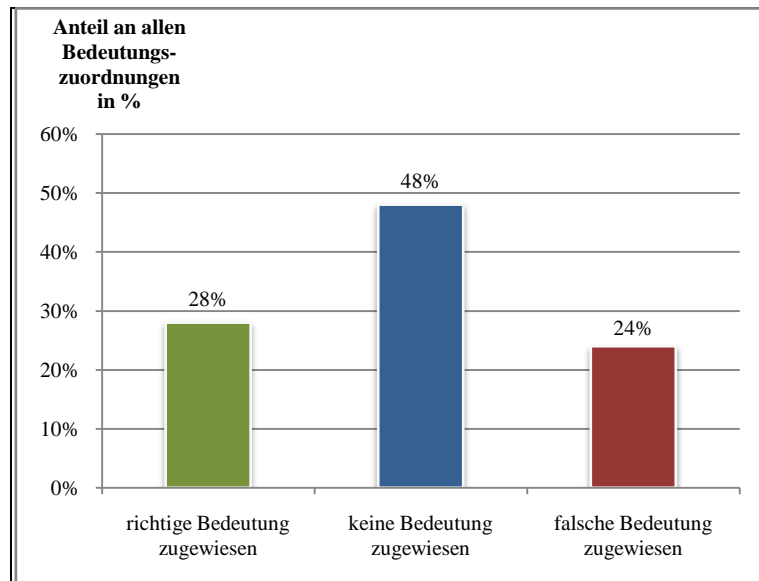
**Remarks:**

This shows the average time taken to search for a title in the list of results in seconds.

N=6

It is true that the book sought could only be identified by its title and the titles were viewed for somewhat less time when searching with KonSearch than when searching with OPAC; nevertheless the test subjects were able to complete the task with KonSearch much more quickly than with OPAC.

In the eye-tracking study it was also examined whether the meaning of the icons, whose purpose is to display the content type of the given title in the list of results, is actually clear to the test subjects. For this reason the test persons were asked about 14 different icons. They could assign the icons the proper meaning, the wrong meaning or no meaning at all. The evaluation shows that in not even one-third of the cases was the proper meaning assigned:

**Illustration 27: Assignment of meaning of icons**

[Key to illustration 27:

Anteil...in % = proportion of all assignments of meaning in %

richtige Bedeutung zugewiesen = proper meaning assigned

keine Bedeutung zugewiesen = no meaning assigned

falsche Bedeutung zugewiesen = wrong meaning assigned

**Remarks:**

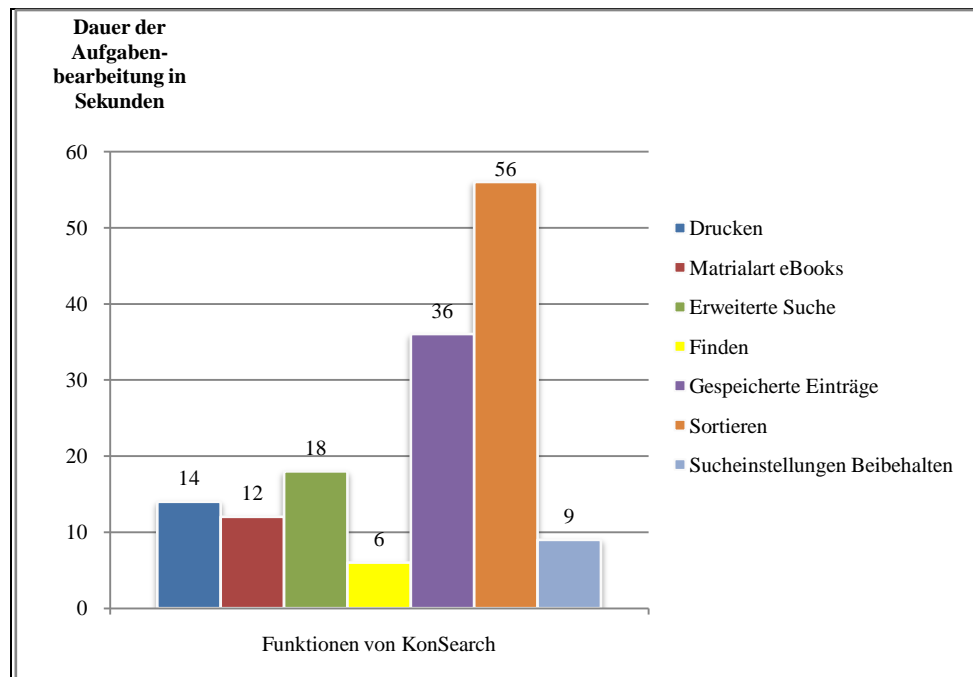
**This shows the proportion of all responses allocated to each response option in %.**

**N = 6**

In this respect there were however big differences between the individual icons (see appendix 8). The only icon that was assigned the proper meaning by all six test subjects was the eBook icon. The meaning of the icons for book, video recording and newspaper article were also mostly recognised in the correct way. Most of the other icons however were generally assigned the wrong meaning or no meaning.

Another task required the test subjects to search for specific KonSearch functions. The aim of this was to examine whether the relevant function was located in a place that was traceable by the test persons or whether they had problems in finding the functions. For this test again the average completion time for the search for a function was determined:

**Illustration 28: Completion time of search for specific KonSearch functions (eye-tracking)**



[Key to illustration 28:

Dauer...Sekunden = task completion time in seconds

Drucken = print

Materialart eBooks = content type eBooks

Erweiterte Suche = advanced search

Finden = find

Gespeicherte Einträge = saved entries

Sortieren = sort

Sucheinstellungen Beibehalten = preserve searchsettings

Funktionen von KonSearch = KonSearch functions]

**Remarks:**

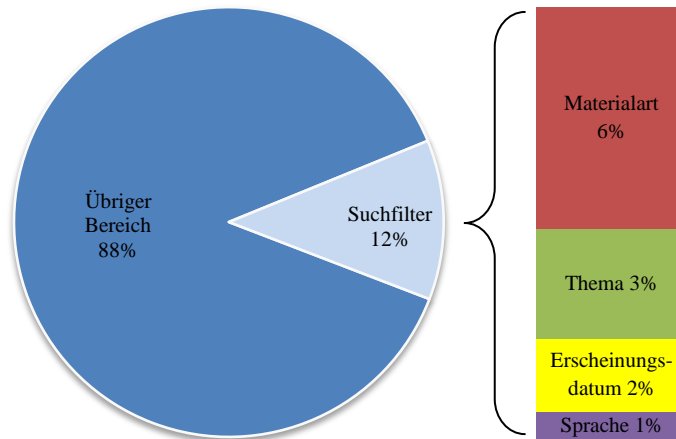
**This shows the average time taken to find the different functions in seconds.**

**N = 6**

The test subjects took a relatively long time to search for the saved entries and the sort function. The Find button and the ‘preserve search settings’ option were however found in less than ten seconds on average.

Another task concerned the question of whether the location of the search filters has an impact on their use. For this purpose a search task was set, in which the different search filters were to be used to narrow down the results. Here too the proportion of the average fixation on the different fields was determined:

**Illustration 29: Fixation on viewing fields when refining search (eye-tracking)**



[Key to illustration 29:

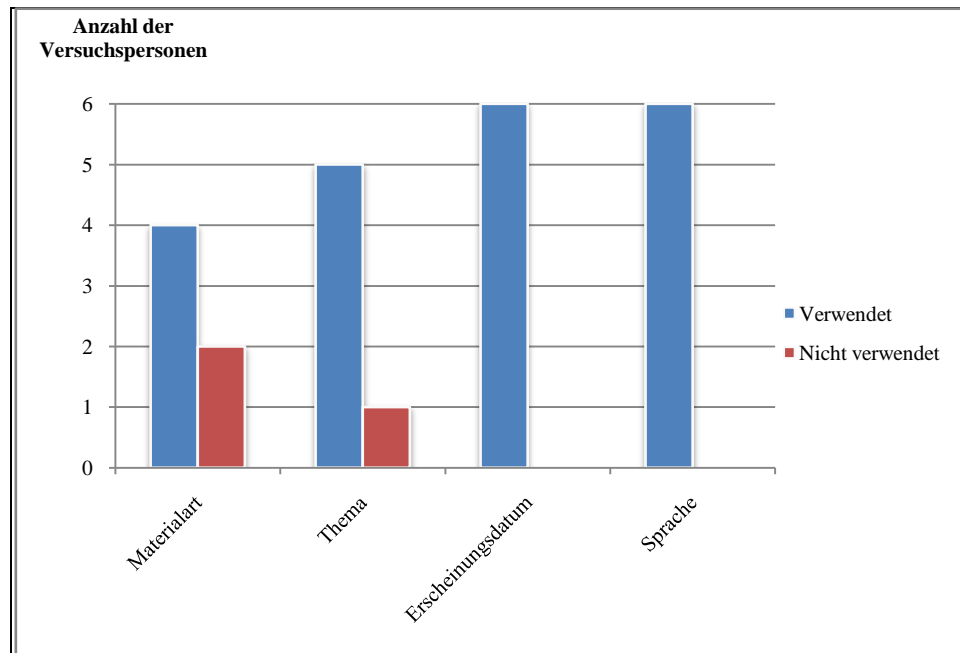
Übriger Bereich = 'other' field  
Suchfilter = search filter

Materialart = content type  
Thema = topic  
Erscheinungsdatum = date of publication  
Sprache = language]

**Remarks:**

This shows the proportion of total viewing time spent viewing specific search filters in %.  
N = 6

Although the search filters were viewed for a relatively short time overall in comparison to the 'other' field, almost all test subjects used all search filters:

**Illustration 30: Use of search filters (eye-tracking)**

[Key to illustration 30:

Anzahl der Versuchsperson = number of test subjects

Materialart = content type

Thema = topic

Erscheinungsdatum = date of publication

Sprache = language

Verwendet = used

Nicht verwendet = unused]

**Remarks:**

**This shows the number of test subjects who used a specific filter.**

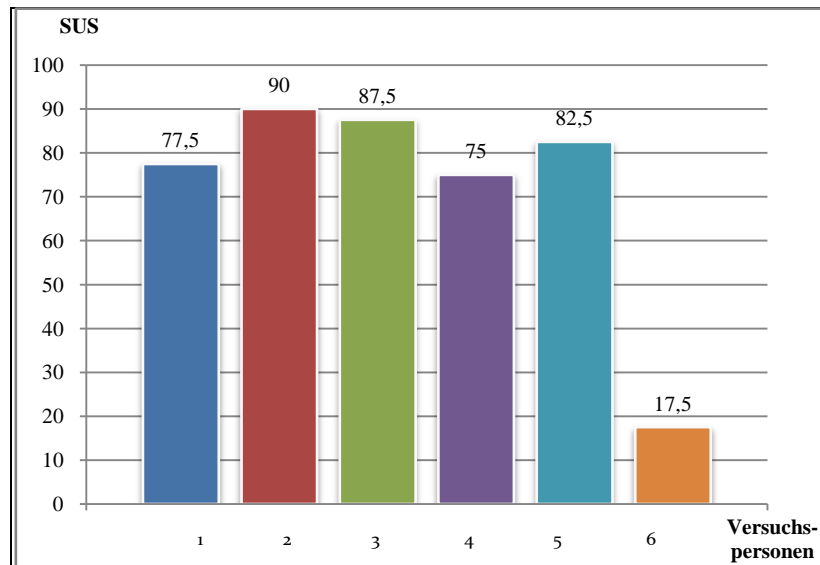
**N = 6**

It is however also clear from this graph that the location of the search filters does not appear to have any impact on their use<sup>19</sup>. The category located at the top, ‘content type’ was the most frequently unused, whilst the category ‘language’ located at the bottom was used by all test subjects to narrow down the results.

Finally in the eye-tracking study the usability of KonSearch was determined by means of the SUS. Here the score of the individual test subjects was very heterogeneous:

<sup>19</sup> There seems to be a negative association with a search filter that is positioned further up but is used less often, but this is not very plausible.

**Illustration 31: SUS evaluation for the individual test subjects (eye-tracking)**



[Key to illustration 31:

Versuchspersonen = test subjects]

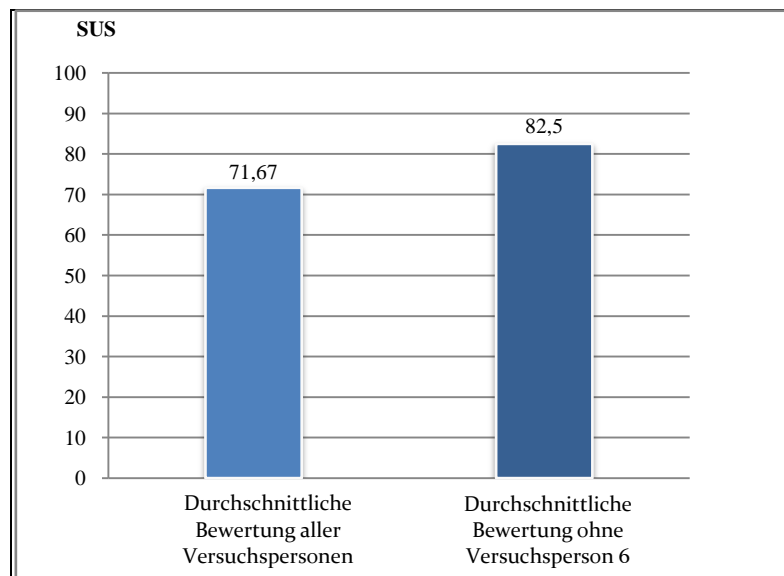
**Remarks:**

**Each score represents the average score of the survey subjects. The best imaginable score would be 100 and the worst 0.**

One test subject in particular is identified as an ‘anomaly’ in this respect, as the evaluation of the interaction with KonSearch with a score of 17.5 was comparatively very negative. For this reason, the average score of all the test subjects was calculated without taking the score of this test subject into account:



**Illustration 32: SUS evaluation for KonSearch (eye-tracking)**



[Key to illustration 32:

Durchschnittliche...Versuchspersonen = average score of all test subjects

Durchschnittliche...Versuchsperson 6 = average score without test person 6

**Remarks:**

**Each score represents the average score of the survey subjects. The best imaginable score would be 100 and the worst 0.**

Irrespective of whether or not the ‘anomaly’ is taken into account, KonSearch has a relatively high usability, which can be classified as ‘good’ to ‘excellent’. However, as the highest field ‘best imaginable’ is not achieved, there is still potential for improvement, so that usability can be further increased by measures to optimise the system. In order to define the most important fields of action in this respect, the next section presents a consolidation and interpretation of the relevant results as well as potential opportunities for improvement.

### 3.4 Consolidation and interpretation of results

The evaluation of the four studies described above must now be supplemented by a consolidation and interpretation of the results. This focuses on the seven research questions which constituted the basis of the entire evaluation of KonSearch (see table 2, p. 19). Here the fourth research question about specific interaction problems and the seventh research question about the comparison between KonSearch and the existing OPAC are to a large extent taken into account during the treatment of the remaining research questions. In addition, where interaction difficulties are exposed, possible recommendations for action are indicated, in order to optimise the usability of the system.

The first research question asked which specific requirements/expectations the student users of the library have of a search tool for the search for academic information and whether KonSearch fulfils these expectations. This question was discussed intensively, in particular with the Asking Users method. In a focus group requirements were determined and divided into requirement categories. These were then ranked according to their importance for the students with the aid of an online survey. It was also examined, whether KonSearch fulfils these requirements. The more important a requirement was rated and the more important the category to which it belongs was rated, the greater the need for optimisation must be rated, in case KonSearch does not fulfil this requirement. But even if the requirement is objectively fulfilled, but difficulties in this respect were established, improvement should be strived for.

The following table shows the three most highly rated requirement categories with the three most highly rated requirements for each of them:

**Table 12: Most important requirements of a literature search tool**

		Categories		
		<i>1<sup>st</sup></i>	<i>2<sup>nd</sup></i>	<i>3<sup>rd</sup></i>
<b>Require- ments</b>	<i>1<sup>st</sup></i>	<b>Search</b> Advanced search options (search explicitly for author, year of publication, etc.)	<b>Refinement of search</b> Topic	<b>Sorting of results</b> <b>Title</b>
	<i>2<sup>nd</sup></i>	Search via all publication Forms (books, eBooks, articles, etc.) in the same application	Locally available items at University of Konstanz	<b>Author</b>
	<i>3<sup>rd</sup></i>	Simple and clear access point (a single search field as with Google)	Content type (book, article, eBook etc.)	Relevance

**Remarks:**

**Requirements, that are not fulfilled by KonSearch, are marked in red.**

Almost all requirements shown are fulfilled by KonSearch. However, a sorting according to title and author cannot be performed with KonSearch. As these requirements were rated as very important, however, the criteria of title and author in the sorting of the list of results should also be made available to the users.

All other requirements are fulfilled, however difficulties and potential for improvement in these areas were determined in the other studies by the investigation of the fourth research question about specific interaction problems. Thus the formative user test showed for example that problems were caused for the test subjects in the advanced search (categories: 1<sup>st</sup> place,

requirements: 1<sup>st</sup> place) by the narrowing down according to content type (categories: 2<sup>nd</sup> place, requirements: 3<sup>rd</sup> place), as the designation of ‘format’ rather than ‘content type’ was selected here. According to the survey of the test persons, a change in this designation would be desirable. In the search via all publication forms (categories: 1<sup>st</sup> place, requirements: 2<sup>nd</sup> place), the subsequent transfer to other systems in particular caused problems for the test subjects in the formative user test, as it is structured differently according to the publication form and was not transparent to the test persons. One improvement option mentioned by the test subjects was that it should be possible with one click on the desired title to arrive directly at the relevant full text and not just at an intermediate page. Likewise, problems were identified in the basic search with one search field (categories: 1<sup>st</sup> place, requirements: 3<sup>rd</sup> place). The test persons in the summative and formative user test entered the criteria for narrowing down the search results directly into the search field, which led to unsuitable results or no results, as apparently not all meta data fields are searched. In particular it might be useful here to adjust the search algorithm and to put a reference in the input field:

### Illustration 33: Recommendation for improvement of the captioning of the input field



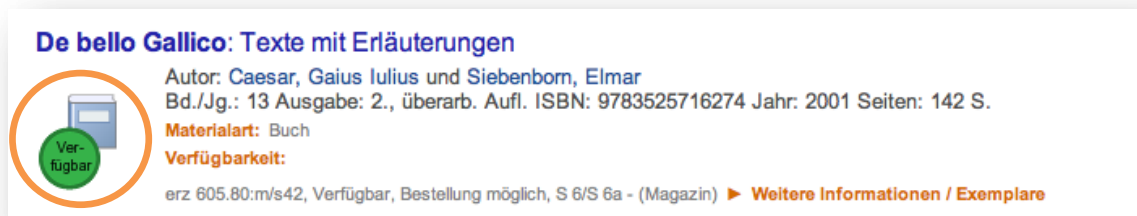
[Key to illustration 33:

Hilfe = help      über = about      Deutsch = German  
Finden = find      Erweiterte Suche = advancedsearch  
Schlüsselwörter eingeben = enter keywords]

The refinement of the search to locally available items (categories: 2<sup>nd</sup> place, requirements: 2<sup>nd</sup> place) is possible with KonSearch, but the formative user test showed that the display regarding the availability of local items was criticised as being not sufficiently visible. This problem

could be resolved by an optical highlighting of the availability display. One test subject made the suggestion: “Perhaps it would be more helpful if one were to work with colours such as green and red – signal colours.” (transation by Atlas Translations)

### Illustration 34: Recommendation for improvement of the highlighting of availability



[Key to illustration 34:

Verfügbarkeit = availability  
 verfügbar = available  
 Bestellmöglichkeit = available to order  
 WeitereInformationen = further information  
 Exemplare = copies]

With regard to the refinement of the search according to content type (category: 2<sup>nd</sup> place, requirement: 3<sup>rd</sup> place), it was established in the eye-tracking study that this narrowing option was used more rarely than the other search filters. However, as it is already ranked in first place, unfortunately no recommendation for improvement could be determined for this. One interaction problem with regard to the sorting of results (category: 3<sup>rd</sup> place) was indicated by the formative user test: test subjects did not use this function, because they could not find it. This result was also verified by the eye-tracking study, as here the test persons needed on average almost one minute to search for the sort function, by far the longest time. The visibility of the search function could be increased simply by including a caption:

### Illustration 35: Recommendation for improvement of the highlighting of the sort function



[Key to illustration 35:

Sortierungnach = sort according to  
 Relevanz = relevance]

The second research question asked whether KonSearch fulfils different information needs and whether different search requests with KonSearch are performed with effectiveness, efficiency

and satisfaction. In both the summative and formative user test different types of task were performed by the test subjects and then rated using the ASQ. The evaluations for both studies are shown in the following table:

**Illustration 36: ASQ evaluation for different task types  
(summative and formative user test)**

Summative user test		Formative user test	
Task type	ASQ	Task type	ASQ
Basic search	3,14	Explorative search	1,42
Advanced search	2,43	Targeted search	1,96
Refinement of search	2,57	Refinement of search	1,31
Search for eBook	2,48	Other functions	1,58
Thematic search	2,24	Other	1,31
<b>Average:</b>	<b>2,57</b>	<b>Average:</b>	<b>1,52</b>
<b>Standard deviation:</b>	<b>0,34</b>	<b>Standard deviation:</b>	<b>0,27</b>

**Remarks:**

Each score represents the average of the test subjects surveyed. The best imaginable score would be 1.0 and the worst 7.0.

This clearly shows that in the summative user test KonSearch was rated less highly than in the formative user test. Overall, however, the results of the evaluation were good in every respect. The standard deviation of 0.34 for the summative user test is larger than that of the formative user test of 0.27, which means that there is a greater difference in the scores of the different task types of the summative user test. The basic search can however be identified as an anomaly here (see section 3.3.2) and if its score is disregarded the standard deviation would be only 0.14. A small standard deviation shows that the different task types have fairly identical scores. As the scores are also positive, it can be stated that KonSearch has a high usability with regard to the performance of the different search requests and therefore fulfils these requests with effectiveness, efficiency and satisfaction.

The third research question concerned the electronic items of the library. It aimed to examine, whether electronic media items, in particular eBooks, can be searched for and found satisfactorily with KonSearch. The online survey attaches great importance to the requirements to enable a search via all publication forms in one single application (category: 1<sup>st</sup> place, requirement: 2<sup>nd</sup> place) and to narrow the search according to content type (category: 2<sup>nd</sup> place, requirement: 3<sup>rd</sup> place). A comparison of the ASQ evaluation of the summative and formative user tests, however, indicates heterogeneous results with regard to the rating of the search for an eBook:

**Illustration 37: ASQ evaluation for the search for an eBook  
(summative user test and formative user test)**

	KonSearch	OPAC
<b>Summative user test</b>	2,48	4,38
<b>Formative user test</b>	3,33	-

**Remarks:**

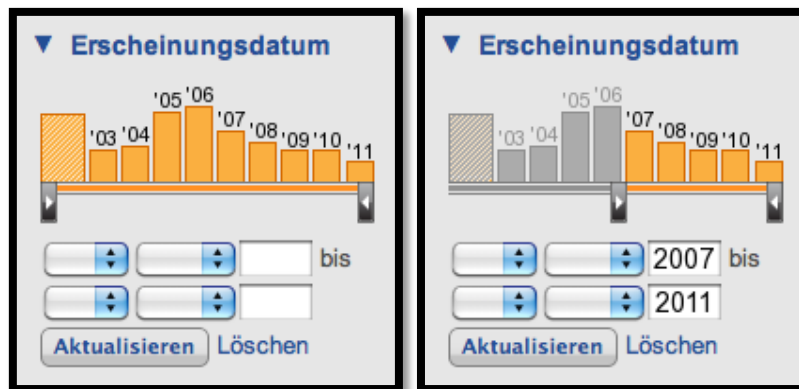
Each score represents the average of the test subjects surveyed.  
The best imaginable score would be 1.0 and the worst 7.0.

In the summative user test the search for an eBook is clearly rated more highly than in the formative user test. In general the latter also showed the described problems with narrowing down according to content type and the transfer to other systems, as can indeed be the case with the search for eBooks. An improvement in these areas might also lead to a higher score for the search for eBooks. In the summative user test the search for an eBook was clearly rated more highly in particular in the comparison between KonSearch and OPAC. Only two test persons made minor errors when they performed this task and the other five solved it without any problems. In addition, the eye-tracking study showed that the test subjects needed only 12 seconds on average to search for the function ‘narrowing according to content type: eBook’. This is the third best result for the task concerning the search for different functions. And even the eBook icon was correctly identified as such by the test persons. Thus the search for eBooks establishes overall that KonSearch performs better than OPAC and adequately fulfils the requirements with regard to the layout, but nevertheless there is still potential for improvement in this area, particularly with regard to the direct availability of the full texts.

The purpose of the fourth research question was to examine which specific interaction problems arise when searching with KonSearch and how they can be solved. The summative user test showed that the test subjects made relatively few major errors in the performance of the search tasks with KonSearch. Two of the three failures are due to the fact that the test persons were unable to identify a title in the list of results and overlooked it. In the eye-tracking study the test subjects were set the task of identifying a specific title in the list of results. The test persons needed on average 33.25 seconds to do this with KonSearch, but 50.25 seconds with OPAC. In comparison with OPAC, therefore, KonSearch fares relatively well in this task. This result does not therefore correspond with that of the summative user test. One reason for this could be that the test subjects in the summative user test had to search through more pages of results, which was not the case with the eye-tracking study. Another interaction problem that was identified in the summative user test is the high response time of KonSearch in updating the list of results after selecting a filter, and here probably only a technical solution could bring about an improvement.

The study that dealt even more intensively than the others with interaction problems with KonSearch was the formative user test. Here for example it was established that the test subjects found it difficult to understand the graphic, with which a search for the date of publication of the media can be narrowed down. The test persons gave as reasons for this the lack of clarity and absence of caption. A different structure could lead to an improvement in this case:

**Illustration 38: Recommendation for improvement of the structure of the graphic for narrowing down according to publication date**



[Key to illustration 38:

Erscheinungsdatum = date of publication  
 bis = until  
 Aktualisieren = update  
 Löschen = clear]

**Remarks:**

**On the left is the illustration without and on the right with narrowing down according to year of publication.**

Problems also arose in the formative user test with the use of the RSS feed. These resulted on the one hand from the fact that the test subjects did not even know what an RSS feed is and on the other hand from an unusual choice of colour. A different colour for the RSS feed icon and a somewhat more meaningful explanatory text could bring improvements:

### Illustration 39: Recommendations for improvement of RSS feed

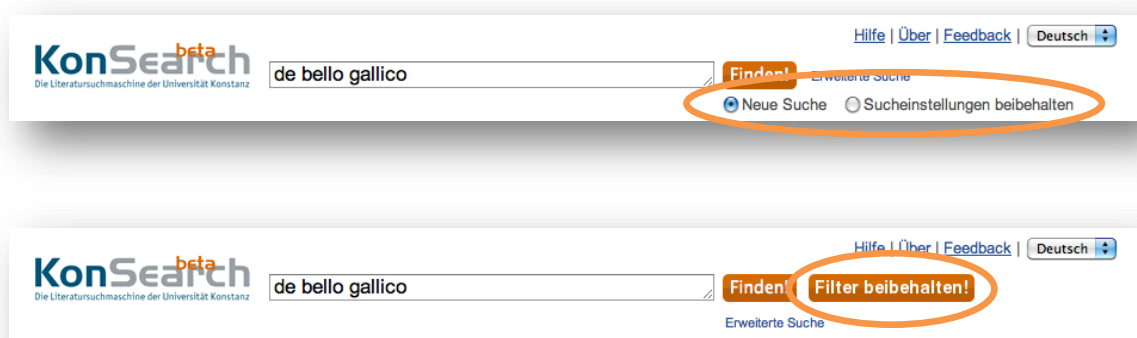


[Key to illustration 39:

RSS feed abonnieren:...erhalten = subscribe to RSS feed: receive notifications about new search results

The option 'preserve search settings' was also not used by the test subjects in the formative user test. However, the general inability to find it was possibly not the reason for this. In the eye-tracking study the option 'preserve search settings' was indeed the second fastest to be found in nine seconds on average. The problem was rather the recommendations for search terms, which appear when a text is entered into the search field and obscure the function. One option for improvement would be simply to insert the function beside the search field below the Find button or to display it in the form of a button:

### Illustration 40: Recommendations for improvement for the function 'preserve search settings'



[Key to illustration 40:

Hilfe = help            über = about        Deutsch = German  
 Finden = find            ErweiterteSuche = advanced search  
 NeueSuche = new search        Sucheinstellungenbeibehalten = preserve search settings  
 Filter beibehalten = preserve filters]



It would however be better if in the German version of KonSearch the recommendations for search themselves were connected with the German instead of the English Wikipedia.

The fifth research question was primarily dealt with in the eye-tracking study. The aim was to examine the impact of the design of the search interface and whether there are elements that strongly attract the attention of the users. One of the results of the eye-tracking study was that the relevant viewing fields of the home page, list of results and advanced search, in particular the search field, the results display and the search criteria are relatively intensively viewed in comparison to other viewing fields. However, the help/feedback etc. viewing field is not tracked by the test subjects. But it cannot be inferred that the field would still have been missed, even if the test subjects had been specifically asked to search for it. However this task was not taken into consideration in the eye-tracking study and so no further results can be given in this regard. A test was however performed to determine how quickly the test subjects were able to find some other functions. One noticeable result, which also corresponds with that of the formative user test, is the long time required by the test persons to find the saved entries. On average they needed 36 seconds to do this, which represents the second worst result. In the formative user test the test subjects criticised the fact that the location of the saved entries and the 'save' icon do not correspond with their experience of other systems. Thus a different icon and the location of the saved entries in the top right corner, as is the case with most shopping baskets on various websites, would correspond more closely to the experience of the users:

#### Illustration 41: Recommendation for improvement of the saving of results



[Key to illustration 41:

gespeicherte Einträge = saved entries

The purpose of the sixth research question was to examine how high the usability of KonSearch is overall. For this purpose the ASQ and SUS evaluations of the different studies could be

brought into play. The ASQ was used by the test subjects in the summative and formative user test to evaluate usability. In the summative user test the usability of both KonSearch and OPAC was rated:

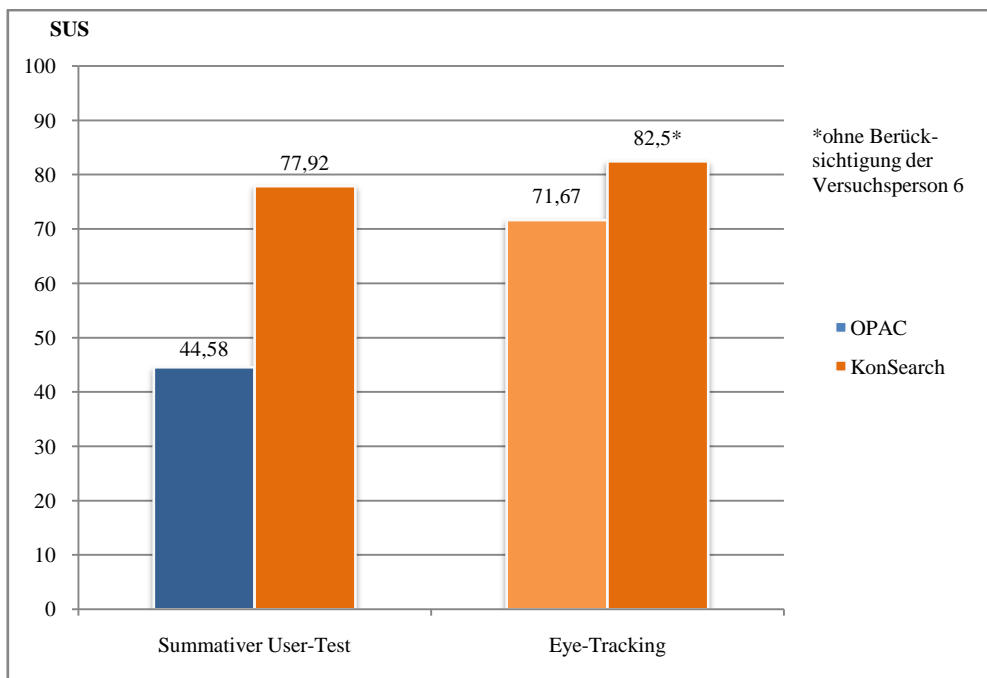
**Table 13: Consolidation of the ASQ evaluations  
(summative user test and formative user test)**

	KonSearch	OPAC
<b>Summative user test</b>	2,57	3,42
<b>Formative user test</b>	1,61	-

**Remarks:**

Each score represents the average of the test subjects surveyed.  
The best imaginable score would be 1.0 and the worst 7.0.

It can be seen that the usability result of 1.61 in the formative user test for the tasks performed with KonSearch by the test subjects is better than the result of 2.57 in the summative user test. Both scores can however be classified as positive, if one considers that the best imaginable score is 1.0 and the worst imaginable score is 7.0. The comparison with OPAC, which was carried out in the summative user test, shows clearly that KonSearch has a higher usability with regard to the performance of the tasks. If one looks at the results of the SUS, by means of which an evaluation of usability was made by the test subjects in the summative user test and in the eye-tracking study, this trend is shown to be even stronger:

**Illustration 42: SUS evaluation (summative user test & eye-tracking)**

[Key to illustration 42:

\*ohne... Versuchsperson 6 = disregarding test subject 6]

**Remarks:**

**Each score represents the average score of the survey subjects. The best imaginable score would be 100 and the worst 0.**

The SUS score of 44.58 for OPAC contrasts with a SUS score of 77.92 for KonSearch in the summative user test, which is a considerable difference. In the results of the eye-tracking study as well, KonSearch has a SUS score of over 70, and if one disregards test subject 6, this score is even higher at 81.5.

These evaluations show clearly that the usability of KonSearch can be described as 'good', although not 'best imaginable', and so there is still room for improvement. The results and recommendations for action shown above should therefore serve as incentives to further increase the usability of KonSearch.

## 4 Summary

In May 2011 the University of Konstanz library made the beta version of the new literature search engine *KonSearch* available to its users. In doing so they were reacting in the same way as many other libraries to changes in the behaviour of their users. A multitude of studies in recent years provide evidence of the fact that today search engines such as Google represent the starting point in the search for information. In the academic field as well, users increasingly prefer the simple and intuitive keyword search, the list of results in order of relevance and the direct access to electronic full texts to a more complex search with library search tools such as online catalogues and databases. And even if they do use these, the search behaviour of the users is similar to that used with Internet search engines: usually the search is made with one or few key words via one single input field, the predefined search settings are not altered and only the first results in the list of results are accessed anyway. In addition to setting up courses in information literacy the reactions of libraries to these findings often consist of efforts to adapt the search tools to the habits and preferences of the users. The enrichment of online catalogues with tables of contents, full texts and entries of electronic documents, the provision of metasearch engines for searching different sources and finally the establishment of search engine technologies represent frequently used strategies. As these measures are ultimately conducted for the library users, it makes sense to give the users themselves the opportunity to evaluate the new search tools and thereby to examine whether the efforts have been successful.

This evaluation was performed at the University of Konstanz in the course of the introduction of *KonSearch*. In collaboration with the *Human-Computer Interaction* working group in the Faculty of Information and Computer Science a usability evaluation of the new search system was performed, by means of which the perspectives of the students were to be examined. In addition to the questions as to which requirements the students have of a literature search engine and whether *KonSearch* fulfils these expectations, it was also examined whether the new search system fulfils different information needs and thus performs different search requests with effectiveness, efficiency and satisfaction. One particular search request concerned the search for eBooks, whose integration with the physical holdings of the library into one single search index is a significant innovation with regard to the already existing online catalogue.

It was also examined whether interaction problems arise when searching with *KonSearch* and if so, how they could be solved. The design of the search interface was also the subject of evaluation; for example it was examined whether specific eye-catchers are present and how long the students need to find individual functions in the search system. Finally the usability of *KonSearch* was also determined, on the one hand with regard to the performance of specific search requests and on the other hand for the system as a whole. The aim of these questions

was also to make a comparison with the existing online catalogue, in order to determine the usability of the system as a whole for it, as well as other comparative values.

The methods used to answer these questions were a focus group and an online survey, a summative and a formative user test as well as an eye-tracking study. For each of the separate studies small groups of between six and seven students were selected as test subjects but in the online survey almost 480 students participated. Because of the small size of the survey sample it was not possible to generalise the results to all students at the University of Konstanz, however the findings managed to highlight some tangible problems regarding searching with KonSearch, and can also serve as a basis for more quantitatively wide-ranging studies in the future.

One definite result is that the usability of KonSearch can be rated as relatively high. In particular in comparison with the online catalogue the new search system performs well with a System Usability Scale of over 70. This score lies between 'good' and 'excellent' on a scale ranging from 'worst imaginable' to 'best imaginable' and thus can be classified as above average. However, with a maximum achievable score of 100 it can be said that the literature search engine still has potential for improvement. KonSearch fulfils a higher proportion of the requirements mentioned by the students than the online catalogue, and this is particularly the case for the categories 'search' and 'refinement of search' that are rated as the most important. However there are deficiencies with regard to the category 'sorting of results' that is rated as the third most important: unlike the online catalogue, KonSearch offers no option to sort according to title and author, the two requirements rated as the most important in this category. Also the sort function was discovered relatively late by the students in comparison with other functions. Improved captioning and the addition of the sort criteria of title and author would therefore be desirable. Some other requirements rated as important were fulfilled in practice, but there are still problems with them, although these could be solved by more minor interventions such as for example changing the name of the search criteria 'format' in the advanced search to 'content type' or indicating available publications more clearly.

Also with regard to different special search requests the usability of KonSearch on the basis of the average After Scenario Questionnaire scores of 1.61 in the formative user test and 2.57 in the summative user test can be rated as good overall. Here the worst imaginable score would be 7, the online catalogue has an average score of 3.42. However, with regard to special search requests there are definitely opportunities for improvement. For example, in the basic search the problem arose that the students were not only entering key words such as title, topic or author name into the search field, but also the date of publication and content types. This led to unsuitable results or no result, and the students could not explain this. Remedial action would be possible here only by making an adjustment to the search algorithm. The refinement of the search was also criticised because updating the list of results after selecting a filter takes a very long time and the multitude of narrowing options results in a lack of clarity. The students had

problems searching for an eBook, and also accessing the result in the case of a printed book, if there was a transfer from KonSearch into another system. In particular the diversion to a link resolver intermediate page was not easy for them to trace and they would prefer direct access to the full text. In comparison with the search for an eBook with the online catalogue however, this search with KonSearch did achieve a much higher usability in the evaluation with the After Scenario Questionnaire (KonSearch: 2.48 / OPAC: 4.38).

Furthermore, many other specific interaction problems and recommendations for improvement were exposed by the usability study and are presented in this report. The University of Konstanz library as well as the company Serials Solutions can use them as incentives to make further adjustments to the search system. But even if not all recommendations are implemented, the presentation of specific problems in the search with KonSearch can nevertheless be useful, as these aspects can, for example, be mentioned in information literacy courses or research training. Finally however, it must be stressed that the relatively high usability of KonSearch, particularly in comparison with the online catalogue, is evidence that, with the introduction of the new literature search engine for the users of the University of Konstanz library, a search tool is now available, which better corresponds to their search habits and preferences and enables an effective, efficient and satisfactory search.

## Bibliography

Bangor, Aaron/Kortum, Philip T./Miller, James T. 2008: An Empirical Evaluation of the System Usability Scale, in: *International Journal of Human-Computer Interaction*, 24:6, pp. 574-594.

DOI:10.1080/10447310802205776.

Bangor, Aaron/Kortum, Philip T./Miller, James T. 2009: Determining What Individual SUS Scores Mean. Adding an Adjective Rating Scale, in: *Journal of Usability Studies*, 4:3, pp. 114-123.

URL: [http://www.upassoc.org/upa\\_publications/jus/2009may/JUS\\_Bangor\\_May2009.pdf](http://www.upassoc.org/upa_publications/jus/2009may/JUS_Bangor_May2009.pdf)

(as at: 21 October 2011)

Blenkle, Martin/Ellis, Rachel/Haake, Elmar 2009: Next generation catalogues: Review of E-LIB Bremen, in: *Serials*, 22:2, pp. 178-181.

DOI: 10.1629/22178

Brooke, John 1996: SUS: A 'quick and dirty' usability scale, in: Patrick W. Jordan et al. (Ed.): *Usability Evaluation in Industry*, London: Taylor and Francis, pp. 189-194.

URL: <http://www.usabilitynet.org/trump/documents/Suschapt.doc> (as at: 21 October 2011)

Calhoun, Karen et al. 2009: Online Catalogs: What Users and Librarians Want. An OCLC Report.

URL: <http://www.oclc.org/reports/onlinecatalogs/fullreport.pdf> (as at: 21 October 2011)

Connaway, Lynn Silipigni/Dickey, Timothy J. 2010: The Digital Information Seeker: Report of the Findings from Selected OCLC, RIN and JISC User Behaviour Projects.

URL:

<http://www.jisc.ac.uk/media/documents/publications/reports/2010/digitalinformationseekerreport.pdf> (as at: 21 October 2011)

Connaway, Lynn Silipigni/Dickey, Timothy J./Radford Marie L. 2011: "If It Is Too Inconvenient, I'm Not Going After It": Convenience as a Critical Factor in Information-seeking Behaviors.

URL: <http://www.oclc.org/research/publications/library/2011/connaway-lisr.pdf> (as at: 21 October 2011)

DIN EN ISO 9241-11: Ergonomische Anforderungen für Bürotätigkeiten mit Bildschirmgeräten, Teil II: Anforderungen an die Gebrauchstauglichkeit – Leitsätze (ISO 9241-11:1998); Deutsche Fassung EN ISO 9241-11:1998.

Ekens, Andy/Koster, Lukas 2011: Unified Resource Discovery Comparison.

URL: <http://sites.google.com/site/urd2comparison/home> (as at: 21 October 2011)

Ewert, Gisela/Umstätter, Walther 1999: Die Definition der Bibliothek, in: *Bibliotheksdienst* 33:6, pp. 957-971.

URL: [http://bibliotheksdienst.zlb.de/1999/1999\\_06\\_Bibliothekn01.pdf](http://bibliotheksdienst.zlb.de/1999/1999_06_Bibliothekn01.pdf) (as at: 21 October 2011)

Ferré, Xavier et al. 2001: Usability basics for Software Developers, in: *IEEE Software*, 18:1, pp. 22-29.

DOI: 10.1109/52.903160

Häder, Michael 2010: Empirische Sozialforschung: Eine Einführung, 2., überarbeitete Auflage, Wiesbaden: VS-Verlag für Sozialwissenschaften.

Hassenzahl, Marc/Beu, Andreas/Burmester, Michael 2001: Engineering Joy, in: IEEE Software, 18:1, pp. 70-76.  
DOI: 10.1109/52.903170

Hennies, Markus/Dressler, Juliane 2006: Clients information seeking behaviour. An OPAC transaction log analysis (Refereed Paper, ALIA 2006 Biennial Conference).  
URL: [http://conferences.alia.org.au/alia2006/Papers/Markus\\_Hennies.pdf](http://conferences.alia.org.au/alia2006/Papers/Markus_Hennies.pdf) (as at: 21 October 2011)

Klatt, Rüdiger et al. 2001: Nutzung elektronischer wissenschaftlicher Information in der Hochschulausbildung.. Barrieren und Potenziale der innovativen Mediennutzung im Lernalltag der Hochschulen. Kurzfassung, Dortmund.  
URL: <http://www.stefi.de/download/kurzfas.pdf> (as at: 21 October 2011)

Kohl-Frey, Oliver 2011: Zwischen Informationskompetenz und Informationsleichtigkeit. Die Einführung eines Discovery-Systems am Beispiel der Universität Konstanz.  
URL: [http://www.opus-bayern.de/bib-info/volltexte/2011/1134/pdf/Kohl-Frey\\_Bibliothe Kartag\\_2011\\_Informationsleichtigkeit.pdf](http://www.opus-bayern.de/bib-info/volltexte/2011/1134/pdf/Kohl-Frey_Bibliothe Kartag_2011_Informationsleichtigkeit.pdf)  
(as at: 21 October 2011)

Kostädt, Peter 2008: Innovative Recherchemöglichkeiten in Katalogen und Bibliotheksportalen, in: Evelinde Hutzler/Albert Schröder/Gabriele Schweikl (Eds.): Bibliotheken gestalten Zukunft. Kooperative Wege zur Digitalen Bibliothek, Dr. Friedrich Geißelmann zum 65. Geburtstag, Göttingen: Universitätsverlag, S. 101-113.  
URL: [http://epub.uni-regensburg.de/4564/1/hutzler\\_digitale\\_bibliothek.pdf](http://epub.uni-regensburg.de/4564/1/hutzler_digitale_bibliothek.pdf) (as at: 21 October 2011)

Lazar, Jonathan/Feng, Heidi Jinjuan/Hochheiser, Harry 2010: Research Methods in Human-Computer Interaction, Chichester: Wiley.

Lewandowski, Dirk 2010: Der OPAC als Suchmaschine, in: Julia Bergmann/Patrick Danowski (Eds.): Handbuch Bibliothek 2.0, München: de Gruyter Saur, S. 87-107.  
DOI: 10.1515/9783110232103.87

Lewis, James R. 1991: Psychometric Evaluation of an After-Szenario Questionnaire for Computer Usability Studies: The ASQ, in: SIGCHI Bulletin, 23:1, pp. 78-81.  
DOI: 10.1145/122672.122692

Mayfield, Ian et al. 2008: Next-generation library catalogues: Reviews of ELIN, WorldCat Local and Aquabrowser, in: Serials, 21:3, pp. 224-230.  
DOI: 10.1629/21224

Nielsen, Jakob 1999: Usability Engineering [reprint], San Francisco: Kaufmann.

Nienerza, Heike/Sunckel, Bettina 2011: Unser Katalog soll besser werden! Kataloge und Portale im Web 2.0- Zeitalter – Online-Umfrage für den HeBIS-Verbund vom 13.12.2010 bis 21.01.2011. ErgebnisübersichtGesamtauswertung.  
URL: [http://www.hebis.de/de/ueber\\_ uns/projekte/benutzerumfrage-2010/umfrage-2010-ergebnisse.pdf](http://www.hebis.de/de/ueber_ uns/projekte/benutzerumfrage-2010/umfrage-2010-ergebnisse.pdf). (as at: 21 October 2011)



- Raabe, Beate 2009: Bibliotheksleitbilder im internationalen Vergleich (= Berliner Handreichungen zur Bibliotheks- und Informationswissenschaft, Heft 258) Institut für Bibliotheks- und Informationswissenschaft der Humboldt-Universität zu Berlin.  
URN: urn:nbn:de:kobv:11-100101872
- Sarodnick, Florian/Brau, Henning 2011: Methoden der Usability Evaluation. Wissenschaftliche Grundlagen und praktische Anwendung, 2, überarbeitete und aktualisierte Auflage, Bern: Huber.
- Sauro, Jeff/Lewis, James. R. 2009: Correlations among Prototypical Usability metrics. Evidence for the Construct of Usability, in: CHI: Proceedings of the 27<sup>th</sup> Conference in Human Factors in Computing Systems (CHI 2009), Boston MS, pp. 1609-1618.  
DOI: 10.1145/1518701.1518947
- Stevenson, Karen et al. 2009: Next-generation library catalogues: Reviews of Encore, Primo, Summon and Summa, in: Serials, 22:1, pp. 68-82  
DOI: 10.1629/2268
- Tullis, Tom/Albert, Bill 2008: Measuring the User Experience. Collecting, Analyzing and Presenting Usability Metrics, Amsterdam et al.: Morgan Kaufmann/Elsevier.
- Universitätsbibliothek Regensburg 2009: Unser Katalog soll besser werden! Umfrage zum Regensburger Verbundkatalog.  
URL: <http://www.bibliothek.uni-regensburg.de/katalog/umfrage.phtml> (as at: 21 October 2011)
- Virzi, Robert A. 1992: Refining the Test Phase of Usability Evaluation: How Many Subjects Is Enough? In: Human Factors, 34:4, pp. 457-468.  
URL:  
<http://coursesite.uhcl.edu/hsh/PeresSc/Classes/PSYC5911www/Refining%20the%20test%20phase.pdf> (as at 21 October 2011)
- Wilmsmeier, Silke 1999: "...und was haben die Benutzer davon?" Kundenorientierung im Bibliotheks- und Informationswesen, in: Bibliothek, Forschung und Praxis, 23:3, S. 277-315.  
DOI:10.515/bfup.1999.23.2.277
- Wong, William et al. 2009: JISC User Behaviour Observational Study. User Behaviour in Resource Discovery: Final Report.  
URL:  
<http://www.jisc.ac.uk/media/documents/publications/programme/2010/ubirdfinalreport.pdf> (as at 21 October 2011)

## Appendix

<b>Appendix 1: Screening questionnaire .....</b>	<b>77</b>
<b>Appendix 2: Requirements of a literature search system .....</b>	<b>79</b>
<b>Appendix 3: Online questionnaire .....</b>	<b>80</b>
<b>Appendix 4: Tasks in the summative user test .....</b>	<b>88</b>
<b>Appendix 5: Tasks in the formative user test .....</b>	<b>90</b>
<b>Appendix 6: Tasks in the eye-tracking study .....</b>	<b>92</b>
<b>Appendix 7: ASQ evaluation of the formative user test .....</b>	<b>98</b>
<b>Appendix 8: Evaluation of icons task in the eye-tracking study .....</b>	<b>99</b>

## Appendix 1: Screening Questionnaire

1. Sex:  male  female
2. Age: \_\_\_\_\_
3. Mother tongue: \_\_\_\_\_
4. Do you wear glasses?  yes  no
5. Please say which subject you are currently studying or in which field you are taking your degree:
- \_\_\_\_\_

6. Which semester are you in? \_\_\_\_\_

7. What is your intended degree? \_\_\_\_\_

8. Are you writing your thesis or are you planning to start this in the next semester?
- yes  no

9. How confident are you with using computers? Give a score using the school marks scale

<b>very good</b> <b>(1)</b>	<b>good</b> <b>(2)</b>	<b>satisfactory</b> <b>(3)</b>	<b>fair</b> <b>(4)</b>	<b>poor</b> <b>(5)</b>	<b>weak</b> <b>(6)</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. How often do you use these search options? Please mark with a cross where applicable.

	<b>never</b>	<b>rarely</b> (less than once a month)	<b>occasionally</b> (about once a month)	<b>often</b> (about once a week)	<b>very often</b> (several times a week)
Google	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Google Scholar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online catalogue of university library	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KonSearch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. Do you use other search options? \_\_\_\_\_

12. How do you rate your knowledge of the options mentioned? Give a score using the school marks scale.

	<b>very good (1)</b>	<b>good (2)</b>	<b>satisfactory (3)</b>	<b>fair (4)</b>	<b>poor (5)</b>	<b>weak (6)</b>
Google	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Google Scholar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online catalogue of university library	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KonSearch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix 2: Requirements of a literature search system

Search	Refinement of results	Sorting	Presentation	Help	Exchange & cooperation	Personalisation & search notification
Advanced search options (search explicitly for author, year of publication etc.)	Topic	Title	Preview of a result (additional information, abstract etc.)	Frequently asked questions (FAQ)	Review / comment on media	Search settings can be defined and saved (lanuges, specialist areas etc.)
Search via all publication forms (books, eBooks, articles etc.) in the same application	Locally available items at University of Konstanz	Author	Display of number of results	Context-sensitive help (e.g. display of help texts, if you move the mouse over an element)	Assess media	View list of media previously viewed or borrowed
Simple and clear access point (a single search as with Google)	Content type (book, article, eBook etc.)	Relevance	Display of results as a list as in Google	Detailed help texts	Index / tag media	Search results can be permanently saved
Rapid system respond time	Elektronic full texts	Year of publication	Display of definitions / explanations of search term	Direct contact with a librarian b instant messaging (chat, Skype etc.)	Draw up common lists of results	Export of saved search results in different citation formats into reference management systems
Recommendation of other search tools (e.g. more extensive academic database) based on search entry	Available media (not out on loan)	Content type (book, article, etc.)	Display of cover illustrations	Feedback / question form	Extend recommendations via social networks (e.g. Like button etc.)	Send search results by email
„Did you mean...?“ type suggestions for improvement	Year of publication	Shelf mark	Presentation of results as table	Navigation in system by keyboard		Save personal comments about media
Automatic completion of search terms during input	Academic publications		Grafic presentation of list of results according to separate criteria (e.g. in diagram form)			Personal recommendations based on previous search requests (“This might also be of interest to you.”)
Recommendations such as „Users who viewed X, also found Y interesting.“	Language		Multilinguism of application			Notifications about new search results (RSS feeds, email)
Display of results during input (Search-as-you-type)	Course material		Optimised presentation on smartphones			Literature search option from iGoogle, Facebook and other services (widgets)
						Layout can be adjusted (change colours, move elements etc.)

## Appendix 3: Online questionnaire

0% complete

### Thank you for your interest in our study!

Since May 2011 the new literature search engine KonSearch has been available to you to search for books, ebooks, journal articles etc. In a comprehensive usability study the University of Konstanz Library, together with the Institute of Human-Computer Interaction aims to determine the interests and wishes of the users, in order to be able to develop and improve the new system.

Want to know more? Then please take about **10 to 15 minutes** to complete the following short questionnaire. **It's worth taking part:** you can contribute to the improvement of the new literature search engine and win a **book token** worth € 25 !

You can try out the new search engine at any time: KonSearch (the link opens a new window). But you don't necessarily have to know anything about the search engine to fill in the questionnaire.

At the end of the questionnaire you have the option of giving your email address, so that you can take part in the draw for the book token and be informed about the results of the study.

All data will of course be used exclusively and **anonymously** for the purposes of research and with the aim of improving the services of the University of Konstanz library. **Under no circumstances will the data be passed to third parties!**

[Next](#)


---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz

8% complete

### 1. What is your gender?

- male  
 female

### 2. How old are you?

Age 29

### 3. Please say which subject you are currently studying or in which field you are taking your degree. If you are not studying, please state your profession.

Course of study Information Engineering

### 4. What is your intended degree? If you are not currently studying, please select the highest educational qualification you have achieved. If this is not available in the selection, please choose "other".

Masters

### 5. Which semester are you currently in? If you are not currently studying, please write "N/A".

A semester means all semesters in which you have hitherto taken papers in your subject area.

Number of semesters 10 N/A

### 6. What is your mother tongue?

Mother tongue German

[Back](#)
[Next](#)


---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz

17% complete

**On the following pages you will find different aspects that can be significant for a literature search engine. Please sort the terms according to how important they are to you personally for a literature search.**

You will find all the individual terms on the left side of the window in a light blue field. Please drag this with the mouse into a numbered field on the right side of the window.

You can also move the individual terms within the numbered fields or if necessary store them again on the left side of the screen if for example you would like to resort them.

**Please note:**

- 1) All terms on the left side must be integrated into the numbered fields!
- 2) The item that you feel is the most important should be put at the very top and the least important item must be put at the very bottom.

[Back](#)

[Next](#)

---

Human-Computer Interaction, University of Konstanz Library, University of Konstanz

25% complete

### 7. Which functions in the “search” field are important for you?

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

<b>Recommendations such as “users who viewed X also found Y interesting.”</b>	1
<b>Recommendations of other search tools (e.g. more extensive academic database) based on search entry</b>	2
<b>Display of results during input</b>	3
<b>Automatic completion of search terms during input</b>	4
<b>Rapid system response time</b>	5
<b>Simple and clear access point (a single search as with Google)</b>	6
<b>“Did you mean...?” type suggestions for improvement of the search request</b>	7
<b>Advanced search options (search explicitly for author, year of publication, etc.)</b>	8
<b>Search via all publication forms (books, eBooks, articles etc.) in the same application</b>	9

[Back](#)

[Next](#)

---

Human-Computer Interaction, University of Konstanz Library, University of Konstanz

3% complete

**8. Which aspects in the “refinement of search” are important for you? “Refinement means that you can narrow down the search results with other criteria.**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

**I would like to narrow the search to / according to...**

<b>Available media (currently not out on loan)</b>	1
<b>Course equipment</b>	2
<b>Year of publication</b>	3
<b>Language</b>	4
<b>Academic publications</b>	5
<b>Topic</b>	6
<b>Items available at the University of Konstanz</b>	7
<b>Content type (book, article, eBook etc.)</b>	8
<b>Electronic full texts</b>	9

[Back](#)[Next](#)



42% complete

**9. You can sort the “results” of your search according to different criteria. Which criteria are the most important to you?**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

**I would like to sort according to...**

<b>Title</b>	1
<b>Author</b>	2
<b>Content type (book, article, eBook etc.)</b>	3
<b>Year of publication</b>	4
<b>Relevance</b>	5
<b>Shelf mark</b>	6
<b>Availability (out on loan or not? )</b>	7

[Back](#)[Next](#)

50% complete

**10. Which functions in the field of graphic “presentation” are important for you?**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

<b>Optimised presentation on mobile devices</b>	1
<b>Display of number of results</b>	2
<b>Preview of a result (additional information, abstract, etc.)</b>	3
<b>Multilingualism of application</b>	4
<b>Graphic presentation of list of number of results according to separate criteria (e.g. in diagram form)</b>	5
<b>Presentation of results as in Google</b>	6
<b>Display of definitions/explanations of search terms</b>	7
<b>Presentation of results as table</b>	8
<b>Display as cover illustrations</b>	9

Back Next

---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz

58% complete

**11. Which functions in the “help” field are important for you?**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

<b>Detailed help texts</b>	1
<b>Context-sensitive help (e.g. display of help texts, if you move the mouse over an element)</b>	2
<b>Frequently asked questions (FAQ)</b>	3
<b>Navigation in system by keyboard</b>	4
<b>Feedback/question form</b>	5

Back Next

---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz

67% complete

**12. Which functions for exchange and “cooperation with others” are important for you?**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

**Users can...**

<b>Draw up common lists of results</b>	1
<b>Tag/index media</b>	2
<b>Assess media</b>	3
<b>Extend recommendations via social networks (e.g. Like button etc.)</b>	4
<b>Review/comment on media</b>	5

[Back](#)[Next](#)

**13. Which functions in the “personalisation and notification” field are important for you?**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

<b>Personal recommendations based on previous search requests</b>	1
<b>Email notifications about new search results</b>	2
<b>Save personal comments about media</b>	3
<b>Layout can be adjusted (change colours, move elements etc.)</b>	4
<b>Export of saved search results in different citation formats</b>	5
<b>RSS feeds (notifications) about new search results</b>	6
<b>Export of saved search results into different reference management programmes</b>	7
<b>Send search results by email</b>	8
<b>View list of items previously viewed or borrowed</b>	9
<b>Search settings can be defined and saved (languages, specialist areas, etc.)</b>	10
<b>Search results can be permanently saved</b>	11

[Back](#)[Next](#)

83% complete

**14. Which of the fields mentioned previously in the questionnaire are important for you?**

Sort the following terms according to importance, beginning with 1 = “most important” and ending with 9 = “least important”. You can drag the individual fields with the mouse from the left into a numbered field on the right hand side (drag and drop).

Personalisation and notification	1
Sorting of results	2
Search	3
Help	4
Exchange and cooperation	5
Presentation	6
Refinement of search	7

Back

Next

---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz

92% complete

**You're nearly there...****15. If you wish to take part in the draw for the book token worth 25 euros or would like to be informed about the results of the study, please select as appropriate.**

I would like to

 take part in the draw! receive results of the study!**16. Please give your email address, if you wish to take part in the draw or would like to be informed about the results of the study.**

Email address

...now click on *next* again!

Back

Next

---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz
**Many thanks for your participation!**

If you have any questions, please contact [Stefan.Dierdorf@uni-konstanz.de](mailto:Stefan.Dierdorf@uni-konstanz.de), at the Institute for Human-Computer Interaction or [Helena.Knatz@uni-konstanz.de](mailto:Helena.Knatz@uni-konstanz.de) at the University of Konstanz Library.

---

 Human-Computer Interaction, University of Konstanz Library, University of Konstanz

## Appendix 4: Tasks in the summative user test

### KonSearch Task 1

Imagine you are studying physics. In your last lecture you heard by chance that there is an interesting text about Einstein. Unfortunately you didn't manage to make a note of the title, but are sure that you would recognise the title if you read it.

Now search for **Einstein**.

**Enter manually** and look through the list of results to search for the title **Einstein's Miracle**, which you then recognise.

---

### KonSearch Task 2

In order to see whether the book deals with topics that interest you, find **Abstract or Summary** of the text and view it.

---

### KonSearch Task 3

You are searching for a book by Meyer from 2011. Unfortunately you can't remember the title.

Search for **Meyer 2011**.

As the list of results is too long, **narrow down** the results **to books published in 2011**.

---

### KonSearch Task 4

Now **save the first three results**, so that you can access them again later, when you have asked your professor again about the title.

---

### KonSearch Task 5

You are unable to get to the university library to borrow a book, so you would like to borrow an **eBook** by the **author Bernd-Dieter Meier**.

---

### KonSearch Task 6

For a seminar you have to learn everything about the Cuba crisis. Your professor gives you a tip about a good book and you know the author but only the approximate title and year of publication:

**Graham T. Allison, Cuban Missile Crisis, 2005-2007**

You should use the **advanced search** to narrow the search in advance.

---

### KonSearch Task 7

So that you can use it for your paper, your professor has said that he would like the citations in a specific citation format.

Therefore you must first **store** the found book **in the memory** and then **export it** in the **Harvard citation format**.

---

### KonSearch Task 8

In the coming semester you would like to prepare to learn a foreign language. You search for a specific topic and the search results for the **topic French** are displayed. Choose as location **only media of the University of Konstanz**, as the subject areas can in this respect cover all areas.

**Libero Task 1**

Imagine you are studying music. In a seminar last week a text about Mozart was recommended. Unfortunately you didn't manage to note down any other information about it. But if you read the title again, you would remember it.

Now search for **Mozart**.

**Enter manually** and look through the list of results to search for the title **Mozart oder die Entdeckung der Liebe [Mozart or the discovery of love]**, which you then recognise.

---

**Libero Task 2**

Now you would like to know which topics are dealt with in the book and have an initial look at the list of contents.

Now find the **list of contents** and view it.

---

**Libero Task 3**

You are looking for a book by Meier from 1990. Unfortunately you can't remember the title.

Search for **Meier 1990**.

---

**Libero Task 4**

As the list of results is too long, **narrow down** the results **to books published in 1990**.

Now **save all results**, so that you can access them again later, when you have asked your professor again about the title.

---

**Libero Task 5**

You are unable to get to the university library to borrow a book, so you would like to borrow an **eBook(not a normal book from the local stock)** by the **author Mark Smith**.

---

**Libero Task 6**

For a seminar in American history you have to research the war in Vietnam. As this is part of the American Studies course, it has to be written in English. So you need to search for English literature. Your professor has already given you a tip about a specific book, but the details are vague:

**David Anderson, Columbia Guide, 2000-2011**

Now search for the book using **advanced search**.

---

**Libero Task 7**

Now you should view the **list of contents** for the found book, so that you know which pages are important for you.

---

**Libero Task 8**

In the coming semester you would like to prepare to learn a foreign language. You search for a specific topic and the search results for the **topic Italian** are displayed.

Choose as location only the **media library**, as the subject areas can in this respect cover all areas.

## Appendix 5: Tasks in the formative user test

Before you begin the task, you now have up to five minutes to become acquainted with KonSearch. For example, search for a topic of your choice and get a general idea of the possibilities of KonSearch.

### Day 1

*Imagine you are studying history and have to write a paper on the topic “de bello gallico”. You don’t know much about the topic and would like to use the new literature search system “KonSearch”, both to gain an insight into the topic and to find suitable literature.*

#### Task 1.1

You would like to get an initial idea of the topic. Search in KonSearch for “**de bello gallico.**”

#### Task 1.2

Which historical figure can be found among the *authors*?

#### Task 1.3

You are wondering about what literature you can use for the paper. In your opinion sound historical knowledge can only be found in books. Narrow down your search to *books*.

#### Task 1.4

Your professor is old school and prefers older works. *Sort* the search results **chronologically** with the *oldest copy* first.

#### Task 1.5

*Printout* the search results, so that you can show this to your professor and discuss with him how to proceed.

### Day 2

*You have spoken to your professor and discussed the book list with him. He has mentioned a few books that you should use in your paper.*

#### Task 2.1

The first book is a translation of the work “**de bello gallico**” by **Otto Schönberger**. Find the *most recent copy*.

#### Task 2.2

Having found the entry for the book in KonSearch, you would like to borrow it. Find out *where* in the university library the book is located. Is it *available* or *can it be ordered*?

#### Task 2.3

Unfortunately the book cannot be directly borrowed. *Order* it.

#### Task 2.4

Use the KonSearch options to *save* this book.

#### Task 2.5

You would now like to find the second book. Unfortunately your professor’s handwriting is not good and you can only just about decipher that the words “**historical information**” appear in the title. To your amazement your professor even thought that the book might be available as an *eBook*. The year of publication is *1785*. Find this eBook, despite the lack of information.

#### Task 2.6

*View* the first three pages of the eBook. Then *save* it as an entry in KonSearch.



**Task 2.7**

Another book appears to be very important. This time you only know the *ISBN 3884000047* – find the book and *save* it.

**Task 2.8**

Display your saved entries in the *Harvard format*, and send this to your *email* address.

**Day 3**

*When you have acquired the necessary literature, your professor asks you to find out more about the figures involved.*

**Task 3.1**

In addition to all the literature your professor would like new academic knowledge about Caesar and the Gallic War. Search for *academic publications* about **Caesar**.

**Task 3.2**

Obviously the term Caesar is not only used in history. Narrow down the many search results using the *topic* “**history**”.

**Task 3.3**

You only wish to receive current publications. Narrow down the search results so that you receive only academic publications *from 2010 onwards*.

**Task 3.4**

Read the *abstract* of the first search results in the *preview*.

**Task 3.5**

Search with *the same search settings* (academic publications only, from 2010 onwards, topic history) for **Caesar** and **Cleopatra**, to find out some background information about Caesar.

**Task 3.6**

In *which journal* (title, year, edition) did the *first* search result appear?

**Task 3.7**

You also want to keep up to date with this topic. Search in KonSearch for an option that you can use to receive notifications, as soon as there are *anynew search results*.

**Task 3.8**

After so much Gallic War, Gaul fever has taken hold and you feel like watching an **Asterixfilm** again. Use the search options and find an Asterix video of your choice.

You have completed all the tasks. Many thanks for taking the time to help us!  
We just have a few more questions for you now.

## Appendix 6: Tasks in the eye-tracking study

### Task 1.1

You will be shown three images of KonSearch one after the other. Please look at these images. The images will change automatically.

#### Screenshot 1 : KonSearch home page



## Screenshot 2 : KonSearch list of results

The screenshot displays the KonSearch website interface. At the top, there is a search bar with the text "Suche" and a "Finden" button. Below the search bar, it indicates "Suchergebnisse: Ihre Suche nach führte zu 87.898.318 Ergebnissen".

On the left side, there are several filter sections:

- Suche verfeinern**: Includes checkboxes for "Nur elektronische Volltexte", "Nur wissenschaftliche Publikationen (Peer Review)", "Zeitschriften/Zeitschriften", "Nur das vollständige Beträglichkeit", and "Über das Beträglichkeitangebot hinaus suchen".
- Materialart**: Includes checkboxes for "Zeitschriften/Zeitschriften", "Zeitschriften (26.688.421)", "Elektronische (2.891.867)", "eBook (1.758.632)", "Buch (1.688.348)", and "Punktschrift/Braille (1.150.042)".
- Thema**: Includes checkboxes for "united states (1.423.620)", "biochemistry & molecular biology (787.887)", "cancer (590.594)", "short stories (388.733)", "narratives (346.452)", and "research article (241.337)".
- Einrichtungsdatum**: A bar chart showing the distribution of results by date, with a range from -15 to 30 days.
- Language**: Includes checkboxes for "Any", "English (85.004.812)", "German (2.381.597)", "French (865.617)", "Spanish (358.478)", "Portuguese (190.868)", and "Italian (178.188)".

The main content area displays a list of search results:

- Cobas Reports Loss, Expects Profits In Q3**: Author: Amy Gilroy. TWICE Bz./Jg.: 34 Ausgabe: 6 ISSN: 0890-7276 Jahr: 03/2008 Anfangswerte: 49. Themen: Cash surrender value, financial performance, Product lines, Net losses, CB ratios. Chicago: Cobas Electronics reported a \$20.8 million net loss for the fourth quarter due to a write-down of \$20.1 million triggered by the falling price of its s... Metadaten: Zeitschriftenartikel. Verfügbarkeit: Volltext online.
- House Debates Deficits and Proposed Balanced Budget Amendment**: Author: By ADAM OLYMER Special to The New York Times. New York Times (1857-Current 8x) Ausgabe: Late Edition (East Coast) ISSN: 0362-4331 Jahr: 06/17/08 Beschreibung: A19. Themen: Budgeting, Constitutions, Legislation. WASHINGTON, June 16 -- For 10 hours today, the House of Representatives debated a constitutional amendment to require a balanced Federal budget, as its author e... Metadaten: Zeitschriftenartikel. Verfügbarkeit: Volltext online.
- The effects of gender violence/ harassment prevention programming in middle schools: a randomized experimental evaluation**: Author: Taylor, Bruce Stark, Nan, Barden, Frances. Violence and Victims Bd./Jg.: 25 Ausgabe: 2 ISSN: 0896-0706 Jahr: 2010 Anfangswerte: 202. Themen: Crime Victims - psychology, Adolescent Behavior - psychology, Counseling - methods, Spouse Abuse - prevention & control, Child Behavior - psychology. In this experiment, 122 sixth and seventh grade classrooms from Cleveland area schools were randomly assigned to one of two five-session curricula addressing ge... Metadaten: Zeitschriftenartikel. Verfügbarkeit: Volltext online.
- OFF FOR EUROPE TO-DAY: Some of the Passengers Sailing on Five Steamships**: New York Times (1857-Current 8x) ISSN: 0362-4331 Jahr: 01/03/1812 Beschreibung: 13. Metadaten: Zeitschriftenartikel. Verfügbarkeit: Volltext online.
- THE ISLE-OF-MAN - CELEBRATING A SENSE OF PLACE - ROBINSON, V, MCCARROLL, D**: Author: BUTLIN, RA. GEOGRAPHY Vol 77 Issue: 336 ISSN: 0950-7487 Date: 04/1992 Description: 186 - 187. Subject: J KJ GEOGRAPHY. Content Type: Book Review. Availability: Older Dates.
- NEW BREED OF MANAGER: Magazine Edition**: Author: D and Meyer. Jerusalem Post ISSN: 0792-622X Date: 05/19/1998 Description: 02. Perhaps this is a sign that the days when unhappy, frustrated, uncooperative, inefficient, unproductive employees can only satisfy their needs by putting roadb... Content Type: Newspaper Article. Availability: Full Text Online.

## Screenshot 3 : KonSearch advanced search

Hilfe | Über | Feedback | Deutsch

Universität  
Konstanz  
Bibliothek

**KonSearch** beta  
Die Literatursuchmaschine der Universität Konstanz

Die Literatursuchmaschine der Universität Konstanz

Mit diesen Begriffen:  [Einfache Suche](#)

Autor/Herausgeber:   
z. B. Fitzgerald

Mit diesen Wörtern im Titel:   
z. B. Der große Gatsby

ISBN:

Aus dieser Publikation:   
z. B. Journal Of Endocrinology

Band:  und Ausgabe:

Datum von:  bis:

Mit diesen Formaten anzeigen:

Nur anzeigen:  Nur elektronischer Volltext  
 Nur wissenschaftliche Publikationen (Peer review)  
 Nur lokal vorhandene Bestände (Bücher, Medien, Zeitschriftenlit.)

Ausschließen:  Zeitungsartikel  
 Buchbesprechungen  
 Hochschulschrift

Ergebnisse ausweiten:  Über das Bibliotheksangebot hinaus suchen?

[Formular zurücksetzen](#) [Formular leeren](#)

**Task 1.2**

Which parts of KonSearch caught your eye (give reasons)

---



---



---



---

**Task 2.1**

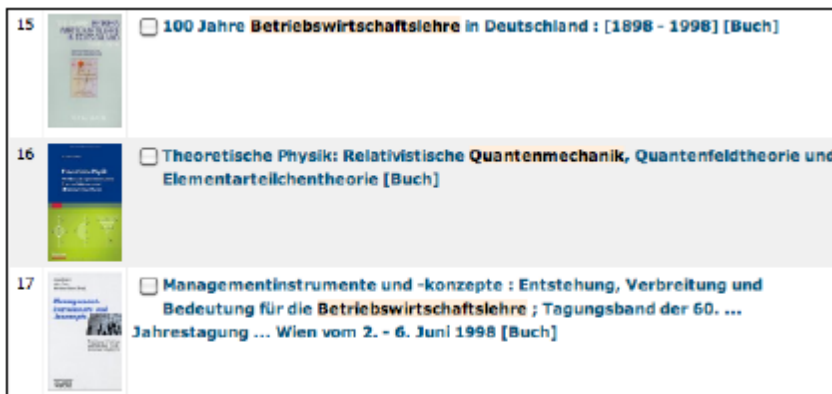
You will be shown two more images one after the other of two different results lists from a search request. Please look at these images. One book in the results list of each screenshot does not correspond to the search term as regards the topic.

Please note down the relevant book title:

Screenshot 1: \_\_\_\_\_

Screenshot 2: \_\_\_\_\_

## Screenshot 4: Extract from list of results shown by OPAC



[Key to screenshot 4:

100...[Buch] = 100 years of **business management** in Germany: [1898 – 1998] [book]

Theoretische...[Buch] = theoretical physics: relativistic **quantum mechanics**. Quantum field theory and elementary particle theory [book].

Managementinstrumente...[Buch] = management tools and concepts : origin, expansion and significance for **business management**; 60<sup>th</sup> anniversary conference...Vienna from 2to 6 June 1998 [book]]

## Screenshot 5: Extract from list of results shown by KonSearch



[Key to screenshot 5:

**Physik**...Thermodynamik = figures and reality; the conceptual and mathematical principles of a universal quantitative description of nature; mathematical physics and thermodynamics

Orientierung **Philosophie**...will = Philosophy: what it can do, what it wants to do

**Physik**...Lösungswegen = Physics: with 89 tables and 105 calculated examples and 1065 tasks with complete solutions

**Task 2.2**

In your opinion, which results list is better presented? (give reasons)

---

---

---

---

---

---

**Task 3**

In the following tasks different functions of KonSearch will be mentioned to you and you have to find them in the image presented. In order to complete the task show the project leader with the mouse where the function is located.

**Task 3.1**

Find the function “saved entries”.

**Task 3.2**

Find the function “print”.

**Task 3.3**

Find the function “advanced search”.

**Task 3.4**

Find the function to narrow the search for content type to eBooks.

**Task 3.5**

Find the function “preserve search settings”.

**Task 3.6**

Find the button “Find”.

**Task 3.7**

Find the function that allows you to sort the results.

**Task 4**

You have five minutes to become acquainted with the search with KonSearch.

**Task 5**

You are interested in finding an article in a journal about Leonardo Da Vinci. In order to improve your language skills the article should be in English. You are particularly interested in the topic of art. The article should have been published in the last ten years.

Save three results.

**Task 5.1**

Search for the term “sea travel”. Please narrow the search according to the following criteria:

- Contenttype : book
- Date of publication : after 2010
- Refine search : Widen search beyond library content

**Task 5.2**

Refine your search request. You are particularly interested in sea travel in the ancient world. The same search criteria apply as in the previous task.

**Task 5.3**















Did you notice the option 'preserve search settings'?

## Appendix 7: ASQ evaluation of the formative user test

Task	ASQ	Type of task
1.1	1,00	Explorative search
1.2	1,00	Other
1.3	1,00	Refinement of search
1.4	1,51	Other functions
1.5	1,06	Other functions
2.1	1,06	Targeted search
2.2	1,56	Other
2.3	1,89	Other functions
2.4	2,28	Other functions
2.5	3,33	Targeted search
2.6	1,72	Other functions
2.7	1,50	Targeted search
2.8	1,50	Other functions
3.1	1,83	Explorative search
3.2	1,11	Refinement of search
3.3	1,11	Refinement of search
3.4	2,00	Other functions
3.5	1,78	Other functions
3.6	1,39	Other
3.7	2,11	Other functions
3.8	2,00	Refinement of search
<b>Average:</b>	1,61	



## Appendix 8: Evaluation of icons task in the eye-tracking study

Icon		Proper meaning assigned	No meaning assigned	Wrong meaning assigned
	eBook	6	0	0
	book	5	1	0
	video recording	4	2	0
	newspaper article	4	2	0
	tape recording	2	3	1
	internet resource	1	4	1
	thesis	1	5	0
	map	1	3	2
	report	0	5	1
	kit	0	4	2
	data record	0	4	2
	microfilm	0	3	3
	conference report	0	2	4
	musical score	0	2	4