

# How to use interaction logs effectively for usability evaluation

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## ABSTRACT

In this paper we argue for a combined approach of logging analysis and interview techniques to evaluate the usability of web distributed applications. Logging analysis has proven as an efficient and effective method to investigate websites usability. However it seems insufficient for more complex applications. We outline a case study of a library search system, in which users' information seeking behavior is investigated with both the analysis of log files and qualitative interviews with real users. We argue that such an approach should provide a more accurate usability assessment of the system, especially when users' performance in a long-run is investigated.

## Categories and Subject Descriptors

H.5 [Information Interfaces and Presentation]: Multimedia Information Systems – *Evaluation and Methodology*.

## General Terms

Human Factors

## Keywords

Interaction logs, usability evaluation.

## 1. INTRODUCTION

Since Google started to release new web sites and services in a beta stadium as part of their development strategy, many more large companies as well as (initially) small start-ups have followed, especially in the context of social software like Flickr<sup>1</sup> and others. From the popularity of these web-sites, it seems that also their users tend to accept this strategy. The continuous improvement of applications became the alternative.

Besides usability testing in the initial development phase, such improvements can now also be based on the insights gained from real users by analyzing their usage behaviour. Looking at interaction logs seems to be one of the more efficient ways to do this [1]. So for example it is nowadays quite easy and common to visualize and analyze click streams or navigation paths with

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<sup>1</sup> <http://flickr.com>

commercial tools like Alterwind Web-Log Analyzer<sup>2</sup> or Google Analytics<sup>3</sup> and therefore optimize the navigation concept of a website. However web applications have grown to be more and more complex and are not comparable with the classic html sites of the past. Techniques like Java, Flash, AJAX or .NET 3.0 allow the design of much more powerful user interfaces and interaction techniques, much alike standard desktop applications. This development even allows including information visualization tools into websites, making them available to a large audience. Examples are InfoZoom which was used for example for the ADAC Website for car comparisons<sup>4</sup> and our own system MedioVis [4]. The latter is used as a visual search system in the university library of Konstanz and is capable of more complex analysis and visualizations as well, as shown in the InfoVis Contest 2007, where the Blockbuster (see figure 3) derivate of MedioVis reached third place [2]. In the long run, many companies are pursuing the strategy of “software as a service” which in fact aims to transfers all or most applications into the internet<sup>5</sup>. Therefore we think it is necessary to revisit the method of analysing log files for usability evaluation purposes and check if today's techniques are still appropriate for these new challenges.

## 2. RESEARCH METHOD

For standard websites, the analysis of web server logs is quite common, as mentioned earlier, in order to improve the navigation layout or to see which site elements are missed by the users. However, today's web applications require the analysis of much more complex interaction patterns similar to desktop applications and not just navigation paths between different pages. It may also be necessary to record situational variables like the amount of information presented to, and required by the user. In addition to these factual measurements, developers may also be interested in their users' individual preferences and satisfaction with the system. Standard web-server logs seem to be no longer sufficient since they can't offer this detailed information. Therefore

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<sup>2</sup> <http://www.alterwind.com/loganalyzer/>

<sup>3</sup> <http://www.google.com/analytics/>

<sup>4</sup> <http://www.adac.de>

<sup>5</sup> [http://en.wikipedia.org/wiki/Software\\_as\\_a\\_service](http://en.wikipedia.org/wiki/Software_as_a_service)

developers need to design and integrate appropriate logging mechanisms directly into the web-application. Besides, the task of analyzing log files also grew in complexity. So for example we might not only be interested in finding and analyzing interaction patterns but also in how these patterns change over time – for certain users or the application in general. Or to put it in other words: How logging analysis is suitable for longitudinal usability evaluation. Methods of data-mining like sequence-analysis and temporal data-analysis (e.g. T-Pattern analysis) should be considered for efficient information extraction from such log files.

Nevertheless logging analysis doesn't answer all of our usability questions and in some cases it probably raises even new ones. Since we often don't know the context of use, we are left wondering why a user behaved in a certain, probably unexpected way. In other words, the interpretation of the data can be really troublesome and error prone. Usability consultants such as SirValuse<sup>6</sup> offer the integration of subjective feedback mechanisms within their website analysis services, so that users can directly comment on aspects of the website or web application. Another possibility would be to pair logging analysis with qualitative methods such as interviews or user tests. These qualitative evaluation methods provide designers with the necessary information how to support their users' preferences and increase their satisfaction when using the system. In addition, information about users' strategy to perform a certain task and choice during task performance can be considered. We think that the combination of these two evaluation methods – logging and qualitative methods – as already suggested by [3] – should provide a clearer and more accurate assessment about the usability of a system, by allowing the cross-validation of the collected results and selection of adequate user-information and should therefore be researched more intensely.

In the following section, we want to present our first step in this direction by briefly describing ongoing research in combining logging analysis with qualitative interviews (see figure 1).

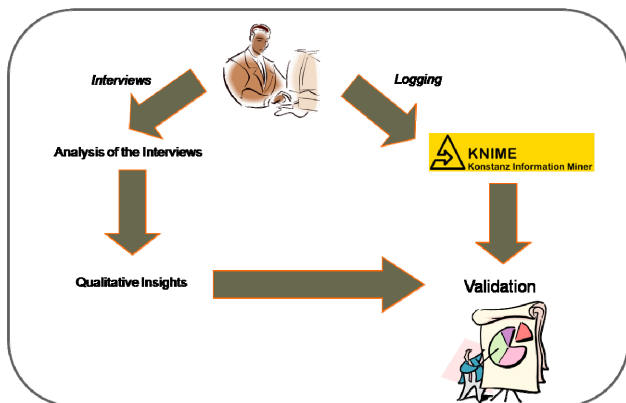


Figure 1: Combining logging analysis with qualitative interviews

<sup>6</sup> <http://www.sirvaluse.com>

### 3. A CASE STUDY

In our current research approach we are using our visual search system MedioVis with the integrated logging framework DROID for data gathering and the data mining tool KNIME<sup>7</sup> for analysis. MedioVis allows the user to search for videos within the library of the University of Konstanz. It is in daily use by the members of the university since the end of 2004 and has been steadily improved since then. It offers the user several views to the data like for example a table-visualization and a detail view in a multiple coordinated views approach (see figure 2).

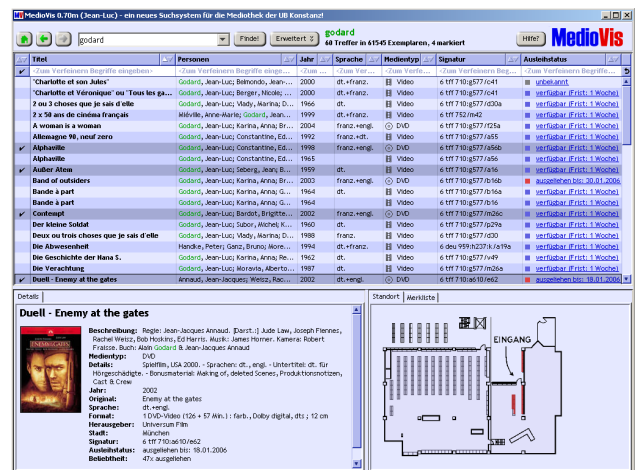


Figure 2: MedioVis – a visual search system for libraries

In a more advanced research version several different visualizations are available that can be combined by the user (see figure 3).

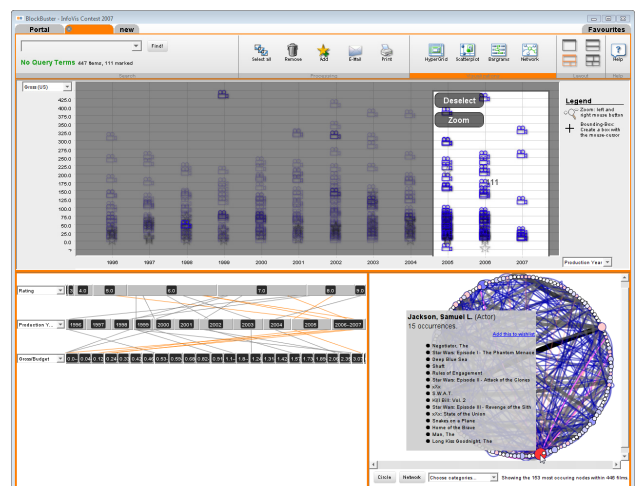
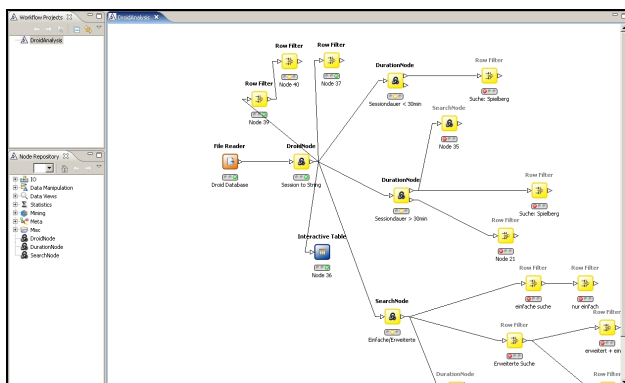


Figure 3: MedioVis advanced - Blockbuster

Within MedioVis a logging mechanism was integrated that logs every user interaction, like panel changes or mouse movements into a database. This mechanism is based on the logging

<sup>7</sup> <http://www.knime.org>

framework DROID<sup>8</sup>, which aims at automatically collecting data about user behaviour in the background of everyday operation and transmit all relevant user interaction and system incidents within an application over the internet to a central logging server. This server plays the role of a usability data warehouse which provides a steady flow of usability-relevant data during development and post-deployment phase. For analysis of this logging data we use the Konstanz Information Miner Tool, that allows to simply define filters on the data and search for certain events. The modular concept of KNIME allows the definition of filters step by step, making it easy to play around and look for noticeable problems without the need to formulate complex SQL queries (see figure 4).



**Figure 4: KNIME – Konstanz Information Miner used for DROID logging analysis**

In our first approach of combining logging with interviews we concentrated on the analysis of the search process and the general use of the MedioVis functionality. The logging analysis showed that some functions like the sorting functionality of the table were used quite seldom, leaving us with the question whether these functions were just not needed by our users or not recognized. We therefore conducted a semi-structured interview with six experienced MedioVis users. This gave us a deeper understanding, so for example the mentioned sorting functionality was recognized by most interview participants, but just not needed because they most of the time refined their query when they encountered large results sets. On the other hand our interview participants mostly stated that they used MedioVis only for short session durations of a few minutes. This again could be validated by analyzing the usage logs, resulting that about 60% of the sessions are between 1 and 10 minutes. Further research questions include the use of standard and extended search functionality and the reaction of users in terms of “what to do next” when being confronted with large result sets or zero hits. A second interview phase could further be used to validate new questions that have been arisen out of the current analysis of log files and the first session of interviews. Furthermore we will analyze our log files in terms of temporal changes, e.g. after the introduction of new features. Appropriate algorithms could be integrated into KNIME or third party software such as Noldus

Theme<sup>9</sup> could be used to find usage patterns and changes over time. Again interviews should be conducted to deepen the understanding and allow a more thorough interpretation of the results

#### 4. SUMMARY

We argued that combining logging analysis with traditional techniques such as interviews not only allows the cross validation of the data, but also provides a better picture of users’ behaviour than either one of the methods applied alone. Furthermore, we suggested that it would be beneficial to extend such an evaluation approach to a longitudinal design to analyze changes in interaction patterns over time. We showed on an ongoing case study that the integration of a logging mechanism based on a framework called DROID into a visual information seeking system for a university library called MedioVis can be used in combination with qualitative semi-structured interviews to assess the systems usability.

#### 5. REFERENCES

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<sup>8</sup><http://hci.uni-konstanz.de/index.php?a=research&b=projects&c=15851850>

<sup>9</sup> <http://www.noldus.com>