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User-oriented Usability Evaluation of a Research Website

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Göttingen, den 15. August 2013

Bachelor Thesis

User-oriented Usability
Evaluation of a Research Website

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Acronyms

API   Application Programming Interface

AM   Arithmetic Mean

CIP   Computer Investment Program

CMS   Content Management System

CSUQ Computer System Usability Questionnaire

DOM   Document Object Model

DSL   Digital Subscriber Line

GUI   Graphical User Interface

HCI   Human-Computer Interaction

HTML Hypertext Markup Language

ID   Identifier

JS   JavaScript

JSON JavaScript Object Notation

MAC   Macintosh

PC   Personal Computer

QUIS Questionnaire for User Interface Satisfaction

SUS   System Usability Scale

UCA   Usability Context Analysis

UE   Usability Engineering

URL   Uniform Resource Locator

XML   Extensible Markup Language

Abstract

This bachelor thesis investigates the usability of the research homepage of the Software Engineering for Distributed Systems Group (`http://swe.informatik.uni-goettingen.de`) at the University of Göttingen. The analysis was done with a combination of user-oriented usability evaluation methods: Questionnaires and the thinking-aloud test. In preparation for this test, an Usability Context Analysis (UCA) was done to identify target groups and their corresponding tasks, which they want to accomplish with the help of the website. 20 students, five researchers and three professional web developers have taken the test. They expressed their expectations regarding the website and were asked to answer questions with the help of the website, while they were observed. These questions represent the identified tasks of the target groups. The results show, that two expectations (examples of an usability analysis and lecture material) are not met by the homepage completely. Additionally, there were major problems with the solution of at least one-third of the questions. Furthermore, six question-overlapping problems were found. The major problems are the inconsistent design in different sections of the homepage, the inconsistent language, the missing bidirectional connection between publications and projects, the emphasis of links and that the projects can be overseen easily. The System Usability Scale (SUS)-Score of the website illustrates, that the functions of the website, especially the search bar in the publications sections, need to be integrated in the website better.

1. Introduction

The area of Usability Engineering (UE) plays an important role in the development of software. Much research in recent years has focused on this field. UE is a process, which is concerned with design human-computer interfaces that have a high usability. One essential element of UE is the evaluation of software. Hegner (2003) describes the different methods to perform an evaluation. UE also plays an important role in the development of websites. Von Gizycki (von Gizycki 2002), Schweibenz and Thissen (Schweibenz and Thissen 2002) show, what usability in matter of websites is and how these methods can be applied to websites. Within an usability evaluation, there is always an UCA done. Thomas and Bevan (1996) describe how a UCA is performed. Unfortunately, such methods are often not applied for smaller websites, because the overhead for their application is expected to be too high.

This bachelor thesis presents the results of the application of a combination of two scientifically proven user-oriented usability evaluation methods: Thinking-aloud and questionnaires. These methods are applied to the research website of the Software Engineering for Distributed Systems Group of the University of Göttingen (`http://swe.informatik. uni-goettingen.de`). The basis for this application is an UCA, which is done within this bachelor thesis. Furthermore, the thesis presents redesign suggestions based on the identified usability problems. The acquired results will be used in a doctoral thesis, where a website usability evaluation tool is developed. These results will be compared with the results of the developed tool.

2. Foundations

In the following chapter the foundations for this bachelor thesis are described. A short overview of different definitions of usability is given. Furthermore, the term usability evaluation is defined and an overview of usability evaluation methods, with a focus on the applied method, is given. Additionally, the context analysis method is described as well as the tool AutoQUEST.

2.1. Definition of Usability

Usability is composed of the words to use and the ability, which means it describes the ability to use something. It is not only a specific software or websites, where usability can be applied to. Also in the development of everyday objects usability is an important field of research (see: Norman 2002).

Usability originates from the field of the Human-Computer Interaction (HCI). Researchers in this field study, how users interact with computer technology. It contains aspects from the field of psychology as well as informatics and design. The goal of HCI is to design software, which users can use easily (Smith-Atakan 2006).

It is hard to give an exact definition of usability. Nevertheless there are many different definitions of usability, which are used in professional circles. One of them was made by Nielsen: "usability is about learnability, efficiency, memorability, errors, and satisfaction" (Nielsen and Hackos 1993). Nielsen shows that usability is a complex topic and has multiple components which need to be considered.

Another definition of usability was made by Dumas and Redish: "Usability means that people who use the product can do so quickly and easily to accomplish their own tasks."

(Dumas and Redish 1999). Dumas and Redish say, that usability needs to focus on the user. People who use this product do so, because they want to be productive. They want to accomplish their tasks easy and fast and it is important to mention that the users decide, if a product is easy to use or not. Therefore Dumas and Redish have a focus on the user in their usability definition (Dumas and Redish 1999).

One of the often used definitions of usability is the ISO-Norm 9241-11 (Guidance on usability): "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (Jokela, Iivari, Matero, and Karukka 2003). Good effectiveness means, that the user is able to accomplish his task. The time or the effort he needs for this accomplishment is not considered. However, efficiency considers this effort. Efficiency connotes, that the user needs the minimum amount of resources (e.g. time, material, psychological strain) to achieve his goal or task. The user feels satisfaction with a product or website if his expectations are fulfilled or even excelled. As it is shown in this definition, it is important to know the expectations of the user. Only if these expectations are known, the usability of a product can be improved (Jokela, Iivari, Matero, and Karukka 2003).

2.2. Usability Evaluation

In this section a definition of a usability evaluation as well as a short overview of some of the usability evaluation methods is given. Furthermore, the applied usability evaluation method is described.

2.2.1. Definition

Like the definition of usability its also hard to define the term of usability evaluation (Wottawa and Thierau 1998). An approach to define this term is to look at the definition of a test in the area of software testing: A test or evaluation is defined as a process in which a program is executed with the intention to find errors (Myers 2001). A usability evaluation is similar to this definition. It simulates the praxis in which the user uses this product. This

simulation will be evaluated. The evaluation shows, if a redesign is necessary and if every need of the user is fulfilled.

There are a lot of usability evaluation methods, but they are similar. Hence, during a usability evaluation the user (or expert) tries to fulfil tasks, which were given to him from the person who is in charge of the evaluation. The actions of the user (e.g. mouse clicks) can be recorded in different ways. For example with the help of a camera or a program, which produces log files with the actions of the user in it. These records are the foundation for the evaluation of the product. The usability researcher can evaluate these records with the help of different metrics (e.g. number of clicks, time or how many participants were able to fulfil the given task). It is important for the evaluation, that the software has a minimum of quality. This means, that the product does not has obvious errors like wrong or incomprehensible captions. These errors can detract the participants from serious usability problems (Hegner 2003).

An usability evaluation can be carried out with the help of different methods, which are explained in section 2.2.2. But the manner how they are performed can also be different. The range of the forms of an usability evaluation reach from the informal, fast procedure to usability tests in testing labs (Schweibenz and Thissen 2002). The form, which is used in an evaluation, depends on the needed data, accuracy of the data, target group and the used method. The form of the usability test in this thesis is a carefully arranged procedure with a scientific approved method. For the evaluation of the usability of a product some criteria is needed. The used criteria and recorded actions of the users are further described in section 4.2.

2.2.2. Software Usability Evaluation Methods

There a many scientific approved usability evaluation methods. In this section several of them are classified and described. Figure 2.1 shows a classification of the methods for a software usability evaluation. These methods can be classified into expert-oriented, user-oriented and automated methods. These methods are used for the evaluation of software. In this case, the term software includes installable software as well as websites.

For every usability evaluation the number of participants should be considered. Studies

showed, that 80% of the major usability problems are found after only five tests (Virzi 1992). However, Holzinger distinguishes the number of participants on the basis of the used usability evaluation method. Holzinger says, that the used evaluation method is important to set the right number of participants (Holzinger 2005).

It is also important to consider the context in which the product is used (see: Section 2.3). For an usability evaluation the simulation of this context during the usability tests is desired. If the context is simulated, the data which is acquired is more reliable, because factors which would tamper with the data (e.g. hardware) are disabled.
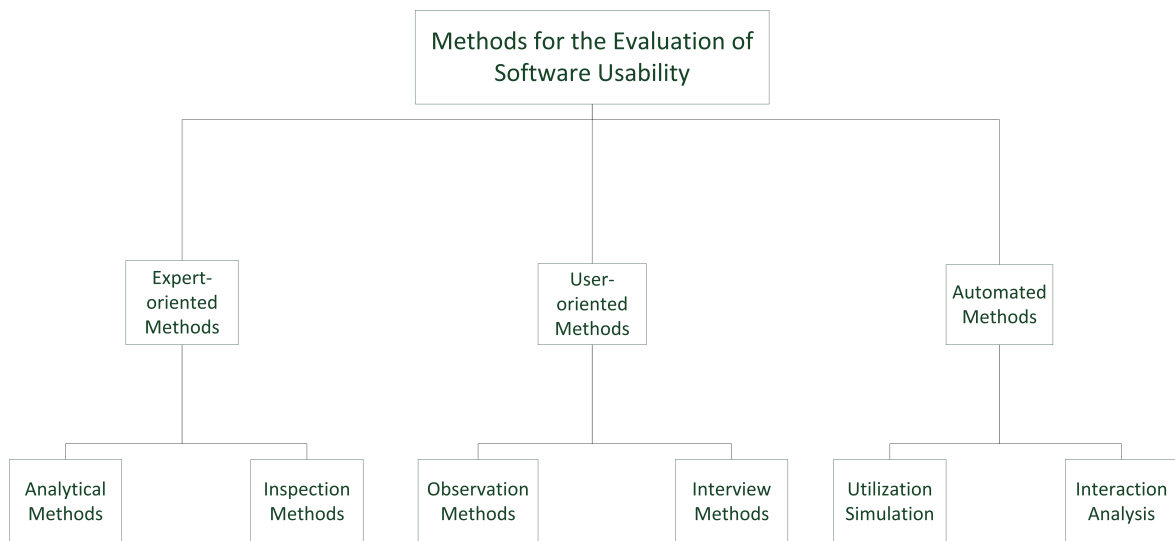
Figure 2.1.: Classification of usability evaluation methods. Own figure, based on (Harms 2012).

Expert-Oriented Methods

In expert-oriented methods the evaluation of the software is performed by experts. These experts can be usability experts as well as experts in the area in which the software will be used. Expert-oriented methods define every step which is needed to evaluate the software.

These methods are divided into analytical methods and inspection methods. In analytical methods the basis for the evaluation is the creation and examination of models. These

models define the usage and structure of the software. In inspection methods the base of the evaluation is the specific software (or prototype) and not just the model of the software (Harms 2012).

Figure 2.2.: Overview of several expert-oriented usability evaluation methods.

User-Oriented Methods

In user-oriented methods the evaluation of the software is performed by the user. This user is part of the target audience of the evaluated software. The user needs to perform tasks with the help of the software. Data is recorded either during the execution of the tasks or after the completion of it.

The user-oriented methods are divided into observation methods and interview methods. In observation methods the user is not influenced during his work with the system. He completes the tasks without any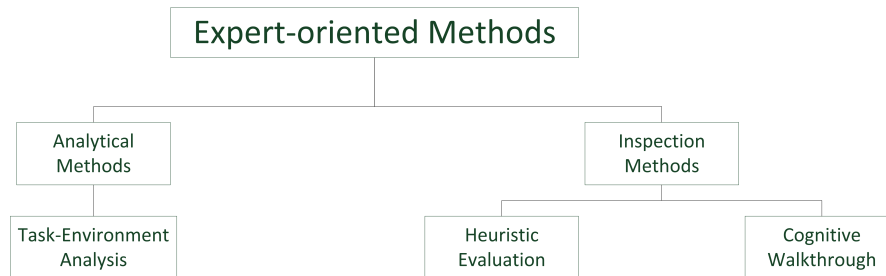 distraction and the needed data is recorded in the background. In interview methods the user needs to express his thoughts and impressions during the processing of the tasks. These thoughts and impressions are the basis for the evaluation (Harms 2012).

Interview: This is a technique to get information from users by talking directly to them. More information is gathered with interviews than with questionnaires through a conversation between interviewer and user. It may go into a deeper level of detail. But the data, which is acquired through interviews, is not objective. "Subjective reactivation opinions, and insights into how people reason about issues" (Bowman, Gabbard, and Hix 2002) are acquired. There are two types of interviews: Structured interviews and open-ended interviews. Structured interviews "have a pre-defined set of questions and responses" (Bow-

man, Gabbard, and Hix 2002). The open-ended interviews allow the participants to provide additional information or to ask questions (Bowman, Gabbard, and Hix 2002).

Thinking-aloud: There are two different proceedings to complete the thinking-aloud usability evaluation. In the first proceeding users are asked to solve tasks with the help of the software (see: task-based testing). In the other proceeding users are asked to explore the software. During this exploration they are asked to express their thoughts. They should not only express their thoughts, but also what they are doing and if they like what they see (and what they see) (Geest 1999). There are different methods to record these statements (e.g. voice recorder, video camera). A detailed description of this method is given in section 2.2.3.
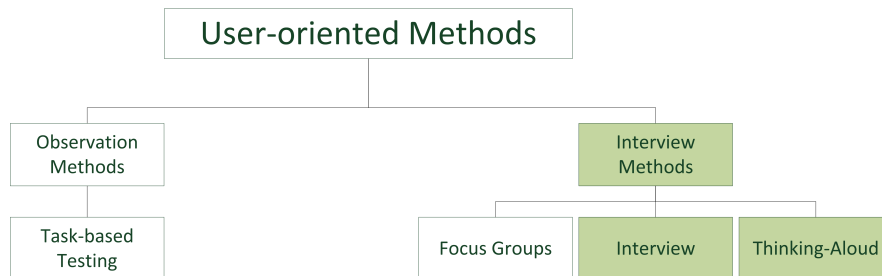
Figure 2.3.: Overview of several user-oriented usability evaluation methods. Green marked methods are further described in the text.

Questionnaires - SUS-Questionnaire: Often, in addition to an user-oriented method, a questionnaire is used. The questionnaire can be completed by the user after the usability test to get data about the thoughts of the user about the software. There is also the possibility, that the users complete the questionnaire before the test to get data about their expectations. A pretest is important for every questionnaire, because it shows if a questionnaire is understandable and solvable for a user.

A variety of questionnaires is used for assessing the usability of a software (e.g. Questionnaire for User Interface Satisfaction (QUIS), Computer System Usability Questionnaire (CSUQ)). One of these questionnaires is the SUS-Questionnaire. This is an scientifically acknowledged questionnaire. It was developed at the Digital Equipment Corp. and consists of ten statements. Each statement can be rated from one (Strongly Disagree)

to five (Strongly Agree) points. The evaluation of this questionnaire is described in section 4.3.

Automated Methods

In automated methods the evaluation of the software is automated. The foundation for this area of methods are the experience and approaches of the expert-oriented and user-oriented methods. But the automated methods are not only the automation of user-oriented or expert-oriented methods. The automated methods use basics of user-oriented and expert-oriented methods and form new methods out of it with the aim to automate them.

The automated methods are divided into utilization simulation and interaction analysis. In the utilization simulation the expected use of the software is simulated to get the needed data. In the interaction analysis the interaction between the software and the user is recorded, compared to the expected use of the software and evaluated (Harms 2012).
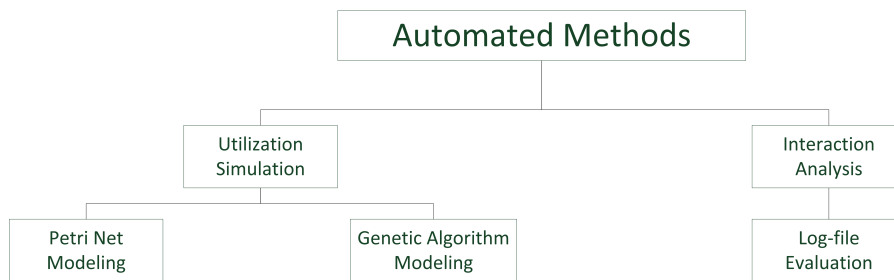
Figure 2.4.: Overview of several automated usability evaluation methods.

2.2.3. Applied Usability Evaluation Method: Thinking-Aloud with Questionnaire

The thinking-aloud usability evaluation method is user-oriented. This method was originally introduced by Karl Duncker (Duncker and Lees 1945). It originates from the experimental psychology, where Duncker studied productive thinking. But the classical thinking-aloud method, which is used in the field of usability evaluation, was introduced by Ericsson and Simon (Ericsson and Simon 1985). The thinking-aloud method seems to be the most popular technique and "it is often referred to as the usability method" (Nielsen,

Clemmensen, and Yssing 2002). A survey of methods and techniques, done by Clemmensen et al., supports this thesis. The survey showed, that the thinking-aloud method was the "single most frequently applied technique in testing" (Nielsen, Clemmensen, and Yssing 2002). Participants of this study were HCI practitioners and researchers (Clemmensen and Leisner 2002). In the following section the usability method, which was used in this bachelor thesis, is described.

The main idea behind this method is, that the participants express their thoughts during the accomplishment of tasks. These thoughts are recorded via a voice recorder or video recorder. The main goal of this method is, that the usability analyst can analyse the view and the thoughts the user has on the product. Furthermore, he is able to identify places (in the website), where problems with the HCI occur. With this data the usability analyst can redesign the website to improve the usability.

There are many variations of the thinking-aloud method. Nielsen et al. show many of these variations, which are modifications or extensions of the classical thinking-aloud method (see: Nielsen et al. 2002). The thinking-aloud technique can be divided into two types: retrospective thinking-aloud and concurrent thinking-aloud (Prüfer and Rexroth 1996). The difference is the time, when the participants verbalise their thoughts. In the retrospective thinking-aloud method they are asked to express their thoughts *after* they have finished the tasks. However, in the concurrent thinking-aloud method, they are asked to verbalise their thoughts *during* the completion of the tasks. The used method is a composition of both types. Participants were asked to verbalise their thoughts during the completion of tasks. After that, they had the opportunity to give a statement or an opinion about the website. At this time they also had the chance to ask questions. Additionally, participants filled out a questionnaire before and after the test (see: Section 4.1). This composition was used, because the pretest showed that some participants are too busy during the completion of the questions to express their thoughts. But after that they were able to give an opinion and reasons for their behaviour during the test. Another positive effect is, that not only thoughts that have a direct connection with the completion of the tasks are recorded but also statements about satisfaction, enthusiasm and frustration (Bartz 2001).

The advantages and disadvantages of the thinking-aloud method are listed in table 2.1. Thinking-aloud is cost-efficient (see: Discount-Usability-Methods Hegner 2003), because only a computer and a voice recorder is needed. The effort is low, because the average

time that is needed for the test is about 30 minutes (in this thesis). More time is needed for the evaluation of the tests and questionnaires. Another advantage is, that the thinking-aloud method directly shows the spots, where participants leave the designated path. If a participant is leaving the path it is almost certainly that an usability problem is found. These method puts the focus of the participants on the completion of the tasks and the website. But the simulation of the environment of the user is difficult to accomplish. More problems may be, that the participant thinks that he needs to fulfil expectations or that he is more critical than normal. That would tamper with the data. The success of this method highly depends on the willingness and the ability for the expression of thoughts and opinions of the participant. If he is not able to articulate these, the test does not gather usable data.

Advantages	Disadvantages
Cost-efficient	Simulation of real environment difficult
Low effort	Participant thinks he needs to fulfil expectations
Directly show places, where participants leave designated way	Willingness and ability for expression of thoughts
Strong focus of participant	Participants may be more critical than normal

Table 2.1.: Advantages and disadvantages of the thinking-aloud method.

It is important to mention that, if the performance is measured during the test, the working speed is reduced, because participants have the double burden of expressing their thoughts and solving the tasks (Bartz 2001). In the processed evaluation the performance is measured twice. With the help of the audio recorder, where the exact working time is displayed and with the help of the AutoQUEST HTML Monitor (see: Section 2.4).

The applied usability method does not need an usability lab. Every usability test was done in a, for the participant, familiar context. This is important, because only if a simulation of the real environment is done, the data, which is acquired, is usable for an usability evaluation. Without this simulation, the data would be fudged, because the participant

might feel uncomfortable or is too distracted, which would have an effect on the time he needs to solve the tasks and the way in which he will do it (Puscher 2001).

The thinking-aloud method needs communicative participants and an experienced moderator. This moderator has the function to create the different tasks, in view of the target groups, and to moderate the usability tests. This includes an introduction and the encouragement of the participants to talk during the test. But the moderator needs to be careful, because his words can have an influence on the participant and his thoughts. Hence, table 2.2 gives a short overview of methods to encourage the participant and incorrect behaviour during a test. Of course the list is not complete, but the most important mistakes are listed there. It is essential, that the moderator does not give hints to the participants. This includes shaking the head or nodding. He also must not give advice about how to solve a question or where to click (e.g. pointing on it with a finger). The moderator is not allowed to answer questions during the test, after the test there is a possibility to do so. But he also needs to encourage the participant. Methods for encouraging are asking the participant what he is doing at the moment or why he is doing that. The moderator needs to observe the participant exactly, because out of this observation he can form questions. For example, why the participant is hesitating. Out of this questions a conversation can develop and this leads to a communicative participant.

Encouraging Methods	Incorrect Behaviour
Ask what the participant is doing if he is not talking on his own	Shake the head
Ask why the participant is doing that (e.g. scrolling up and down on a page)	Nodding
If the participant is hesitating ask why he is hesitating	Giving advice how the task can be solved
	Answer Questions
	Saying something from which the participant can conclude if he is on the right way or not

Table 2.2.: Encouraging methods and incorrect behaviour during a thinking-aloud test.

2.3. Usability Context Analysis

The context in which the product is used needs to be analysed, because this context can influence the user and his actions. Hence, this analysis needs to be done within the usability evaluation, because the results are needed to plan the usability tests (e.g. data about the target group of the product). Without the context a simulation of the environment, in which the product is used, would not be possible. Furthermore, if the environment is not simulated, the data which is acquired from the usability tests is fudged (Thomas and Bevan 1996). Hence, the context is one of the most important parts of an usability evaluation, because a software with a good usability in one context can have a very bad usability in another one. So it is very important to know the context in which a software is used.

Context includes all the factors, which affect the usability of a product like the technical, physical or organisational environment in which this product is used. This means, that in an UCA these influence factors are identified (Thomas and Bevan 1996).

UCA is used to find out

1. Characteristics of the product

2. Target group of the product

3. Which tasks the product is for

4. Circumstances of system use

The persons that should be involved in the UCA are project managers, designers and users (from the target group). Furthermore, the main areas which need to be discussed in several meetings (named: Context meetings) are the product, users, tasks and environment. The resulting documents of this are the product and context report (Thomas and Bevan 1996).

The product report includes data about the product, like a basic description (name, version, purpose, main application areas and main functions) and a specification of the product (hardware and software which is included in the product) (Thomas and Bevan 1996).

The context report contains data about the target group of the product (users), the tasks which they are carrying out and data about the organisational, technical and physical envi-

ronment. Organisational environment refers to the organisational conditions under which users work. This can be, for example, "the number of and nature of any interruptions" (Thomas and Bevan 1996). The technical environment includes details about hardware, software and the network environment. Physical environment means the "physical location and characteristics of the workplace" (Thomas and Bevan 1996).
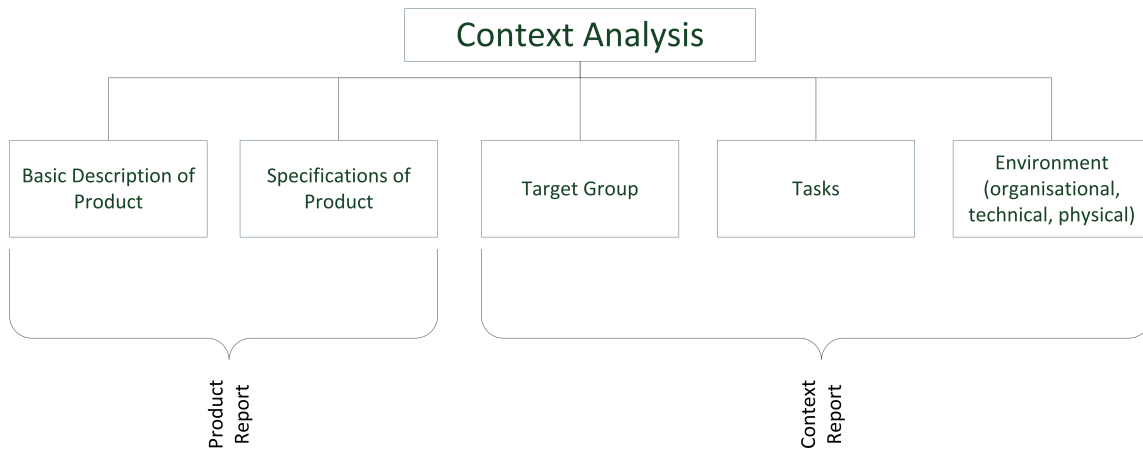

Figure 2.5.: Overview of the different areas of a context analysis and the resulting reports.

Figure 2.5 gives a short overview of the different areas of a context analysis and the resulting reports.

2.4. AutoQUEST

The Automated Quality Engineering of Event-driven Software (AutoQUEST) tool suite is used to assure software quality. It allows "the implementation of testing techniques using an abstract Application Programming Interface (API)."(Herbold and Harms 2013). For the testing of software it is only necessary to develop a plug-in which translates between the named abstract API and the concrete software platform API. Figure 2.6 shows the architecture of AutoQUEST.
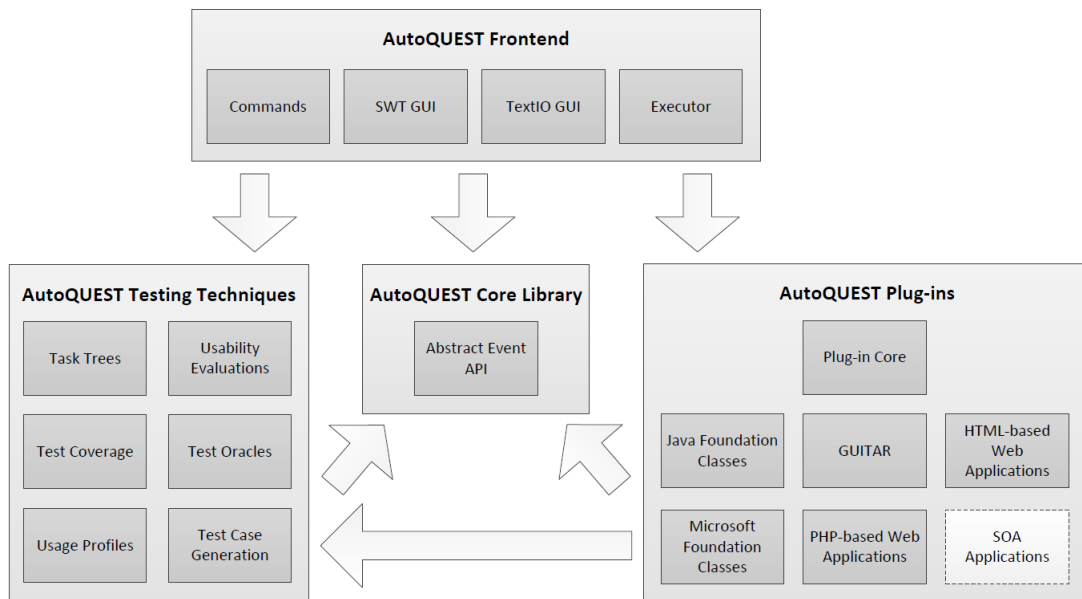
Figure 2.6.: Overview of the AutoQUEST architecture. The arrows indicate dependencies between the components, e.g.,
AutoQUEST plug-ins depends on AutoQUEST core library (Herbold and Harms 2013).

The most important part in AutoQUEST is the core library. This library implements the abstract event API. The AutoQUEST Testing Techniques module provides a bundle of testing techniques which can be used in AutoQUEST. The AutoQUEST Fronted provides an interface for the interaction between AutoQUEST and the user. These interfaces can be a text console or a Graphical User Interface (GUI). The plug-ins allow an interaction between abstract events (e.g. moving mouse, clicking mouse, typing on the keyboard) and "platform-independent tooling and event-driven software platforms" (Herbold and Harms 2013). Therefore a plug-in maps the events and targets (which are platform-specific) to the abstract API which is implemented by the core library. Because only one plug-in (AutoQUEST HTML Monitor) and the mentioned events are important for this thesis, the other parts of AutoQUEST are not described further.

The used plug-in of AutoQUEST is called HTML Monitor. This monitor records usage data from a website and sends it to a server. The monitor consists of two parts: The AutoQUEST HTML Monitor Server (written in Java) and the AutoQUEST HTML Monitor

JavaScript (JS). The data, which is recorded by the JS-part is the GUI-Model of the website and user events. Events in this case means Hypertext Markup Language (HTML) Document Object Model (DOM) events (e.g. onClick, onSubmit). These events make it possible to register different event handlers on elements in a HTML document (N.U. N.Y.). The GUI-Model of the website is the whole HTML structure. Every HTML-Tag and the Uniform Resource Locator (URL) gets an unique Identifier (ID) from the JS-part of the HTML Monitor. With the help of this ID it is possible to link recorded user events to HTML-Tags of the website. Figure 2.7 shows the interaction between the two mentioned parts of the AutoQUEST HTML Monitor.
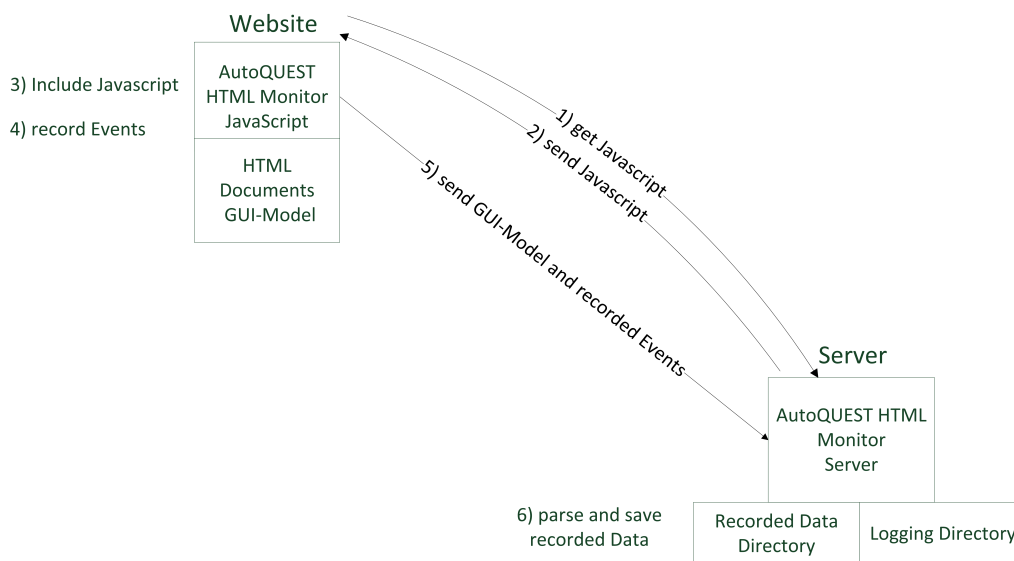

Figure 2.7.: Interaction between AutoQUEST HTML Monitor Server and JS (Trautsch 2013).

The requirement for the interaction between the two AutoQUEST HTML Monitor parts is, that the JS location is registered in the website through a script-tag. By including the URL of the JS the AutoQUEST HTML Monitor JS part can determine the location where the recorded events and the GUI-Model needs to be sent. This determined location is also the location of the server part.

The process is as follows. The website sends a get request to the server to include the JS-file in the website. The server answers this get request and sends the JS-file to the web-

site. Now the JS-file is included and it records the events (which can be declared in the JS-file), if a user is browsing through the website. Together with these recorded events the GUI-Model of the website is sent to the server (in JavaScript Object Notation (JSON)-format), which parses this JSON, tests it for errors and saves it in an Extensible Markup Language (XML)-file on the server. These XML-files are organized in folders, where each folder represents a session. These XML-files were used for the usability evaluation.

3. Usability Context Analysis

This chapter illustrates the result of the UCA of the website `http://swe.informatik.uni-goettingen.de`. As it is explained in section 2.3, there are four factors that need to be analysed: The product, target groups, tasks and circumstances of system use. This chapter gives a description of the analysed factors.

It is important to mention, that the analysis of the usability context was not carried out with scientific methods. The scientific way would be creating questionnaires and let them be filled out by persons, who visit this website. This information would shed light on which target groups the website has, what the main tasks are that they want to accomplish with the help of this website and what information they need. The creation and analysis of the questionnaire would take a lot of time, because pretests need to be made and a lot of filled-out questionnaires would be needed to make a valid conclusion. This is not possible within a bachelor thesis. Target groups and tasks were identified by analysing the content of the website and brainstorming.

3.1. Website

In this case the website is the product which needs to be described. Websites have a complex structure. They have single pages with information on it, mostly different GUI and these single pages are also connected with each other (e.g. navigation, links). But they are build up on three main parts: content, design and structure. Nielsen calls these elements content-design, page-design and site-design (Nielsen 2000). Hence, the description is done in three steps: Description of the content, design and structure.

3.1.1. Content

Content is the whole information, which can be found on the website and the presenting style of it. In contrast to the design, the presenting style does not include the visual presentation of the content (e.g. colors) (von Gizycki 2002). In this thesis only the parts of the website are illuminated, which are important for the following evaluation. From figure 3.2 to figure 3.5 the navigation bar as well as the headlines which can be seen in figure 3.1 are cut out, because these parts are the same throughout the whole website. Only the content below the headlines is changing. This content is displayed in the figures.

Figure 3.1 shows the welcome page of the website. In the menu the different main areas of the website can be seen: Staff, Research, Publications, Awards and Teaching. On the welcome page the contact details and the latest news are presented. The presenting style is simple. The content is presented in a column-style. Another detail that has to be mentioned is the search bar in the upper right corner. This is a global search bar, which searches through the content of the whole website.

Figure 3.2 shows the "How to Find Us" page. The address and a description of how to get to the Institute of Computer Science in Göttingen is presented on this page. There is also a picture of a part of the north campus at the University of Göttingen, where an arrow shows the way to the Institute of Computer Science in Göttingen. Another picture shows the bus stops and a way to get to the institute. The presenting style of this page is a two-column style. On the left side there is the text with the information about how to get to the institute and on the right side are pictures to support this description.

Figure 3.3 shows the "Research" page. On this page the research focus is explained and on the right side there is information about ongoing and past research projects. The presenting style is a two-column style. The main part (research focus) is in the middle of the page. The second column is the navigation for the ongoing and past research projects. They are arranged in drop-down menus.

Figure 3.4 shows the "Publications" page of the website. This page contains all publications, which were published by members of the research group. Furthermore, the publications are sorted by document type by default. But it is also possible to filter them by year or author. The presenting style of this page is the one of the "Research" page. In the middle

of the page is a list with the publications and a search bar to search in it. On the second column there are different filters to filter the publications.

Information about the assignment of bachelor and master thesis, student research projects as well as information about seminars and tips for writing technical documents and presenting can be found on the "Writing and Presenting" page of the website. There are also technical tips on this page. Figure 3.5 shows a part of this area of the website. The presenting style is a column with text. This text is separated by headlines to make it scannable for the reader.

Figure 3.1.: Welcome page of the website `http://swe.informatik.uni-goettingen.de`.

Figure 3.2.: How to find us page of the website `http://swe.informatik.uni-goettingen.de`.

Figure 3.3.: Research page of the website `http://swe.informatik.uni-goettingen.de`.

Search All Publications

Search terms:

[_____] Apply

Books

Paul Baker, Zhen Ru Dai, Jens Grabowski, Oystein Haugen, Ina Schieferdecker, Clay E. Williams
Model-Driven Testing - Using the UML Testing Profile , ISBN 978-3-540-72562-6 , Springer-Verlag, Berlin Heidelberg , 2007

Book Chapters

Steffen Herbold, Uwe Bünting, Jens Grabowski, Stephan Waack
Deployable Capture/Replay Supported by Internal Messages , Advances in Computer, Vol. 85, Elsevier , 2012

Jürgen Großmann, Philip Makedonski, Hans-Werner Wiesbrock, Jaroslav Svacina, Ina Schieferdecker, Jens Grabowski
Model-Based X-in-the-Loop Testing , Model-Based Testing for Embedded Systems (Computational Analysis, Synthesis, and Design of Dynamic Systems Series) , CRC Press , 2011

Ina Schieferdecker, Jens Grabowski, Theofanis Vassiliou-Gioles, George Din
The Test Technology TTCN-3 , Formal Methods and Testing. Lecture Notes in Computer Science (LNCS) 4949, DOI: 10.1007/978-3-540-78917-8_10 , Springer-Verlag, Berlin Heidelberg , 2008

Journal Articles

Thomas Rings, Patrick Poglitsch, Stephan Schulz, Luca Serazio, Theofanis Vassiliou-Gioles
A generic interoperability testing framework and a systematic development process for automated interoperability testing , http://link.springer.com/article/10.1007%2Fs10009-013-0281-2 , Springer-Verlag Berlin Heidelberg , 2013

Thomas Rings, Jens Grabowski, Stephan Schulz
A Testing Framework for Assessing Grid and Cloud Infrastructure Interoperability , International Journal On Advances in Systems and Measurements (SysMea11v4n12) ISSN: 1942-261x, 2011 vol 3 nr 1&2, IARIA , 2011

Patrick Harms, Jens Grabowski
Usability of Generic Software in e-Research Infrastructures , Journal of the Chicago Colloquium on Digital Humanities and Computer Science, Vol 1, No 3 (2011), available at letterpress.uchicago.edu , University of Chicago , 2011

Steffen Herbold, Jens Grabowski, Stephan Waack
Calculation and Optimization of Thresholds for Sets of Software Metrics , Empirical Software Engineering. DOI: 10.1007/s10664-011-9162-z , Springer Netherlands , 2011

Jens Grabowski, Philip Makedonski, Thomas Rings, Benjamin Zeiß
Systematische Qualitätssicherung für Testartefakte , OBJEKTspektrum Online Themenspezial: Testing , SIGS DATACOM , 2009

Thomas Rings, Geoff Caryer, Julian Gallop, Jens Grabowski, Tatiana Kovacikova, Stephan Schulz, Ian Stokes-Rees
Grid and Cloud Computing: Opportunities for Integration with the Next Generation Network , Journal of Grid Computing: Special Issue on Grid Interoperability, JOGC, Volume 7, Issue 3 (ISSN 1570-7873 (Print) 1572-9814 (Online)) DOI: 10.1007/s10723-009-9132-5 , Springer Netherlands , 2009

1 2 3 4 5 6 7 8 9 … next › last »

CURRENT SEARCH

Search found 248 items

FILTER BY YEAR:

○ 2013 (6)
○ 2012 (6)
○ 2011 (14)
○ 2010 (21)
○ 2009 (21)
○ 2008 (19)
○ 2007 (14)
○ 2006 (13)
○ 2005 (7)
○ 2004 (16)
Show more

FILTER BY AUTHORS:

○ Jens Grabowski (172)
○ Steffen Herbold (18)
○ Thomas Rings (16)
○ Philip Makedonski (10)
○ Patrick Harms (6)

FILTER BY DOCUMENT TYPE:

○ Articles in Conference Proceedings (94)
○ Presentations (45)
○ Technical Reports (21)
○ Journal Articles (19)
○ Master's Theses (14)
○ Bachelor's Theses (13)
○ Tutorials (13)
○ Ph.D. Theses (8)
○ Miscellaneous (7)
○ Diploma Theses (5)
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Figure 3.4.: Publications page of the website `http://swe.informatik.uni-goettingen.de`.

Writing and Presenting

On this page you will find tips, advice, and best practices regarding the preparation, writing, and evaluation of theses, talks, reports, and students' research projects.

Bachelor's and Master's Theses

If you are interested in writing your Bachelor's or Master's thesis in the field of software engineering, you are welcome to inquire about open topics in our group. In addition to general open topics, we offer supervision for personalized topics on an individual basis, as well as accept your own suggestions, as long as they fit our research profile so that we can offer competent supervision. Supervision of external Bachelor's and Master's theses is only possible under special circumstances, such as particular interest in the topic on our side, or close relation to our research activities and the potential for reuse of the results in our research.
Proper supervision is vital for the successful completion of Bachelor's and Master's theses and also very important for us. In order to guarantee intensive and individual supervision, we expect matching commitment, enthusiasm, and independent initiative from our students. Individual appointments for the discussion of the progress, emerging problems, and potential solutions are arranged on a regular basis, roughly every 1-3 weeks. Additional appointments and e-Mail discussions can be arranged on demand as well.
Bachelor's and Master's theses should be written in English whenever possible. German is acceptable only in exceptional cases. The completed thesis must also be presented in a graduate seminar. The results from outstanding theses may be published in scientific journals and conferences.
Our evaluation and grading scheme for Bachelor's and Master's theses is available here (in German).

Student Research Projects

Participation in student research projects is possible only in combination with a subsequent Master's thesis supervised by our group. The student research project should be related to ongoing research activities of our group. It could also involve collaboration on research publications. Inquiries about topic suggestions are always welcome. We gladly discuss open topics with students on an individual and personalized basis. It is also possible to work on student research projects in small teams.

Seminars

Participation in seminar courses typically involves attending an introductory organizational session, during which seminar topics and presentation appointments are introduced and assigned to the participants. Should you be unable to attend the introductory session, it is also possible to register for the course per e-Mail or personally, preferably before the introductory session. Upon being assigned a topic and corresponding topic-related materials, you are expected to prepare a seminar presentation according to the guidelines defined for the seminar course. The presentation, as well as potential topic-related issues, should be discussed with the seminar and/or topic supervisor well in advance of the actual presentation (at least 2-3 weeks ahead), for which you should arrange appointments as necessary. Suggestions from the supervisor should then be included in the final presentation. All seminar participants are expected to attend all presentation sessions and demonstrate active participation in the discussions after the seminar presentations. Depending on the seminar, participants may be required to submit a written report on the assigned topic. Participants are encouraged to discuss a preliminary version of their reports with the seminar and/or topic supervisor before the final submission. Suggestions can then be integrated in the final report.
The general evaluation scheme for successful participation in seminar courses consists of a grade for the presentation, which accounts for 40% of the final grade and a grade for the written report, which accounts for 60% of the final grade. The grading scheme may vary for individual seminar courses (where no written report is expected, for example).
During presentations, the following aspects are evaluated:

- Quality of the presentation materials
- Preparation of the presenter
- Structure and organization of the presentation
- Work on the topic (e.g. independent research in further resources)
- Answers to questions

For written reports, the following aspects are subject to evaluation:

- Completeness
- Scientific content
- Form and style

For tips on the preparation of presentations and written reports, please consult the corresponding sections below.

Figure 3.5.: Part of the writing and presenting page of the website `http://swe.informatik.uni-goettingen. de`.

The other areas of the website are:

- Staff: Information about the current and former staff is presented in this section as well as information about advertised jobs.

- Awards: Contains information about the accomplished awards from members of the research group.

- Teaching: In addition to the given information about this area (see: Figure 3.5), there is also information about the lectures, which are given by members of the research group in this area of the website.

It is important to mention, that the website is completely in English except some of the lecture pages.

3.1.2. Design

Design is the visual presentation of the content. This includes, for example, colors, used font and the classical "web-design" (von Gizycki 2002). The pictures of the websites (figure 3.1 to figure 3.5) illustrate the design. It is a simple design in shades of grey and the content is mostly presented in text form. The only exception here is the "How to Find Us" page, where the text is supported by two pictures. Another processing of the content is done in the whole website. The text on the different pages is split into parts, where each part gets an own headline. This supports the scannability of the text.

3.1.3. Structure

Structure is the alignment of each page in the whole website. The links between the different pages are important for the structure (von Gizycki 2002). Figure 3.6 shows the navigation menu. The green marked fields are the areas, where the user will be redirected to, if he clicks on the main point of the section (e.g. if the user clicks on "Staff", he will be redirected to the page "Current Staff").
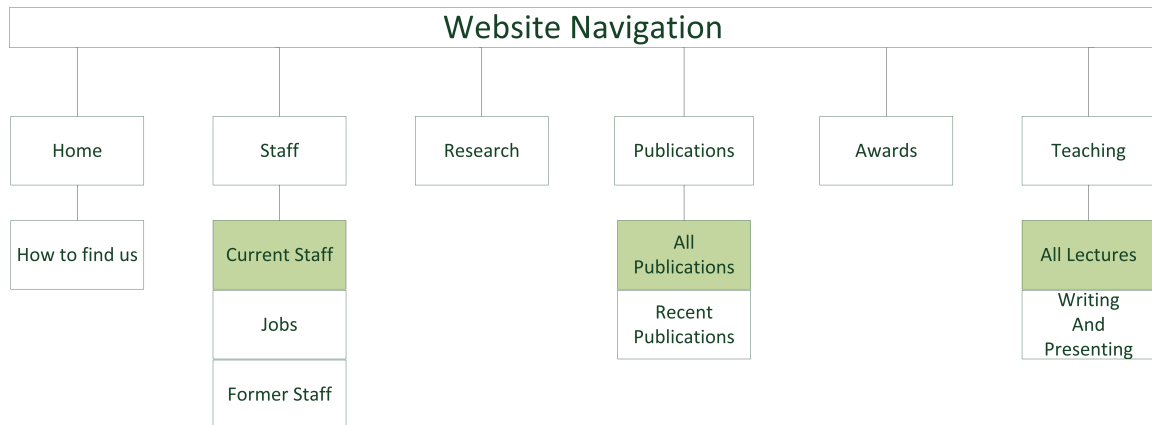
Figure 3.6.: Structure of the website http://swe.informatik.uni-goettingen.de. Green marked fields are areas, where the user will be redirected to if he clicks on the main point of the section.

The links between the pages are shown in figure 3.7. Not every single page is listed, but the different main areas and areas that are important for the evaluation. The main areas of the website are connected through the menu/navigation on top of the page. Arrows indicate, which page has a link to the other one. Lines without arrows stands for bidirectional links.

As the figure 3.7 illustrates, the welcome page has direct links to the page of the staff member "Jens Grabowski" as well as links to special news pages. These pages are not ordered to the main areas of the page. The single staff member pages are well connected. They have bidirectional links to projects, publications and lectures. The jobs section has a link to a single staff member, because one member is the contact person for the advertised jobs. The project section has links to itself (related projects), bidirectional links to the single staff members pages and unidirectional links to the publications (related publications).
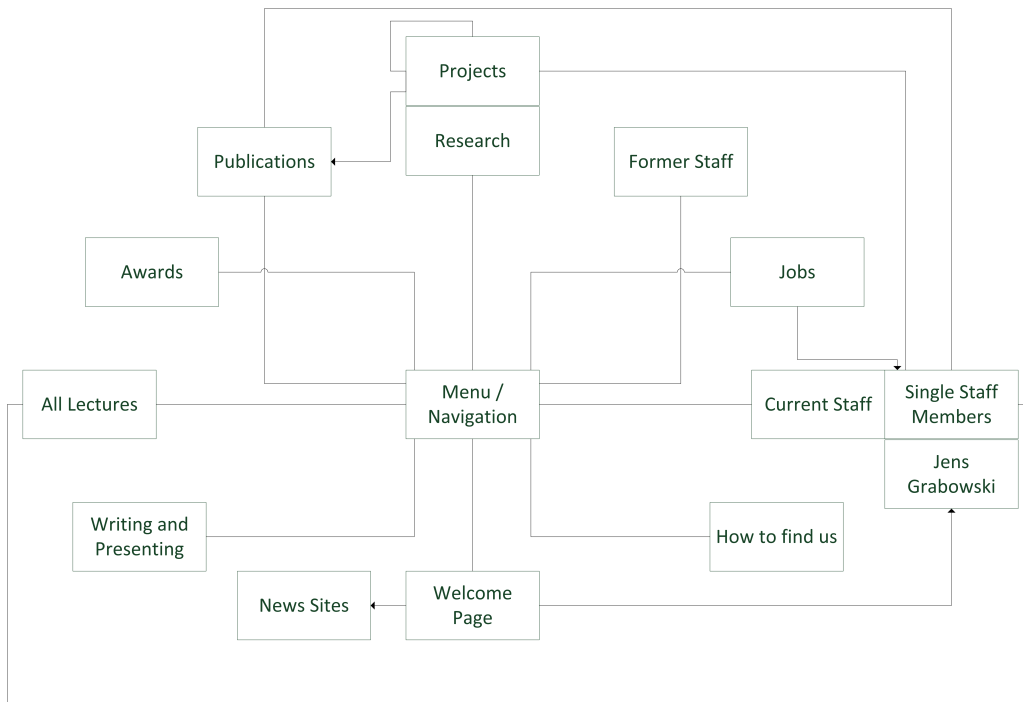
Figure 3.7.: Internal link structure of the website `http://swe.informatik.uni-goettingen.de`. Arrows indicate, which page links to which (e.g. there is a link from "Jobs" to a "Single Staff Member" page but not the other way around). No arrows stand for bidirectional links.

3.2. Target Groups

Different target groups of the website were identified by brainstorming and analysing the content: Students, researchers and others. Students includes people, who are matriculated at a university. In this case the term researcher includes professors and Ph.D. students. The target group "others" contains the administrators of the website and every other visitor, who does not belong to one of the other groups. Figure 3.8 shows the different target groups of the website. This evaluation focuses on students and researchers, because these are the main target groups of the website.

Figure 3.8.: Target groups of the website `http :// swe. informatik. uni-goettingen. de`. *Green boxes indicate the target groups this evaluation will focus on.*

3.3. Tasks of the Target Groups

The different tasks for the target groups of the website were identified by brainstorming and informal surveys. Figure 3.9 shows the different target groups with arrows to the tasks they want to accomplish on the website.

For students, finding information about the lectures (time, place, requirements) is important. They also want information about bachelor or master thesis as well as student projects (see: Figure 3.5). Researchers want information about the awards, which were accomplished by members of the Software Engineering for Distributed Systems Group. Both Groups desire information about the address and how to get to the research group (see: Figure 3.2), job advertisements, contact details of the head and contact details in general (see: Figure 3.1), projects (see: Figure 3.3) and publications (see: Figure 3.4).
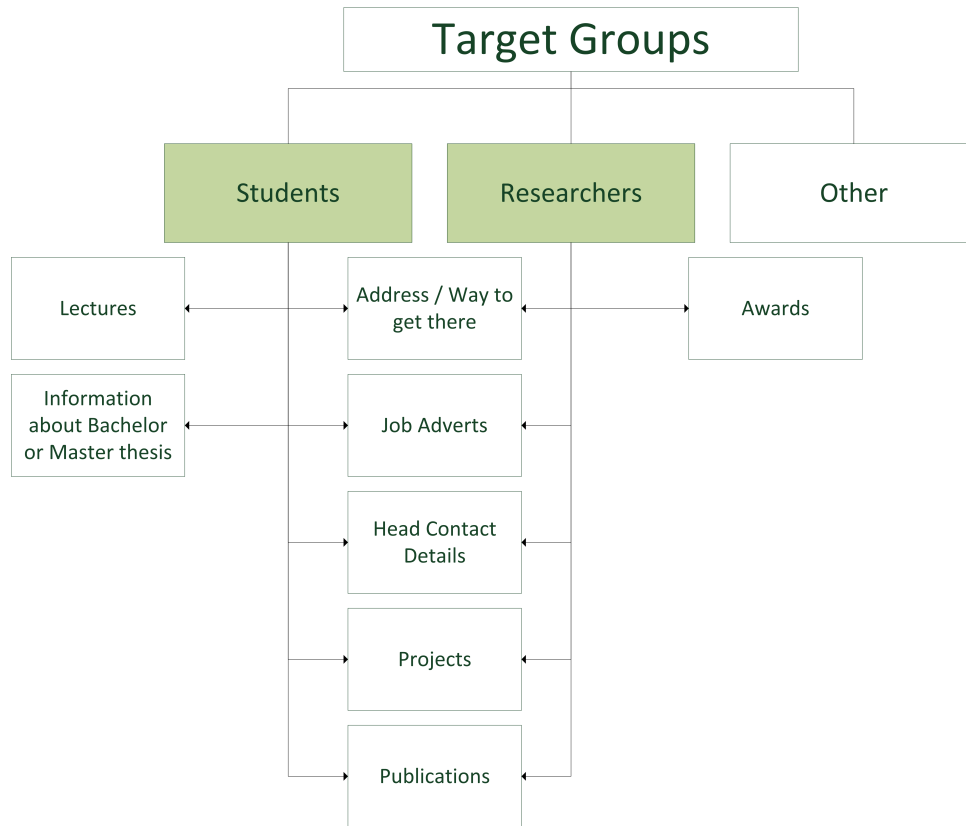
Figure 3.9.: Tasks of the target groups of the website `http://swe.informatik.uni-goettingen.de`*. Green boxes indicate the target groups this evaluation will focus on. Arrows show, which task belong to which target group.*

3.4. Circumstances of System Use

The environment is divided into organisational, technical and physical environment. The organisational and physical environments are different for the analysed target groups (see: Section 3.3).

Researcher - Organisational environment: Researchers mostly work alone in their office, but there is also a possibility to ask for assistance in a different office. Hence, they accomplish the listed tasks mostly alone. Interruptions are frequently, because they get

emails, phone calls or people that come to the office to ask questions. This especially applies to professors. Researchers mostly have the responsibility for their work, but the head of the research group can interfere. Communication is done via email or direct conversations.

Students - Organisational environment: Students accomplish the listed tasks alone. They can get assistance by writing an email to the research group, if they do not find the desired information. The interruption frequency is very low and they work on their own. Information which is related to the user tasks are communicated via email or direct conversation.

Researcher and students - Technical environment: The hardware and software that is needed to run the product is similar for both target groups. The hardware is a device with an internet connection. This can be a PC, Mac, Notebook, Smartphone, Tablet, etc.. The required software is a browser like firefox[1], chrome[2], opera [3], etc..

Researcher - Physical environment: Researchers mostly work in their office with the help of their PCs. The PC is also the place, where the product is, because the analysed product is a website.

Students - Physical environment: Students use the website at different locations. At home with the PC, on the way with a notebook or in one of the Computer Investment Program (CIP)-Pools at the university.

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[1]http://www.mozilla.org/de/firefox/new/
[2]https://www.google.com/intl/de/chrome/browser/
[3]http://www.opera.com/de/

4. Realisation of the Usability Evaluation

This chapter gives a short overview of the used questionnaire and its parts. Furthermore, the procedure of a usability test in the thinking-aloud method is described and how the evaluation is done. After that the results are presented and discussed.

4.1. Questionnaire

The developed questionnaire is divided into three parts: The introduction questionnaire (see: Appendix A), task-paper (students: Appendix C, researcher: Appendix D) and the SUS-Questionnaire (see: Appendix B). This fragmentation is shown in figure 4.1.
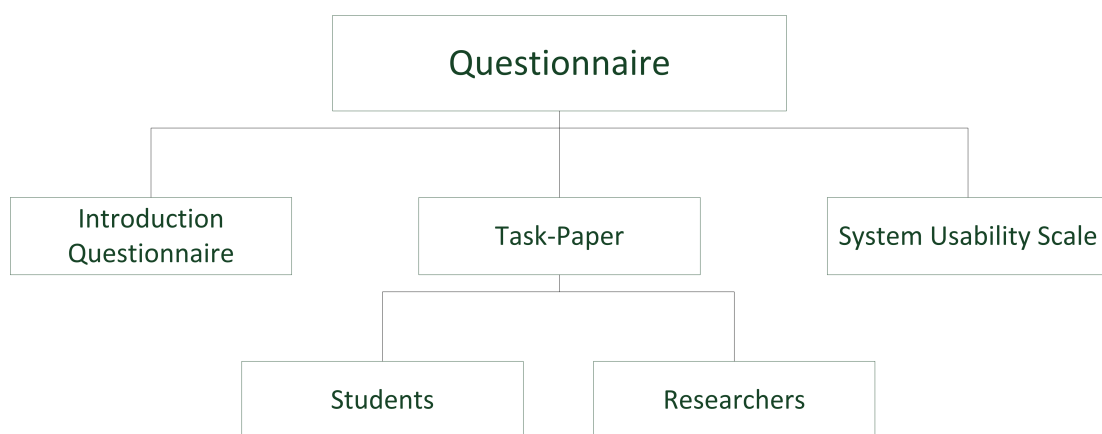
Figure 4.1.: Questionnaire fragmentation of the used questionnaire.

The introduction questionnaire consists of demographic questions, a question about the time the test persons spends browsing the internet and questions about the environment.

These questions are needed to analyse if the environment (browser, device) or the experience with websites have an influence on the browsing behaviour. Furthermore, the participant is asked if he was on the website (`http://swe.informatik.uni-goettingen.de`) before and if not, what he is expecting to be on the website (he can name three information or topics). This question is needed to evaluate, if a person, who was on the website before, completes the tasks better or faster and if the expected content is consistent with the content of the website. This questionnaire also includes a short introduction of the Software Engineering for Distributed Systems Group to clear the disadvantages of persons, who were not on a research group website before.

The second part of the questionnaire is the task-paper. This part is split into the task-paper for students and the task-paper for researchers. This division is done, because students and researchers have different tasks they want to accomplish with the help of the website (see: Figure 3.9). The questions on this questionnaire are problem-oriented and represent these tasks. Hence, the participants need to reach a goal but they choose the way how to reach it (Pflüger 1992). The advantage of this type of questions is, that the approach, which is chosen by the typical user, is identified fast. But it is important that the identified usability problems do not occur because of the missing expertise (Pflüger 1992). The questions were designed on the basis of the UCA. Hence, the questions on the student tasks-paper are consistent with the tasks which were identified in the UCA:

1. With which bus lines are you able to get from the main station in Goettingen to the north campus?

2. In which room does Prof. Dr. phil. -nat. Jens Grabowski has his office?

3. What kind of jobs are currently available at the Software Engineering for Distributed Systems Group?

4. Which Publications are related to the project "MarLog"?

5. Who was in the project staff for the project "Quality of UML Models"?

6. How many points do you need to get an "1.0" in your bachelor thesis, if you write it in the Software Engineering for Distributed Systems Group?

7. Where did the lecture "Software Testing" in "WS2012" took place?

The first five questions are the same for the researchers, because the UCA showed that students and researchers have similar tasks they want to accomplish on the website. But the last two questions are different:

6. When and where was the paper "Autolink - A Tool for the Automatic and Semi-Automatic Test Generation" published?

7. Who won the first award from the awards mentioned on the website?

The third part of the questionnaire is the in section 2.2.2 explained SUS-Questionnaire. In this evaluation the adapted questionnaire from Tullis and Stetson (see: Tullis and Stetson 2004) was used, which replaced the word "system" with the word "website" in each statement.

A pretest was done with the first version of the questionnaire. This showed that some of the questions were unclear and difficult to translate into German for some participants. After the pretest, the questionnaire was revised in a way that the questionnaire is now bilingual (German and English) and the questions are easier to understand.

4.2. Procedure

The test procedure was the following. The introduction questionnaire was read out loud by the interviewer to start a conversation and the interviewer filled it out with the answers of the participant. After the introduction questionnaire was filled out, the participant opened his browser and went to `http://swe.informatik.uni-goettingen.de`. The interviewer checked if the AutoQUEST HTML Monitor JS-file was loaded. Then the voice recorder was turned on and the different questions of the task paper were read out loud (web developers got the researcher task paper). The time between this and the completion of the task was measured. After the completion of each task the participant was asked to go back to the welcome page. After the participant completed all tasks, he was asked to give a statement about the website, how he felt during the test and if they had any questions. These comments and questions provide evidence about usability problems (Puscher 2001). Then the voice recorder was turned off and the participant was asked to fill out the SUS-Questionnaire.

28 Persons were tested: 20 Students, three professional web developers and five researchers. The test was carried out in the environment of the test persons. Hence, the participants used their own device in their own work environment. The three professional web developers were tested to benefit from the experience of them. AutoQUEST was used to record the user events (see: Section 2.4) to compare these with the data which was recorded during the test. First the introduction questionnaire was filled out, then the test took place and after that the SUS-Questionnaire was filled out.

A short introduction about the questionnaire and the test were given to the participants. They also had the opportunity to ask questions at this time. The participants were advised, that they need to think aloud and to express their thoughts or feeling about the website during the whole test. The interviewer encouraged the participants, if they were not talking during the test. Additionally, he told the participants, that the website is tested and not them. He stuck to the encouraging methods and avoided the incorrect behaviour listed in table 2.2. Furthermore, the test persons were advised that they had 15 minutes to solve a task before it gets cancelled. But they also had the opportunity to cancel a question by themselves if they did not see a way to solve it. Participants needed to say where they click, because with this information recorded it is possible to reconstruct the way they were using the website to solve a task. They were allowed to use everything that is on the website, including the search bar. But if they used it instantly they were asked to solve the task without the search bar again. If a participant gave a wrong answer, the interviewer told the participant that this is not the right answer and that he has to search further.

4.3. Evaluation

In the following section an overview of the evaluation of the data is given. It is explained how the different data is presented and analysed. Additionally, the difference between the local and global search bar is illustrated as well as the complex evaluation of the SUS-Questionnaire.

The data from the introduction questionnaire (gender, browsing h/week, browser and device) are presented in diagrams. The expectations, which were specified by the participants, are summed up and the first five places are displayed in table form. Furthermore,

a comparison between participants who were on the website before and who were not is made. The median of the click frequency and time is compared for each question. For each question the arithmetic mean and median of the click frequency is presented. Additionally the number of aborts and the number of participants who used the search bar instantly or after they failed to answer the question without is illustrated. The term "search bar" only includes the global search bar, which can be seen in figure 3.1 in the upper right corner. The performance is displayed in table form: For each question the arithmetic mean and median of the click frequency as well as the time is presented. Clicks and time of a participant, who used the global search bar, are not considered in the evaluation for the question in which he used the search bar, because this would tamper with the data. A participant who used the global search bar needs less clicks and time. Furthermore, the way (or ways) which was chosen by the participants is described in a protocol for each question. Additionally, the complaints of the participants during the completion of the questions are characterized in this protocol. The statements of the participants, which were given after the questions, are expressed in a summarized form. The way back to the welcome page, which the participants have chosen, is presented in table form. This data is important, because a participant, who uses the browser features or his mouse, does not see any way given by the homepage to get back to the welcome page (Roßmann 2002). With this data it can be seen, if the ways back to the welcome page are obvious enough. The SUS-part of the questionnaire is evaluated in the following way: The score contributions from each statement is summed up. For statement one, three, five, seven and nine the score contribution is the scale position minus one. For the rest of the statements the score contribution is five minus the scale position. This sum is multiplied by 2.5. The score has a range from 0 to 100 (Brooke 1996). The SUS-Score from each participant is processed in an Arithmetic Mean (AM) and median. Furthermore, for every statement the difference to the maximal possible score is presented in a diagram. This questionnaire was chosen, because of the results of Tullis and Stetson (see: Tullis and Stetson 2004).

The data from AutoQUEST (see: Section 2.4) was used to check and complement the data, which was recorded with the voice recorder. The AutoQUEST data was processed with a python script to cut events out, which were recorded outside of the test period.

4.4. Results and Discussion

This section represents the results of the usability tests. First the demographic data is illustrated. After that the named expectations are presented in a table. Additionally, the device and browser distribution is illustrated. Furthermore, a participant website knowledge comparison is made. Question protocols of the different questions are presented in this section as well as the results of the SUS-Questionnaire. Furthermore, every result in this section is discussed.

Demographic Data

The gender distribution is unequally: 20 men have taken the test, but only eight women.
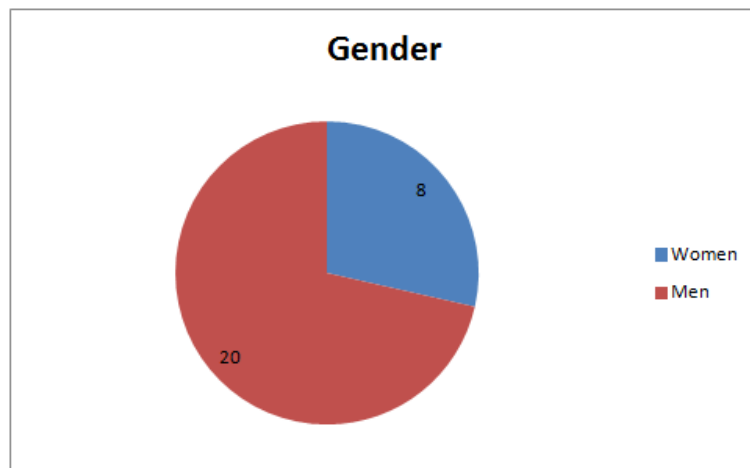
Figure 4.2.: Gender distribution.

The participants were mostly students (20). But five researchers have taken the test as well as three professional web developers.
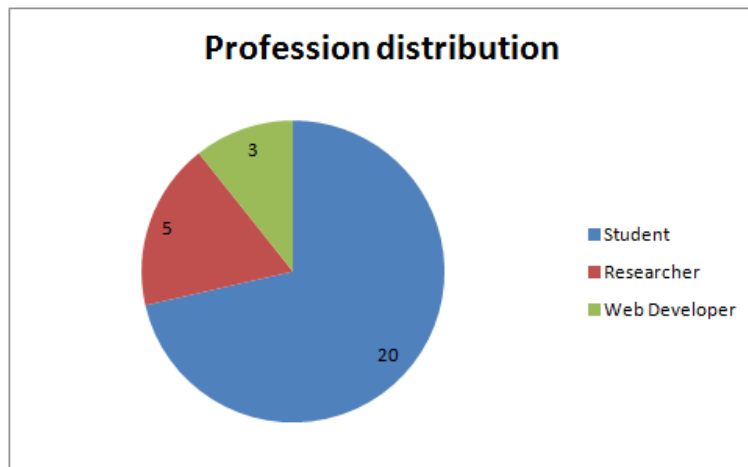
Figure 4.3.: Profession distribution.

The amount of time the participants spend browsing in a week is mostly more than six hours. Three participants spend between three and six hours a week and one between one and three hours.
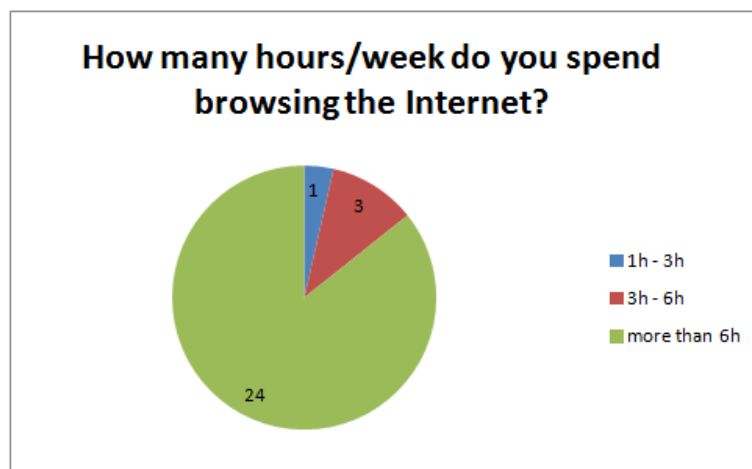
Figure 4.4.: The amount of time the participants spend in browsing the internet.

There were only four participants who spend less than six hours in browsing the internet

in a week. Hence, there is insufficient data to draw a valid conclusion about the connection between the spend browsing time and the test results.

Expectations

19 participants name 10 different topics or information they expect to be on the homepage. Three participant only name two topics or information. Hence, the number of mentions add up to 54. Expectations marked in grey are not met by the homepage completely.

Rank	Expectation	Times mentioned
1	Research Topics / Projects	17
2	Employee list	13
3	Examples for an usability analysis	4
3	Lecture list	4
4	Contact	3
4	Lecture Material	3
4	Publications	3
4	Research Focus	3
4	Research Group Information - General	3
5	Awards	1

Table 4.1.: Expectation top 5. Grey marked column indicates, that the homepage does not fulfil the expectation completely.

As it is seen in table 4.1, the homepage does not fulfil every expectation completely. There is no section on the homepage with examples or tools for an usability analysis. But some of the projects, which are dealing with usability analysis, have their own homepage. AutoQUEST, for example, has its own homepage [1]. And on this homepage, there are examples of how to use AutoQUEST. It would not be good to copy the content from the project homepages to the homepage of the research group. A solution here would be, that the projects are not only divided into past and actual research projects, but also get identification labels. Hence, the visitor of the homepage can see what the project is about with one look. Example marks for AutoQUEST would be: Usability analysis, examples, tool.

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[1] http://autoquest.informatik.uni-goettingen.de

Therefore, the user knows what he will find on the project homepage and what the project is about.

The second expectation that is not fulfilled is the lecture material. This material is not on the pages of the different lectures. It is uploaded to Stud.IP [2]. The duplication of the content (uploading to Stud.IP and the homepage) is not a good idea. It would be advisable, to do it the way it is done now: To give a hint on the lecture page, that the course material is in Stud.IP. In this way, there is no duplicate content and the visitor knows, where he can find the lecture material.

Device and Browser used in the Test

21 participants used a Personal Computer (PC) in the test. Six a notebook and one person a Macintosh (MAC).
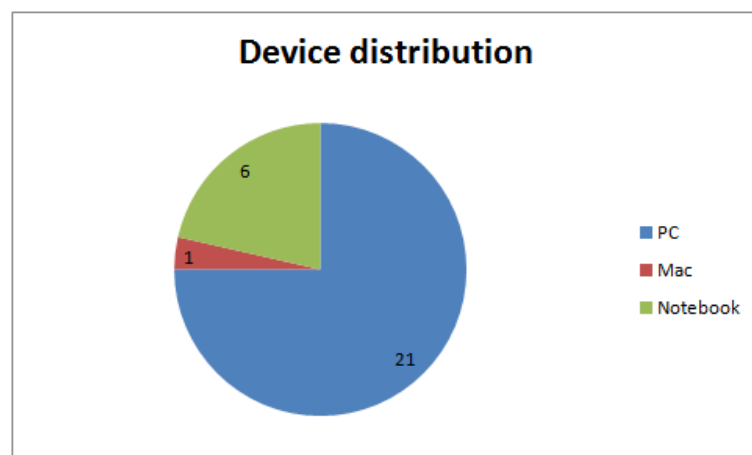
Figure 4.5.: Device distribution.

The browser, which was used the most in the test, was the firefox. 19 participants used it in the test. Eight test persons used chrome and one person the opera web browser.

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[2]Stud.IP is a platform of the University of Göttingen, which is used for the support of lectures. In this platform the lecture material can be uploaded.
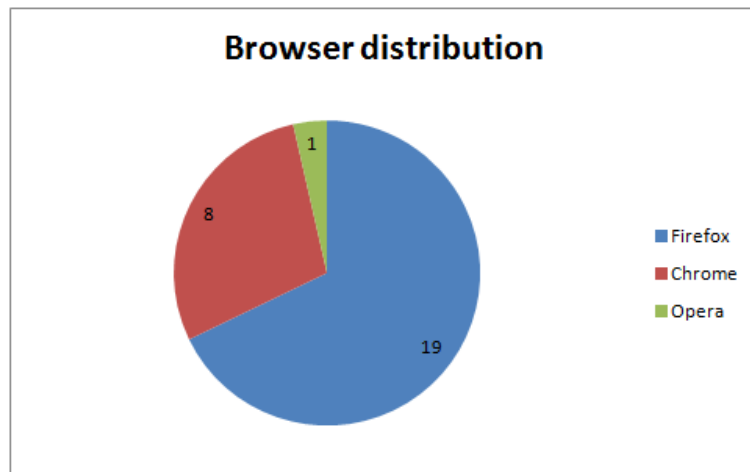
Figure 4.6.: Browser distribution.

There was no problems with the different devices or browsers in the test. Every device and browser displayed the website correctly.

Participants Website Knowledge Comparison

Nine Participants stated, that they have visited the website before. The duration of the visit does not matter in this case. 19 participants have never seen the website before.
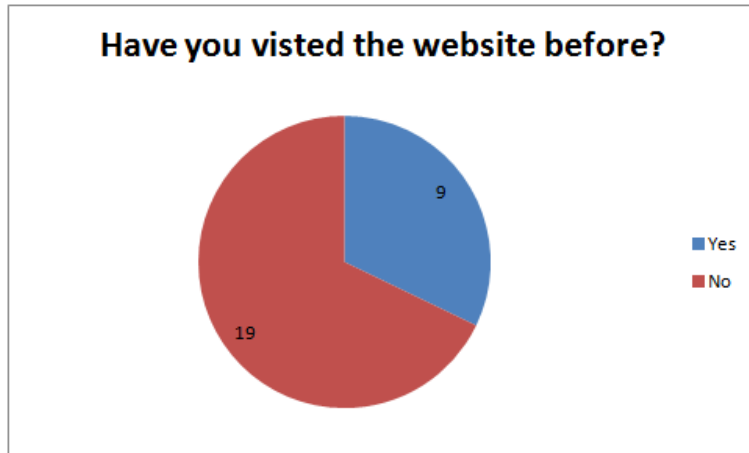
Figure 4.7.: Visit distribution.

Figure 4.8 illustrates the clicks the participants needed to answer a question (median) and figure 4.9 the time (in seconds). It compares those, who have visited the website before and those who have not. Participants, who used the search bar or cancelled the question are not taken into account.
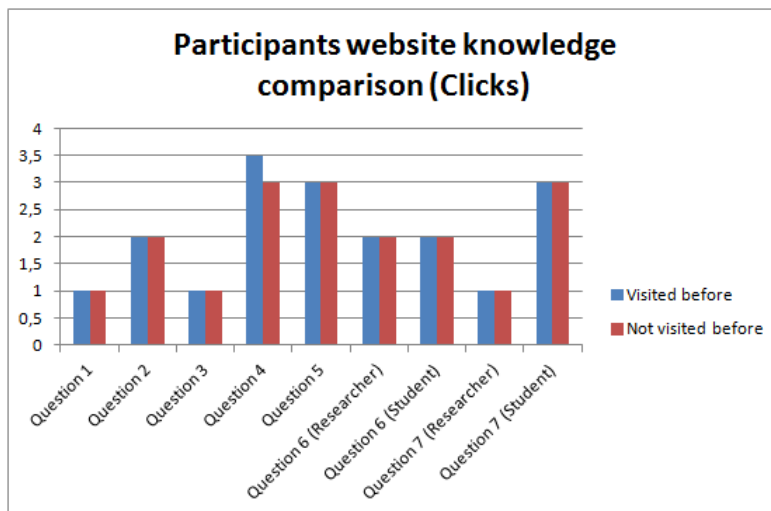
Figure 4.8.: Comparison between participants, who have visited the website before and those who have not. The number of clicks (median), which were needed to answer the question, are compared.
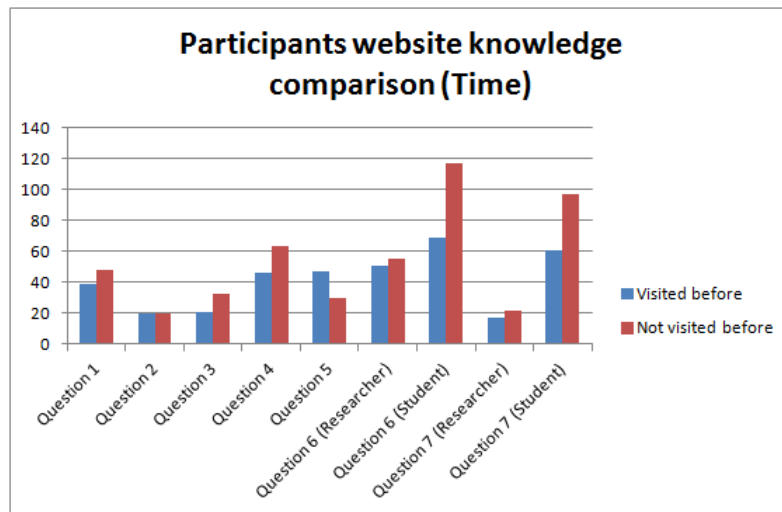
Figure 4.9.: Comparison between participants, who have visited the website before and those who have not. The time (in seconds), which was needed to answer the question, is compared.

As it is seen in figure 4.8 the clicks of participants, who have visited the website before, are equal to those, who have not. The only exception is question four, but the difference is just 0.5 clicks.

Figure 4.9 illustrates the time, which was needed to answer the question. The time of participants, who have visited the website before and those who have not, is compared. They are nearly equal in every question, the exceptions here are question six (Student) and question seven (Student). There is a difference of 48s (question six (Student)) and of 35.5s (question seven (Student)). The difference in the first question is not significant, because there were only three values that were taken into account for students, who have visited the website before. But to make a meaningful statement more values would be needed. It is similar for question seven (Student). There are five values that were taken into account for students, who have visited the website before. It can be assumed, that students, who have not visited the website before, need more time to answer the question, but it can not be proven. For the proof of this assumption, more than five values would be needed.

After the analysis of the click and time comparisons it can be assumed, that there is no significant difference between participants, who have visited the website before, and those

who have not. Hence, in the discussion of the following results there is no division between those two groups of participants.

Question Protocols

Every question has a shortest path. The following table presents the number of participants, who have chosen this way and it presents this value in percent. Participants, who cancelled the question or used the search bar, count as participants, who have not chosen the shortest way. The professional web developers, who have taken the test, have done the researcher task paper.

Question	Number of participants, who have chosen the shortest way	In percent
1	26	92.86%
2	12	42.86%
3	26	92.86%
4	3	10.71%
5	16	57.14%
6 (Researcher)	5	62.5%
6 (Student)	10	50%
7 (Researcher)	8	100%
7 (Student)	14	51.85%

Table 4.2.: This table shows how many participants have chosen the shortest way to get the asked information. It also shows this amount in percent. Participants, who cancelled the question or used the search bar, count as participants, who have not chosen the shortest way.

With the help of the following protocols it can be comprehended, what problems the participants had in each question. Additionally, it is identified how many clicks a participant needed to solve the question. The following figures show the click frequency median, AM and how many clicks are needed for the shortest way. In the headline of every figure, the number of participants that have taken the test are stated (N), how many of them cancelled the question (aborts), how many used the search bar after they failed to find the information without it (failure) and how many instantly used the search bar (instantly).

The participants, who used the search bar or cancelled the questions are not taken into account for the AM and median of the click frequency.

Question 1

The shortest way for this question is the "How to Find Us" link in the "Home" menu. This question was solved within one click by 26 participants (see: Figure 4.10). Just one person could not find the link to the "How to Find Us" section. Nine participants said, that the "How to Find Us" section is too hidden or that the sorting of the section under the "home" menu is illogical. Five participants mentioned, that the picture of the institute and the bus stop map is good for the orientation.
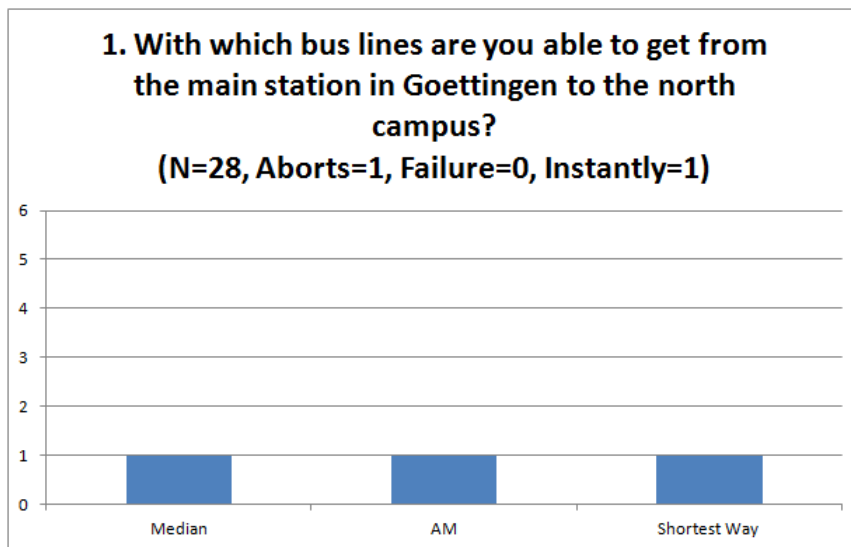
Figure 4.10.: Click frequency of the first question.

The shortest way in this question is one click. Median and AM are equal to the shortest way. Just one person cancelled the question and one instantly used the search bar.

The result for this question was not the expected result. The hypothesis was, that the participants need a lot of time and clicks to find the "How to Find Us" page, because it is hidden in the "Home" menu and this is not the place, where a visitor would expect it

to be. But the results show, although the "How to Find Us" page is hidden, nearly every participant had gone the shortest way. However, participants criticized the placement of the "How to Find Us" page and they needed more time than at other questions, where the shortest way can be gone in one click (e.g. Question two or seven (Researcher)). This increased time can be seen as evidence for the stated hypothesis. A solution for this would be, that the "How to Find Us" page gets an own menu in the navigation. This would be a good solution, because the "How to Find Us" page has the most needed information for visitors on it.

Question 2

The shortest way for this question is to click on the link on the welcome page, because this refers to the contact page of Prof. Grabowski. Just 12 of 28 participants (42.86%) have chosen this way. Seven participants directly criticized the welcome page: The logo is too big, the page has too little information on it and it is confusing.

Figure 4.11.: Click frequency of the second question.

There is a difference from one click between the median and the shortest way. One

person cancelled the question. The difference between the AM and the shortest way is about 0.5 clicks.

Less than half of the participants have chosen the shortest way at this question. A reason for this is, that the welcome page is too empty. The link, which the participant should click on, is too hidden and is not noticed by 42.86% of the participants. It redirects the user directly to the single staff member page of Prof. Grabowski (see: Section 3.6). A solution would be a redesign of the welcome page with a smaller logo, but more text (e.g. not just the contact information, but links to the most important sections of the homepage).

Question 3

The shortest way for this question is the "Jobs" link in the "Staff" menu. This question was solved with one click by 26 participants. Three participants mentioned that the sorting of the "Jobs" section under the "Staff" menu is illogical and not intuitive. 20 participants failed in telling the number of jobs: They said, that the group is looking for one software engineering research assistant and one student assistant. But the right answer was, that the group is looking for four software engineering research assistants and one student assistant. As it is shown in figure 4.12, the median and the shortest way are equal. The difference between the shortest way and the AM is very low.

There were no major problems with this question, but most of the participants failed in telling the right number of advised jobs. A solution would be, that the "Jobs" page get a consistent design. Hence, this design should consist of different headlines or points that need to be filled out for each job that is advertised. For example: Job name, Number of positions that are free, Job description, Job requirements, Contact. With the help of these headlines and the consistent design the visitor is able to understand and scan the text quickly. The sorting of the "Jobs" page under the "Staff" menu is good as it is.

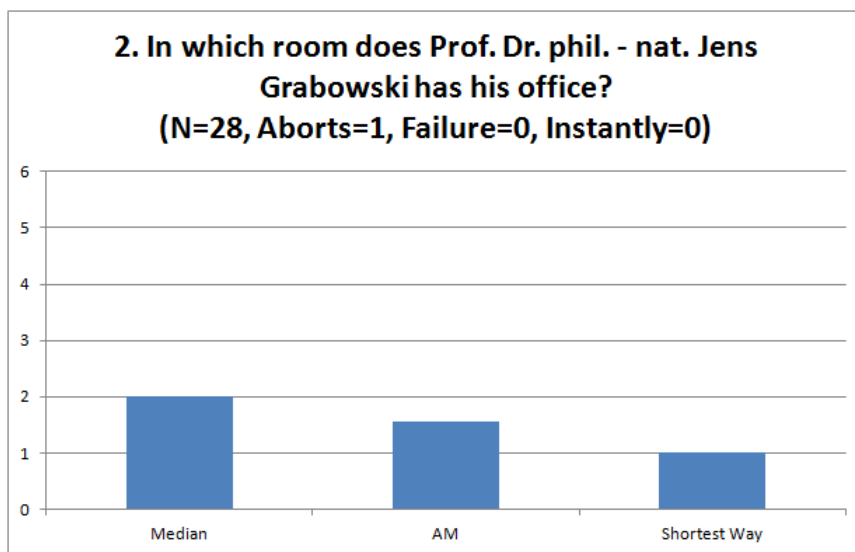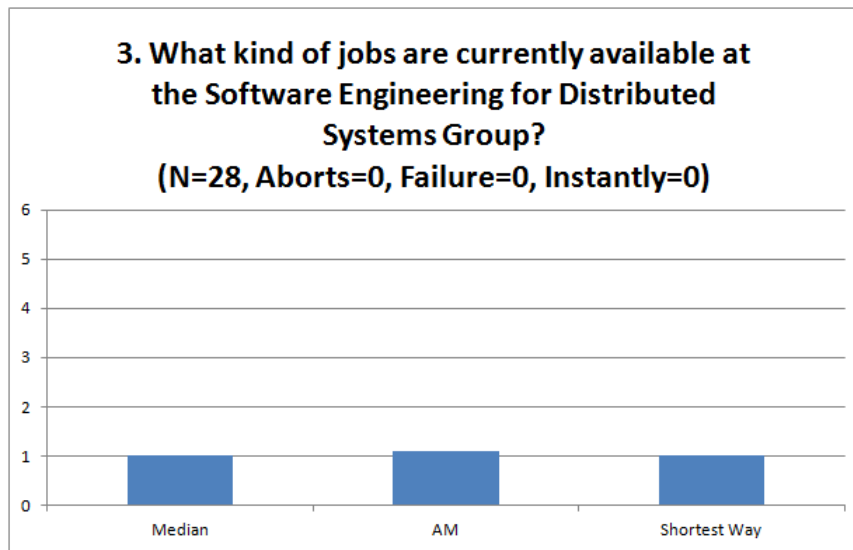*Figure 4.12.: Click frequency of the third question.*

Question 4

The shortest way for this question is to click on "Research", then on the project "MarLog" on the right side of the screen. Only three participants have chosen this way. 23 participants tried to use the local search bar to find the publications that are related to the project "MarLog" by typing "MarLog" or a similar phrase into the search bar. 21 participants did not find the research projects on the "Research" page in this question. They also said, that the research projects are too hidden and it would be better if the projects had an own menu or that they are sorted in a sub menu in the "Research" section. Two participants tried to type "mar" in the local search bar to find the publications that are related to the project. But the search is only functioning, if more than three letters are typed into the search bar. The system shows every publication, after the participant clicked on "Apply". This was very confusing, because the system did not give a feedback that the term was too short.
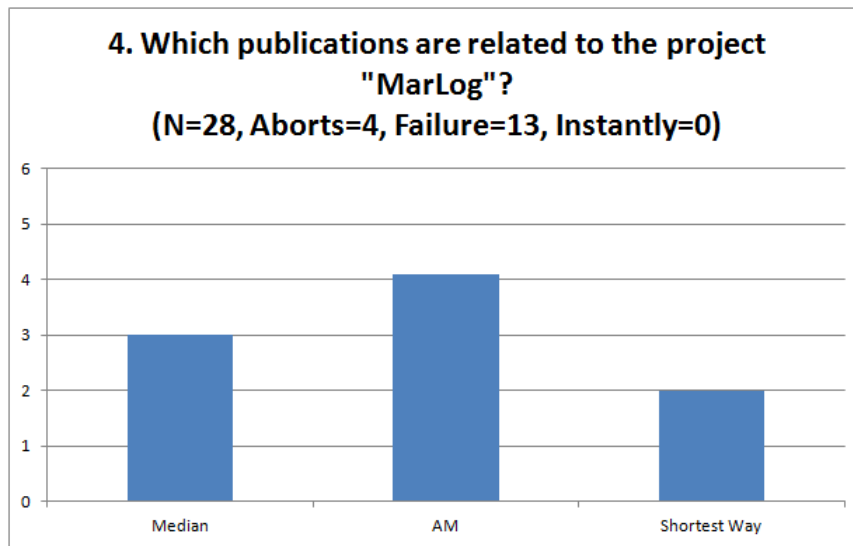
Figure 4.13.: Click frequency of the fourth question.

Four participants cancelled the question, 13 needed to use the search bar. The difference between the shortest way and the median is one click and and between the shortest way and AM is about two clicks.

This question caused the most problems by the participants. The problem is, that there is no mapping between the "Publications" page and the projects. This can also be seen at the internal link structure in figure 3.6. Hence, the publications in the "Publications" page are not mapped to a project. Therefore, it is not possible to use the local search bar at this page to find publications that are related to a project. Another problem is, that the local search bar is only functioning if more then three letters are typed in as a search term. If there are less than three letters typed in, the result will contain every publication. The user is vexed this way, because there is no feedback from the search function, that more than three letters are needed. The next problem is, that the research projects are too hidden. Most of the participants did not search in the "Research" section for the projects and if they did so they overlooked the project navigation on the right side (see: Figure 3.3). The solution for these problems would be a bidirectional connection between publications in the "Publications" page and the research projects in a way, that they can be found by the local search bar if

the project is typed in. Additionally, the local search bar needs to give feedback if less than three letters are typed in as the search term. Furthermore, the "Research" page should be divided into "Projects" and "Research focus". This will result in a "Research" menu, with the subitems "Projects" and "Research focus". With the help of this division the projects will be more obvious to the visitor. If this is not practicable, another solution would be that the projects on the "Research" page are shifted to the left side.

Question 5

The shortest way for this question is to click the "Research" menu button, then the "Past Research Projects" button on the right side so that the menu expands and then click on "Quality of UML Models". Only 16 participants have chosen this way. One participant missed the projects on this page twice, he only saw the text about the research focus. Five participants criticized, that the "Past Research Projects" menu is not expanded. It would be better, if this menu is expanded if you visit the "Research" page.
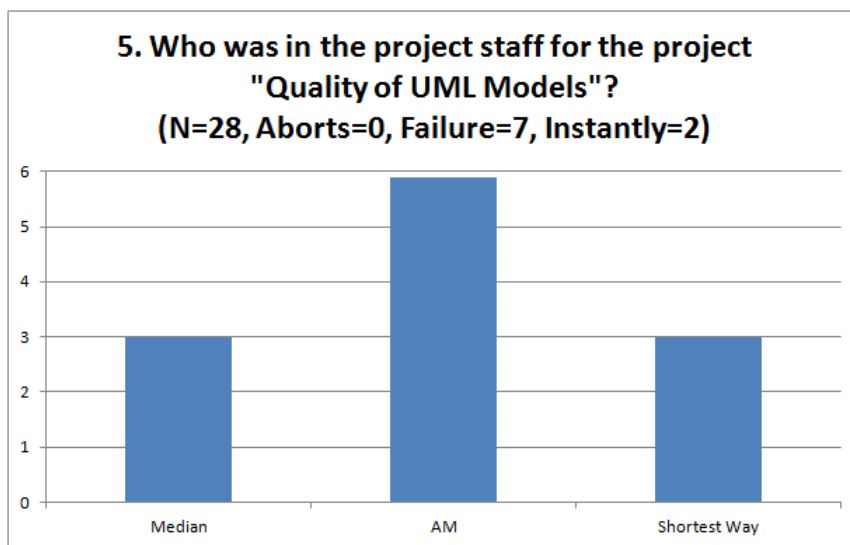
Figure 4.14.: Click frequency of the fifth question.

This question can be answered with just three clicks. The median is equal to that, but

the AM is about three clicks higher. The reason for this is, that one participant needed 37 clicks, one 13 clicks and one 14 clicks. Seven participants used the search bar after they failed to get the answer without it and two used the search bar instantly.

The problem, which caused the participants the most problems at this question, is that they did not find the research projects on the "Research" page (like in Question four). Another problem is, that the "Past Research Projects" menu is not expanded. Because of this, some participants overlooked the menu. A solution would be the division of the "Research" page like it is explained in question four. Additionally to the presented division, there can be an additional subitem, which is called "Past Research Projects". This will solve the problems with the not expanded menu and the hard to find projects.

Question 6 (Researcher)

The shortest way for this question is to click on "Publications", type "autolink" or a similar phrase into the local search bar and click on "Apply". Five of eight researchers did it this way. Two needed to use the global search bar to find the answer and one of the researcher told during the test, that there are two logical ways to answer this question: The first one is the shortest way mentioned above. The second one is to go over the "Research" page to the "autolink" project.

As it is illustrated in figure 4.15, the median and the shortest way are equal here. The AM is not significantly higher. Two researchers needed to use the search bar after they failed to get the answer without it. There were no problems with this question.
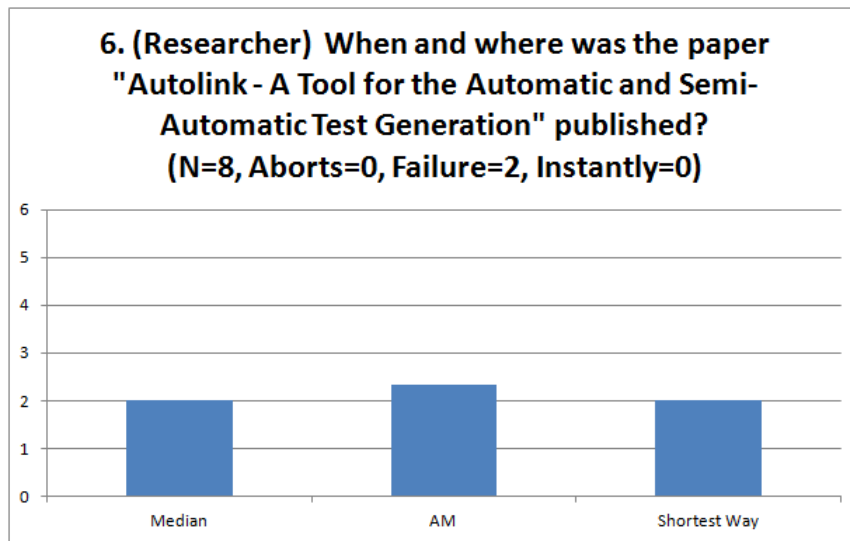
Figure 4.15.: Click frequency of the sixth question (Researcher).

Question 6 (Student)

The shortest way for this question is to click on "Writing and Presenting" in the "Teaching" menu and then click on a link which is named as "here" at the end of the "Bachelor's and Master's Theses" passage. 50% of the students have chosen this way. 14 students mentioned, that the link is too hidden. It would be better if it was more obvious. Some students made the suggestion to use a graphic to do that. Two students told that the link was not obvious, because the blue link text is not good to see on a grey background.

As it is shown in figure 4.16, this question can be answered within two clicks. The median is equal to that, but the AM is about two clicks higher. The reason for this variation is, that one participant needed 18 clicks to get the answer.
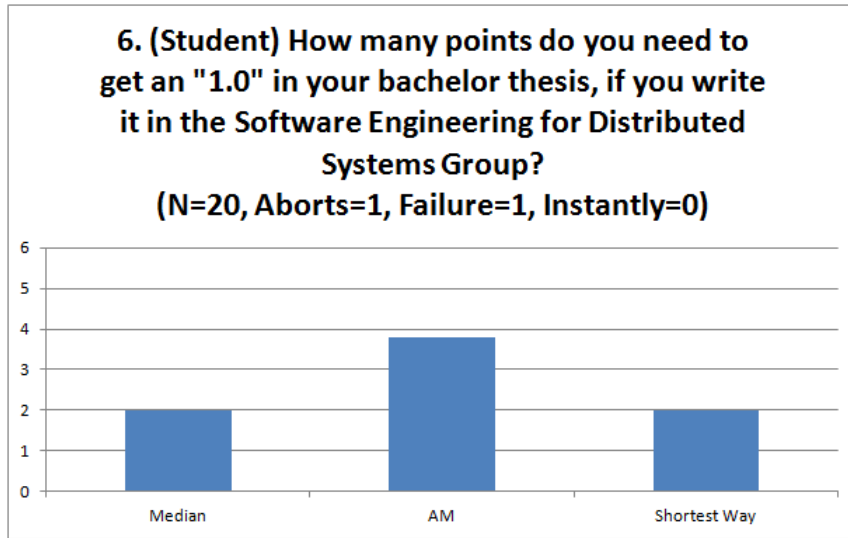
Figure 4.16.: Click frequency of the sixth question (Student).

The problem with this question was, that the students overlooked the link to the grading scheme. As it is illustrated in figure 3.5, the link is at the end of the "Bachelor's and Master's Theses" section. This link can be easily overseen. Further evidence that this was indeed the problem is the time, which was needed by the students to find the answer. It is the question where the participants needed the highest amount of time to answer it. This illustrates, that the students were looking a long time for the answer and were reading the whole section to find the link. A solution would be, that the link is made more obvious. It can be supported by a graphic or another color, because blue is not silhouetted against the grey background.

Question 7 (Researcher)

The shortest way for this question is to click the "Awards" menu button. Every researcher has chosen this way.
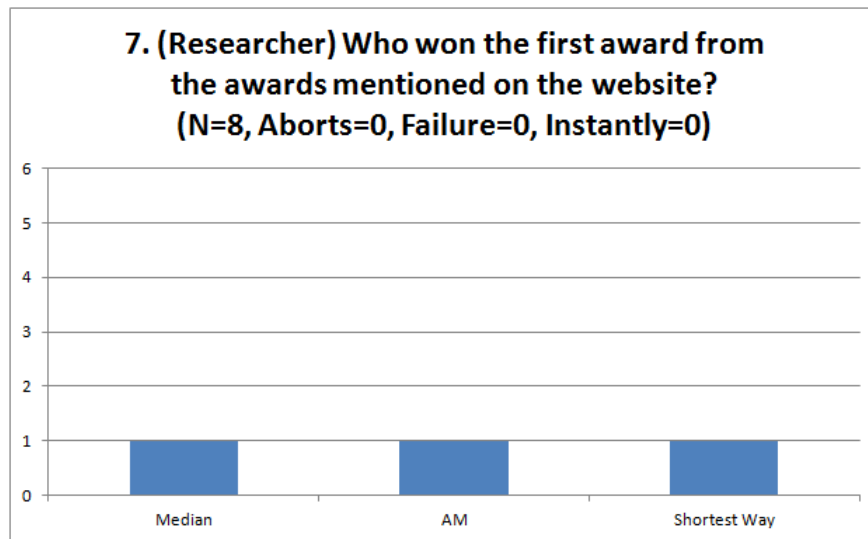
Figure 4.17.: Click frequency of the seventh question (Researcher).

The results show, that the median and AM are equal to the shortest way. There were no problems with this question.

Question 7 (Student)

The shortest way for this question is to click on "Lectures" in the "Teaching" menu, then on the lecture "Software Testing" in "WS2012" and then click on the link to the "UniVZ" for the lecture. 51.85% of the students have chosen this way. Five students mentioned, that they would expect the place and other important information to be on the lecture page and not only on the "UniVZ" page for the lecture.
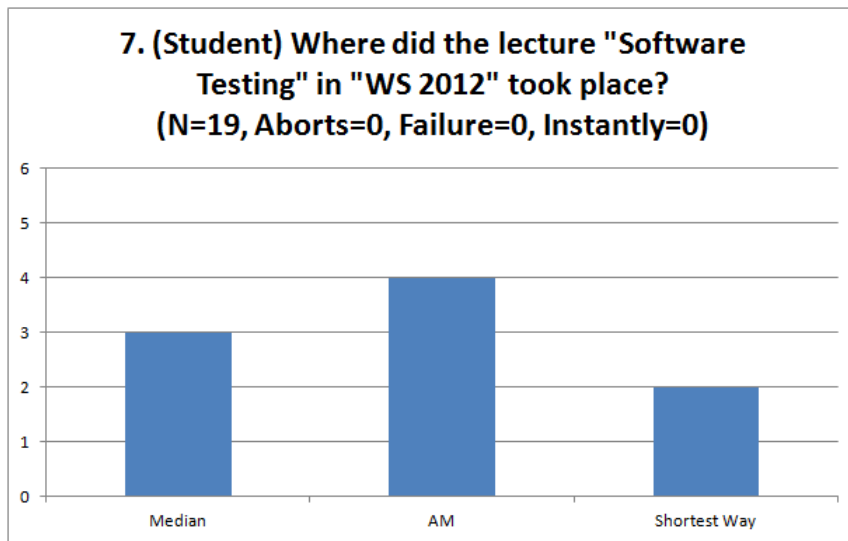
Figure 4.18.: Click frequency of the seventh question (Student).

The median is one click higher than the shortest way. The AM is two clicks higher, because one participant needed 17 clicks to find the answer to this question. One student was taken out of this result, because the UniVZ [3] website was not reachable at this time.

Just nearly half of the students have chosen the shortest way, but most of them clicked in the "Lectures" page on the filter for "WS2012". This counts as an additional click, but this is not a problem with the website. The important information, such as time and place, should be mentioned at every lecture page and not just in the "UniVZ". That the place was not mentioned at the lecture page for the "Software Testing" lecture confused most of the participants. They spend most of the time to read the website (sometimes more than once). To lower the time a visitor would spend searching for the place, every lecture needs a consistent design. Hence, this design should consist of different headlines or points that need to be filled out for each lecture. For example: Overview, Dates, Place, Registration, Material, Content, Examination. The language of the lecture pages should be consistent too.

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[3]UniVZ is an electronic catalogue, where all lectures of the university are listed with room number, time and other data.

Question-overlapping Problems

There are also some overlapping problems, which can not be sorted to one of the questions.

- Nine participants were confused of the forwarding when they click on a menu point (see: Figure 3.6). For example, if they click on teaching, they will be redirected to the "Lectures" page. The confusing forwarding of the menu points can be solved by disabling it. Every menu point needs an introduction page, where the menu point is explained and what information can be found there. For example, the menu point "Publications" should get his own page instead of redirecting to "All Publications" if the visitor clicks on "Publications". On this introduction page, the division between "Recent Publications" and "All Publications" is explained (e.g. what does recent mean? How many years?). Additionally, there should be a link to "All Publications" and "Recent Publications". The same procedure should be done with "Teaching" and "Staff".

- Six participants told, that they think that the navigation should be on the left side of the homepage, because they are used to this. They needed to accustom themselves to the menu on the top side. The confusing navigation can be corrected by shifting the menu from the top of the page to the left side.

- Eight participants say, that the colouring, design or contrast should be different. They say, that the colours should be more friendly and the contrast should be higher. One participant told, that the font size should be bigger, because it is hard to read the words. One participant remarked that the website should not have a fixed height and width. It should adjust itself on the size of the monitor. The design should be changed. An important point is, that the website adjusts itself to the size of the screen. Fixed website sizes are an ancient practice. Furthermore, the font size could be bigger and the contrast should be higher. This results in an easier to read website.

- Five participants told, that they have overlooked the global search bar on the side. It should be more obvious that there is a search bar which can be used. The global search bar is in the upper right corner of the homepage (see: Figure 3.1). There it can be easily overseen by the visitors. A solution can be, that the search bar is shifted to the left side of the page.

- Six participants say, that it is bad that the website is only in English. It was hard for

them to use it. This is a major problem, because this website should also be used by bachelor students. It is possible, that they are not able to understand English enough to use this website, because English skills are not a requirement for the applied computer science bachelor program. Additionally, the website changes between English and German. Some lecture pages are in German, but the rest of the website is in English. A solution would be, that the user can change the language of the website with the help of buttons. These buttons can be in the navigation menu (e.g. a German flag and a Great Britain flag).

- Five participants thought the website was very slow. The speed of the website can only be improved, if the used Content Management System (CMS) is optimized. The processing of the website in the CMS costs most of the time.

Performance

The values in column two and three are in seconds and the values in column four and five are in clicks. This data highly depends on factors like the internet connection or server load. Because of this, the values are just approximate. Another factor that has an influence on these values is the willingness of participants to talk. Hence, the amount of time every participant spend in talking while working is different. This is the reason, why there is no time specification for the shortest way of the different questions. Like in the figures before, the aborts and the search bar usage is also presented.

As it is illustrated in table 4.3, question seven of the researcher task paper is the one, which was answered in the shortest amount of time (21.63 s (AM) or 17 s (median)). The sixth question of the student task paper was the question, which needed the most amount of time before the participant found the answer (135.06 s (AM) 97.5 s (median)). The question with the most aborts and search bar usage is question four. 13 participants needed to use the search bar to find the answer for this question and four cancelled it.

Question	AM (s)	Median (s)	AM (C)	Median (C)	Aborts	Search bar used after failure	Search bar instantly used
1	48.31	43.5	1	1	1	0	1
2	25.59	20	1.56	2	1	0	0
3	30.82	30.5	1.11	1	0	0	1
4	75.55	54	4.09	3	4	13	0
5	65.47	44	5.89	3	0	7	2
6 (Researcher)	52.33	53	2.33	2	0	2	0
6 (Student)	135.06	97.5	3.78	2	1	1	0
7 (Researcher)	21.63	17	1	1	0	0	0
7 (Student)	102	93	4	3	0	0	0

Table 4.3.: Performance data - C: Number of clicks, s: Seconds.

The overall number of aborts is seven. 23 participants used the search bar usage after they failed to get the answer without it. Four participants used the search bar instantly. Hence, with 28 participants and seven questions (but question seven of the student task paper only had 19 participants, (see: Figure 4.18) the abort rate is 3.59%, search bar usage after failure rate is 11.79% and the instant search bar usage rate is 2.05%.

The performance can be evaluated, because every person worked with a Digital Subscriber Line (DSL) connection or a dedicated line. Hence, no participant was restrained by his internet connection.

How did the Participants get back to the Welcome Page?

The following table presents the number of times a specific way to get back to the welcome page was chosen. Participants who uses the search bar or cancelled a question were not taken into account for the affected question. Nearly one-third of the number of times a way was chosen, the participants come to the decision, that there is no other way to get to the welcome page except with the mouse or browser features.

Way	Number of times this way was chosen	In percent
Home Button	94	58.39%
Browser Features	49	30.43%
Logo	10	6.21%
Headline	5	3.11%
Mouse	3	1.86%

Table 4.4.: How did the participants get back to the welcome page.

One-third of the number of times a way back to the welcome page was chosen, the participants used the browser features or the mouse button. This shows, that the home button or logo needs to be more obvious. A solution would be that the logo left to the headline or the home button is made bigger. The linked headline as an additional opportunity to get back to the welcome page does not work. Just five participants have chosen this way and three participants said, that the linked headline is distracting.

SUS-Questionnaire

The SUS-Questionnaire consists of the following statements (see: Appendix B):

A. I think I would use this website frequently.

B. I found this website unnecessarily complex.

C. I thought the website was easy to use.

D. I think I would need Tech Support to be able to use this website.

E. I found the various functions in this website were well integrated.

F. I thought there was too much inconsistency in this website.

G. I would imagine that most people would learn to use this website very quickly.

H. I found the website very cumbersome to use.

I. I felt very confident using the website.

J. I need to learn a lot about this website before I could effectively use it.
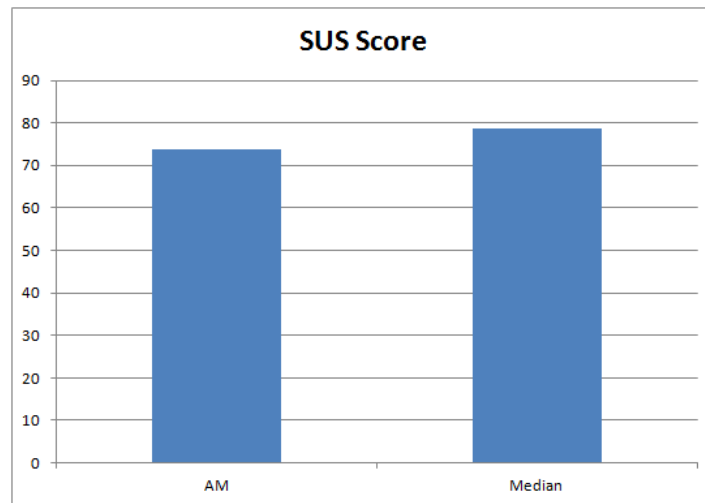
Figure 4.19.: SUS-Score of the tested website. Every participant (28) filled out this questionnaire.

The website accomplish a SUS-Score of 78.75 points (median) or 73.84 points (AM). The maximum SUS-Score is 100 points. Hence, the website is in the upper fourth.
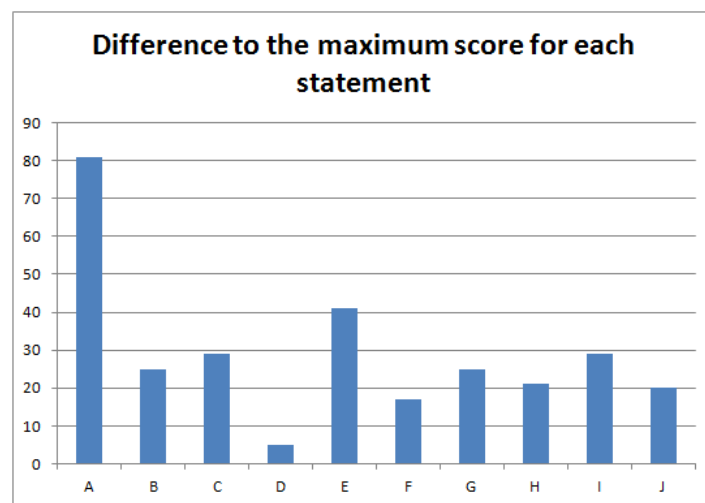
Figure 4.20.: Difference to the maximum score for each statement of the questionnaire.

The highest difference to the maximum score has statement A. After that statement E is the next one, but there are 40 points difference between A and E. Statement D has nearly reached the maximum score. Only the difference is displayed, because of the complexity of the evaluation of SUS-Questionnaire. The statements are evaluated differently, as it is explained in section 4.3.

The website is in the upper fourth of the maximum score, which is a good result. Big differences to the maximum score have statement A and E. A reason for the difference at statement A is, that 19 participants were neither students at the Institute of Computer Science at the University of Göttingen, nor researchers at this institute. Hence, there is no need for them to use this website frequently or visit it another time. The difference at statement E can be explained by the bad functioning local search bar, which is discussed in the question protocols in question four. The differences at the other statements can be explained by the common variability and can be ignored.

5. Redesign Suggestions

The usability evaluation exposed different usability problems in the main tasks of the analysed target groups. But the results illustrate, that most of the usability problems can be corrected easily. Table 5.1 gives a short overview of the identified usability problems and the corresponding redesign suggestion. The priority has a range from one (very low) to five (very high, critical problem).

Priority	Usability Problem	Suggestion
5	Local search bar (in "Publications") feedback	Feedback needs to be implemented, if less than three letters are typed in as search term.
4	Inconsistent design of job advertisements	"Jobs" page needs a redesign: Every advertisement should have a consistent design, which consists of different headlines or labels (e.g.: Job Name, Number of Positions that are free, Job Description, Job Requirements, Contact).
4	Inconsistent design of lecture pages	Lecture pages need a redesign: Every lecture page should have a consistent design, which consists of different headlines or labels (e.g.: Overview, Dates, Place, Registration, Material, Content, Examination). Additionally, the language should be English, German or both for every lecture page.

4	Language	The website should be completely bilingual. A quick change of the language should be made possible through buttons on the website.
4	No bidirectional connection between publications and projects	There should be a bidirectional connection between publications and projects in a way, that the publications of a project can be found, if the project name is typed in the search bar of the "Publications" section.
3	The welcome page is not well designed.	Redesign of the welcome page: Smaller logo, more text and direct links to the important sections of the website.
3	Way back to the welcome page	Logo left to the headline or home button need to be bigger. This way, they will be more obvious to the user.
3	"Research" section is not well designed	Redesign of the research section: This section should be divided in "Research Focus", "Ongoing Projects" and "Past Research Projects".
3	Emphasis of links	Links (especially the link to the grading scheme in the "Writing and Presenting" section) need to be highlighted with color or a graphic.

3	Main menu points	Redesign of the menu: Redirection of the main menu points (Staff, Publications, Teaching) should be disabled and they should get an introduction page. On this introduction page the menu point is explained, what information can be found there and there should be links to the important subitems.
2	Project labels	Projects should get identification labels. With the help of this labels the user can see what the project is about and what he can find on the project website.
2	Website design	Redesign of the appearance of the website: The website should adjust itself to the size of the screen. The font size and the contrast should be higher.
2	Global search bar	Global search bar should be relocated to the left side of the website.
1	How to find us	The "How to Find Us" page should be relocated in the navigation menu.
1	Website speed	The speed of the website should be improved.

Table 5.1.: Suggestions for the redesign of the homepage. The table is sorted by the priority of the identified usability problems.

6. Conclusion and Outlook

In summary, I have applied a combination of two user-oriented usability evaluation methods to a smaller research website. Different target groups of the website, together with their corresponding tasks they want to accomplish with it, were identified (see: Section 3). These target groups are researchers and students. On basis of this results the questionnaire and the thinking-aloud test were developed and applied (see: Section 4). The results of this application are the basis of the redesign suggestions, which are made in section 5.

The results show several major usability problems. Furthermore, two expectations, which were mentioned by the participants, are not fulfilled by the website completely. Additionally, there are six question-overlapping problems, which were identified with the help of the applied methods. 195 questions were processed, seven were aborted (3.59%) and 26 were solved with the help of the search bar (13.34%). Another usability evaluation method should be applied to the website to confirm the data which was acquired. Especially the usability problems with the researcher tasks should be analysed further, because in the applied usability evaluation there were only five researchers who have taken the test. The SUS-Score of the website is in the upper forth of the maximum score, which is a good result. But it shows that the integration of the functions of the website needs to be improved.

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Appendices

A. Introduction Questionnaire

Questionnaire for the Usability Evaluation of the Research Website of the
Software Engineering for Distributed Systems Group (Questionnaire 1)

Go on with
⇓

Date/Datum: **Time/Uhrzeit:**	
Participant number/Teilnehmernummer:	

1. Gender

   Geschlecht

   M... ☐
   W... ☐

2. What is your profession?

   Was für einen Beruf üben Sie aus?

   Student (in Institute for Informatics) .... ☐
   Student (other)................................. ☐
   Researcher (in Institute for Informatics) .... ☐
   Researcher (other)............................. ☐
   Other   ☐

   _____

3. How many hours a week do you spend on browsing the Internet?

   Wieviele Stunden in der Woche verbringen Sie mit surfen im Internet?

   less then 1h .... ☐
   1h - 3h .... ☐
   3h - 6h .... ☐
   more then 6h.................................... ☐

4. Have you visited the website (http://swe.informatik.uni-goettingen.de) before ?

Haben Sie die Webseite (http://swe.informatik.uni-goettingen.de) vorher schon einmal besucht?

Yes... ☐

No .... ☐

6

5. **Short introduction of the Software Engineering for Distributed Systems Group Website**

The research group Software Engineering for Distributed Systems got multiple staff members and is part of the Institute of Computer Science of the University of Goettingen. They offer multiple lectures and they are also researching on projects with the focus on testing and usability.

What do you expect to be on this website if you read/listen the short introduction above and use your own knowledge about research group websites? Name three important topics/information, which you expect to be on the website.

Kleine Einführung der Software Engineering for Distributed Systems Gruppen Webseite

Die Forschungsgruppe Software Engineering for Distributed Systems hat mehrere Mitarbeiter und ist Teil des Instituts für Informatik der Universität Göttingen. Die Mitarbeiter bieten mehrere Vorlesungen an und forschen zudem an Projekten mit dem Fokus auf testing und usability.

Welche Inhalte erwarten sie auf der Seite, wenn Sie den kurzen Einführungstext gelesen/gehört haben und ihr eigenes Wissen über Forschungsgruppen Webseiten benutzen? Nennen Sie drei wichtige Inhalte/Informationen, welche Sie auf der Webseite erwarten.

_____

_____

_____

6. Which Browser will you use for the upcoming test?

Welche Browser werden Sie in dem anschließenden Test benutzen?

Firefox .... ☐
Safari .... ☐
Internet Explorer.............................. ☐
Chrome .... ☐
Opera.. ☐
Other ☐

_____

7. Which device will you use for the upcoming test?

Was für ein Gerät werden Sie in dem anschließenden Test benutzen?

PC.. ☐
MAC... ☐
Tablet... ☐
Smartphone.................................. ☐
Other ☐

B. System Usability Scale Questionnaire

Questionnaire for the Usability Evaluation of the Research Website of the
Software Engineering for Distributed Systems Group (Questionnaire 2)

Go on with
⇓

Date/Datum:	Time/Uhrzeit:
Participant number/Teilnehmernummer:	

Please fill out the following questions after you have done the tasks to rate the website of the research group.

Bitte beantworten Sie die folgenden Fragen um die Webseite zu bewerten, nachdem Sie die Aufgaben bearbeitet haben.

		Strongly Disagree / Starker Widerspruch				Strongly Agree / Starke Zustimmung
A	I think I would use this website frequently. Ich denke ich würde diese Webseite öfters benutzen.	☐	☐	☐	☐	☐
B	I found this website unnecessarily complex. Ich fand diese Webseite unnötig komplex.	☐	☐	☐	☐	☐
C	I thought the website was easy to use. Ich dachte, dass die Webseite einfach zu benutzen war.	☐	☐	☐	☐	☐
D	I think I would need Tech Support to be able to use this website. Ich denke ich würde den Tech Support brauchen um diese Webseite zu benutzen.	☐	☐	☐	☐	☐
E	I found the various functions in this website were well integrated. Ich fand die verschiedenen Funktionen der Webseite sehr gut integriert.	☐	☐	☐	☐	☐
F	I thought there was too much inconsistency in this website. Ich dachte, dass es zu viel inkonsistenzen auf der Webseite gab.	☐	☐	☐	☐	☐
G	I would imagine that most people would learn to use this website very quickly. Ich kann mir vorstellen, dass die meisten Menschen sehr schnell lernen würden mit der Website umzugehen.	☐	☐	☐	☐	☐
H	I found the website very cumbersome to use. Ich fand die Webseite sehr umständlich zu benutzen.	☐	☐	☐	☐	☐
I	I felt very confident using the website. Ich fühlte mich bei der Benutzung der Webseite sehr sicher.	☐	☐	☐	☐	☐
J	I need to learn a lot about this website before I could effectively use it. Ich muss noch sehr viel über diese Webseite lernen, bevor ich diese effektiv nutzen könnte.	☐	☐	☐	☐	☐

C. Student Task-Paper

Task-Paper for the Usability Evaluation of the Research Website of the
Software Engineering for Distributed Systems Group (Student)

Go on with
⇓

1.	With which bus lines are you able to get from the main station in Goettingen to the north campus?
	Mit welchen Bus-Linien kommt man von dem Hauptbahnhof in Göttingen zum Nord Campus?
2.	In which room does Prof. Dr. phil. -nat. Jens Grabowski has his office?
	In welchem Raum hat Prof. Dr. phil. -nat. Jens Grabowski sein Büro?
3.	What kind of jobs are currently available at the Software Engineering for Distributed Systems Group?
	Welche Jobs sind momentan bei der Software Engineering for Distributed Systems Gruppe ausgeschrieben?
4.	Which Publications are related to the project "MarLog"?
	Welche Publikationen sind dem Projekt "MarLog" zugehörig?
5.	Who was in the project staff for the project "Quality of UML Models"?
	Wer war in der Projektgruppe des Projektes "Quality of UML Models"?
6.	How many points do you need to get an "1.0" in your bachelor thesis, if you write it in the Software Engineering for Distributed Systems Group?
	Wieviele Punkte werden für eine "1.0" in der Bachelorarbeit benötigt, wenn man diese in der Software Engineering for Distributed Systems Gruppe schreibt?
7.	Where did the lecture "Software Testing" in "WS2012" took place?
	Wo fand die Vorlesung "Software Testing" im "WS2012" statt?

D. Researcher Task-Paper

Task-Paper for the Usability Evaluation of the Research Website of the
Software Engineering for Distributed Systems Group (Researcher)

Go on with
⇓

1. With which bus lines are you able to get from the main station in Goettingen to the north campus? Mit welchen Bus-Linien kommt man von dem Hauptbahnhof in Göttingen zum Nord Campus?	
2. In which room does Prof. Dr. phil. -nat. Jens Grabowski has his office? In welchem Raum hat Prof. Dr. phil. -nat. Jens Grabowski sein Büro?	
3. What kind of jobs are currently available at the Software Engineering for Distributed Systems Group? Welche Jobs sind momentan bei der Software Engineering for Distributed Systems Gruppe ausgeschrieben?	
4. Which Publications are related to the project "MarLog"? Welche Publikationen sind dem Projekt "MarLog" zugehörig?	
5. Who was in the project staff for the project "Quality of UML Models"? Wer war in der Projektgruppe des Projektes "Quality of UML Models"?	
6. When and where was the paper "Autolink - A Tool for the Automatic and Semi-Automatic Test Generation" published? Wann und wo wurde das Paper "Autolink - A Tool for the Automatic and Semi-Automatic Test Generation" veröffentlicht?	
7. Who won the first award from the awards mentioned on the website? Wer gewann die erste Auszeichnung, von den auf der Webseite genannten?	