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Optimizing university websites in terms of usability

Jop Havinga

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Foreword

As you hold my bachelor thesis in your hands I would like to share a couple of words with you before you start reading it. This research is intended to provide a stepping stone in the design process, in this case of university websites. It is not intended to replace or improve the usability test of a developed product, it is intended to provide alternative starting point for a designer.

In this assessment I've been searching for what works and what does not about the university websites used today. This to allow a way to start with was already has been done and take from it what proves to be efficient and effective. These findings are translated into guidelines and not solid rules, as there will always be exceptions which might require a different approach.

As I wrote more and more on my thesis, I started what I was doing was very similar to the approach of a famous martial arts instructor and philosopher of the last century, who said:

"Absorb what is useful, discard what is not and add your own."

This also sounds like solid advice to be used for a usability designer. While the first part of that approach doesn't seem too revolutionary, I think it is important for designers to also remember the last part. Different universities will require different websites. What might work for a university of 2000 students, one faculty and one building, might not work for university of 50.000 students, multiple faculties and multiple buildings on different locations. The guidelines provide information of what works and what does not, but do not be afraid to innovate and think about specific requirements for a university.

I would like thank some people before who have been a great help during the creation of this thesis. First I would like to thank Martin Schmettow for the guidance he provided during each aspect of this thesis and open minded vision on the approach and data. I would also like to thank my close family members and friends who supported me. My thanks also go out to all test participants who offered me their time and attention, of who most did not ask anything in return.

Jop Havinga

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Summary

In this study 10 different university websites are compared on their usability by executing 10 different tasks on each of the websites. Each participant in the experiment did each task once, and each task was done on a different website. Which task was done on which website was different for each participant. Top and bottom performing websites in terms of successfulness for the completed tasks and time needed to complete the tasks are analyzed. These results show poor and strong designs for specific tasks. Clustering the website based on their features failed to provide any predictive value about the usability of a website. From the results guidelines are proposed to help improve the usability of university websites.

Samenvatting

In dit onderzoek worden 10 verschillende universiteits websites vergeleken op hun gebruiksvriendelijkheid door het uitvoeren van 10 verschillende taken op elk van de websites. Elke deelnemer van het onderzoek heeft elke taak een keer gedaan en elke taak werd gedaan op een andere website. Welke taak werd gedaan op welke website was verschillend voor elke deelnemer. De best en slechts presterende websites op het gebied van het antwoord kunnen vinden op de taken en de tijd die nodig was om de taken te voltooien werden geanalyseerd. Deze resultaten tonen zwakkere en sterkere ontwerpen voor specifieke taken. Klustering van de website op basis van hun eigenschappen bleek geen enkele voorspellende waarde te geven over de gebruiksvriendelijkheid van een website. Uit de resultaten werden richtlijnen opgesteld om de gebruiksvriendelijkheid van de universitairewebsites te verbeteren.

1. Introduction

When building a website for a university, one might read hundreds of books and studies, before creating the first concept. It would be a very scientific approach to first build a model based on the theories of other people. However, many would start by looking at existing websites of universities. As the goal is rather complex, looking at how others have dealt with the problem can be a great help. As we know from Bandura (1977) children learn from looking at how others behave, why not use this system for the design of university website. This study tries to quantify this approach and looks at different university websites, breaks them up in smaller parts by looking at how they perform at different tasks. Quantifying the differences in performances allows websites to be ranked in best and worst performing website, which helps decide what is most effective or efficient. The differences in performance on websites can be used to formulate guidelines to help designers optimize a university website in terms of usability.

For the optimal university website this study looks at its usability. The International Organisation for Standardization (ISO) defines usability as "The extent to which a product can be used by specified users for specified tasks". This definition takes three aspects into account. First the product, which in this case is a university website. The second aspect is about the users, in this study students are the target group. The third aspect is about the tasks, in this study this is providing the information the student is looking for. How these three aspects take form in this study will be discussed in more detail later.

1.1 University websites

This study was conducted in the Netherlands where multiple universities are listed among the top of the world. The websites of these universities however, contain more usability and accessibility errors than other the top universities in other countries (Kane, Shulman, Shockley, & Ladner, 2007). This remains an area where a lot of improvement can be made.

In a pre study done by Schmettow and others in 2011 about the influence of working memory on web browsing was found that there were no significant differences among Belgium university websites in the time it took to finish a set of tasks. The average of all the tasks combined seemed to be equal on the different websites. When looking at each task separately however, there was a difference. Some websites scored better at one task and others scored better on another. Looking at the best scoring websites for each task can teach us about building an optimal website for a university.

All Dutch and Belgium university websites consist of more than 200 different pages (Thelwall et al., 2002). The design of such huge websites is not an easy task. As reported by Jacob Nielsen (1999) such websites do not only require a search function, but a strong navigational structure as well. For the usability of a website a good navigation system is important. The ease of navigation of a website comes from its graphical design, layout and link structure. A good navigation structure makes it easier for users to find what they are looking for, helps the user know where he has been, is and can go from there (Jacob Nielsen, 1999). A website with a good navigation structure makes the website perceived more successful than a website without one (Palmer, 2002).

Hick's law provide a formula to predict how fast users can make a choice in a menu. The fewer choices users have, the faster they can make a decision (Seow, 2005). Landauer & Nachbar (1985) found the same thing, that choosing the right option in a navigation menu goes faster when there are fewer options. However in a design were multiple decisions have to be made, it is faster to have more options for each decision and less decisions. Bachiochi (1997) proposed, from research, guidelines to have information reachable in four clicks at most on websites and information should be retrievable within 60 seconds. The knowledge of these studies combined would favor wide over narrow navigation structures.

To make a website easy to navigate, more than a good structure of the menus is needed. The words used in a navigation structure can be ambiguous and desired information can be related to different links. When a user has a desired information goal, each link has an information scent. This can be

seen as the perceived likelihood of the user that the link will bring him or her closer to the information he or she is looking for (Blackmon, Kitajima, & Polson, 2005). When looking for the opening hours the university's library, links containing words as "opening hours" or "library" will have a high information scent. Problems can arise when a link with the highest information scent, doesn't lead to the desired information. Unfamiliarity with the subject of the user can be at the root of this problem, but competing headings on links of the website as well.

1.2 Users:

In 1988 Egan wrote about usability "Differences among people account for much more variability in performance than system designs or training". There is research supporting that differences in browsing skill among people exist. Things as domain knowledge and computer confidence have been named (Juvina & Oostendorp, 2006), but also reading abilities, the locus of control and spatial working memory of the user (Laberge & Scialfa, 2005) .

To prevent measuring user effects instead of the website effect, the test users were selected on a requirements of the target group. This study focused on students using different websites of universities. Also websites were chosen which the participants will least likely have used in the past.

1.3 Tasks

While usability research is usually focused on the design a product, interface or system, Egan (1988) stressed about what the differences in users can account for. Later Nielsen (1992) added the importance of tasks to this by stating "User differences and task variability are the two factors with the largest impact on usability". A university website has to be suited for a lot of different tasks. It has to provide information about different schedules for different studies, information about extracurricular activity, rules and policies, contact information in general, teaching staff, opening hours and much more. All the websites of the universities in this study have separate websites for specific information on courses. Often they use frameworks as blackboard for this. Other more general information, such as opening hours of the library is located on the main website of the university. This study focused on tasks about retrieving general information.

1.4 Measuring usability

Usability itself cannot be directly measured, the different pieces that create the usability can (Hornbak, 2006). The ISO describes the three facets of usability which can be measured separately. These facets are effectiveness, efficiency and satisfaction. Each of these facets can have multiple measures in a single experiment (Sauro & Kindlund, 2005). In this experiment there was only measured for effectiveness and efficiency. Measuring satisfaction often relies on standardized self-report questionnaires or comparing different options (Hornbak, 2006). These questionnaires often rely on the differences in score between tasks and do not provide a reason what causes the satisfaction. As it is difficult to find what the cause is for higher or lower satisfaction from behavior analysis alone, this was not included in this research.

1.4.1 Effectiveness

Effectiveness focuses on the degree in which users succeed in the task and how well they succeed in the task. Frequent used measures for this are tasks completion, accuracy and error rates made by the user (Hornbak, 2006).

Task completion
Task completion is often done in a binary fashion where the user either succeeds or he or she doesn't. During this experiment there were three possible outcomes for task completion. The first was that the user completed the task successfully, the second was that he or she gave up and couldn't find the answer and the third option was that the user retrieved an incorrect answer. When an explanation has to be found for an unsuccessful completion, this extra distinction can help discover an underlying cause. Accuracy and task completion are integrated with each other in this way.

Error rates
With information retrieval tasks on websites the correct answer is either found or not. The information can often be found on multiple pages and each page can be reached by multiple links. Designers of a website might have a default way in mind for users to reach certain information, but it's impossible to judge if one way is right or wrong. It can be the strength of a website design that information can be reached in multiple ways. What can be measured however is the number of times a user goes back to a link he or she already had visited during a task or the number of times the user returns to the homepage. Pressing the back button of the browser or by link returning to a page a

user had already visited can be seen as an undo command to return to a previous state. Taking note when users make use of the undo command, can often help discover problems with the usability as the action did not lead to the desired results (Akers, Simpson, Robin Jeffries, & Winograd, 2009). To measure this the times a participant visited the homepage was counted, as well as the times the participant visits a page he has already visited. The participant visits a page multiple times by pressing the back button, purposely returning clicking a link to return to a certain page or click a link he doesn't know that it will lead him to the same page, however in each case the user did not manage to directly go to the information he was trying to retrieve. If a user often visits the same single page during one information retrieval task, it isn't a sign of a good design. These can be counted as critical incidents which show problems in the ease of use.

1.4.2   Efficiency

The efficiency is about how much is demanded from the user to achieve a task successful. Time needed to complete a task is the most frequent used measure of efficiency, but there are other measures of efficiency as well, such as required effort or the ease of learning (Hornbak, 2006).

Time on task
The time that a user needs to complete a certain task is frequently used in usability studies as an efficiency measure (Hornbak, 2006). By measuring the time needed, it is possible to discern on which tasks excessive time is spend and where users have trouble with the interface (Jacob Nielsen, 1992).

Usage patterns
Studying the way users interact with an interface can show what recourses the user expends when performing a task. Examining what kind of patterns appear during use does usually not provide a scale on which designs can be compared for better or worse. It does however, provide insight to different interfaces, which can help improve interfaces (Hornbak, 2006). In this experiment the number of clicks of the user was measured when solving a task.

Websites where users need less clicks to find the information are expected to perform better on other measures. The conclusions of Landauer & Nachbar (1985) and Bachiochi (1997) are that information should be retrievable in a small number of clicks, which leads to faster task completion and more positive scores on a range of subjective measures.

TLX questionnaire

The NASA Task Load Index (TLX) is a questionnaire which consists of 6 items. It is developed to measure how demanding a certain task was to complete for the users. As it is a self-report it is a subjective workload test. The questionnaire covers how mental, physical and temporal demanding the task was, how much effort it required from the user, their perceived successfulness and the frustration during the task (Hart, 2006). Preferably a task poses a load as minimal as possible on the user during its execution.

1.5   Usability guidelines

Usability guidelines are frequently used in design processes of web interfaces. The guidelines provide do's and don'ts or recommended practices for the design. Guidelines aren't absolute rules for the design of websites. A guideline usually aims at websites in general, but specific websites might benefit from another approach (Cappel & Huang, 2007). Guidelines are often used by designers during the design process, but they can also be used to evaluate an existing interface (Jacob Nielsen, 1992). Guidelines can be used by usability experts, but also by designers less familiar with usability studies as well. Guidelines as evaluation tool are most proficient at finding general and recurring problems of the usability of an interface (R. Jeffries, Miller, Wharton, & Uyeda, 1991)

Guidelines offer a way to improve a certain usability aspect, without having to do an extended usability test. Nielsen (1992) commented on this, that not each usability goal for a specific design has to be measured in a usability test. Having a goal listed during the process of design can already help improve the usability, as guidelines provide a system to improve the usability.

When designing for high usability it is best to do prototyping early in the design process, as this helps to find problems as early as possible. Large problems in the usability can require that drastic changes have to be made. Finding these problems early in the design process is less costly, as it prevents spending a lot of work on something that doesn't work. With interfaces it is hard to have a complete prototype before the product is nearly finished. This makes guidelines in case of an interface design even more useful (Jacob Nielsen, 1992).

Most web design based guidelines are aimed at making a website universally accessible. The guidelines are proposed with the idea that a website should be usable by any person regardless of their cognitive profile, prior computer experience or more technical aspects, such as the browser they are using (Mariage, Vanderdonckt, & Pribeanu, 1999).

Usability guidelines are classified by different levels of detail. The least detailed guidelines are labeled as principles. They are high level expressions and can be seen as goals to keep in mind during a design process. These principles are often based on basic human cognitive skills. As guidelines become more detailed they are classified as rules, these are more focused on a specific field of design. Rules are still open to some level of interpretation. The most detailed guidelines are classified as conventions or recommendations. These are specific solutions for specific problems and are non ambiguous. (Mariage et al., 1999)

1.6   Research goal

This study is focused on finding and formulating guidelines, by comparing different existing websites, to help designers to create an optimal university website in terms of usability.

To do this first the performance of university websites are compared on different tasks. After a more global inspection of the data, specific behavior on good and best scoring websites are analyzed to find where problems occur.

2 Method

This study compares how ten university websites perform on efficiency and effectiveness on ten different tasks. The design of the research is cross repeated measures, as each participant performed each of the various tasks, on a different website. The combination of websites and tasks was different for each participant. In this design each participant does each task once and every task on a different websites. With ten websites and ten tasks, there are a hundred different combinations of task-website. As there are ten tasks and ten websites, each participant made ten task-website combinations. This means that for every ten participants all task-website combinations were made. This design allows testing of a large number of sites on multiple tasks and prevents any learning effects from influencing the results.

2.1   Participants

The participants pool consisted of 41 Dutch university students, ranging from 18 to 25 years old, with an average age of 22,17 years. Of the 41 students, 29 were male and 12 were female and 7 studied psychology, 7 studied communication, 2 studied social geography, 4 studied industrial design, 2 studied industrial engineering, 3 studied law, 3 studied marketing management, 3 studied public administration, 1 general social sciences, 3 studied economics, 1 studied technical physics, 1 studied kinesiology, 1 studied business, 2 studied leisure studies, 1 studied chemistry. The participants joined either on a voluntarily basis, except for 3 students who were recruited by a student test participant system.

2.2   Tasks

Participants were asked to look up information on different university websites. This study focused on five Dutch and five Belgium university websites. The websites were selected on the information available on the websites and their differences in appearance and structure. The websites chosen for this experiment are: VU Brussel, KU Leuven, UGent, University of Antwerp, UHasselt, Erasmus, Leiden University, VU Amsterdam, RUG and Tilburg University.

Each participant was asked to complete 10 different tasks each on a different website. The tasks selected for this experiment are the following:

1. "How many libraries does the university have?"
2. "How many faculties does the university have?"
3. "Find the schedule of the first year bachelor biology?" For universities that did not offer biology, public administration or criminology was chosen.
4. "What is the central telephone number of the university?"
5. "What are the opening hours of the library? If there are more than one, the first is sufficient."
6. "Who is the current rector (magnificus) of the university?"
7. "You have a complaint about how you were treated by a teacher. Find a ombudsperson or complaints desk. Make sure you have a phone number, email address or specific desk you can visit."
8. "Find a map of the university with different school buildings on it."
9. "Find the current academic calendar of the university."
10. "You have some personal problems and are looking for a student psychologist. Make sure you have a phone number, email address or specific desk you can visit."

These tasks were selected based on what information was available on university websites in general, on the importance of the information and on how likely it is students want to turn to the website to find the information. A student looking for a psychologist for example might not want to ask fellow students for this information. Also a balance was found between tasks which are easily located on most websites, like finding the telephone number, and tasks which require you to go deeper into the website, such as finding a student psychologist.

Each participant performed every task once and every task on another website to prevent the occurrence of any learning effects. The combinations of particular tasks performed on a specific website were different for each participant. To minimize maturation effects the order of tasks and website was shuffled for all the participants. In appendix 1.1 an example of a task list that was given to participants can be found.

The participant decided if he believed he had found a sufficient answer on the website. The time stopped when the participant gave a signal to the experimenter. Before hand each participant was told that in this experiment the websites were tested, not the user and that the study is about locating the information, not about a correct judgment. A university might have listed it has 3 library rooms and 4 digital libraries. This can be counted as 3 libraries or as 7, however the participant was only asked to locate the information, not to formulate a correct answer.

All participants were asked not to use search functions on any website, but were free to use any other feature or browser function, as long as they didn't type a new url in the navigationbar.

2.3 Measurements

In the period the participants were retrieving the requested information on the website their screen actions were recorded with screen recording software. For each task a participant carried out a separate video clip was created which could later be analyzed for the different measures.

For each participant multiple variables were recorded for every task they carried out. First was checked if the user found a correct answer, that he or she gave up or retrieved an incorrect answer. The second measure was the time taken on the task to complete it, this was measured in seconds. This was done by the screen recording software. It was also recorded how many clicks, how often the user returned to the homepage and how often he visited a link that he had already been visited during the completion of the task. All these variables were registered later from analyzing the video clips produced by the screen recording software. For the times they click on a link previous visited, returns to the homepage are not included. After the completion, successful or not, the participant was given the TLX questionnaire to measure their subjective workload for the task. The TLX questions about physical load and temporal load were taken out of the questionnaire as these questions seemed irrelevant for self-paced search task on websites. In a test run of the experiment that was carried out, participants also commented that these questions lead to confusion. In appendix 1.2 the used TLX questionnaire can be found.

In the analysis of the results not only differences in means, but also differences in range are taken into account. When 2 designs have similar means, the one with a smaller range is preferred because it works better for more people. A long range suggests that the task is hard to solve for some users. Keeping the principle of general accessibility in mind, for all users, regardless of experience or cognitive profile, the website should be easy to navigate en retrieve information.

After the websites were compared in performance, the videos of the best and worst performing websites for each task were analyzed more carefully. This allowed seeing where participants' struggled with finding the information. This analysis was to reveal reasons why some website designs performed strong and some did not. The quantitative data points to which behavior needs further inspection, which in turn allowed shedding light on what causes these differences.

2.4   Website feature analysis

All websites were analyzed on a set of 25 features if they were included on the website or not. These features included links in the main navigation bar, multiple navigation trees or not, the appearance of the front page, participant or structure orientated navigation and many more. These were all translated to binary variables with 1 if it was present on the website and 0 if it was not. In appendix 1.3 the complete list of features can be found used for the analysis.

3 Results

To avoid statistical problems the data are first explored (Zuur, Ieno, & Elphick, 2010). As is known by some researchers results of usability are positively skewed and show a gamma distribution. The median is preferred to the arithmetic mean in such cases to estimate the population. However the geometric mean has proven to be closer to the population median, than the sample median for samples smaller than 25 (Sauro & Lewis, 2010). For this reason the geometric mean is used for the analysis, which follows after the data exploration.

One explanation for this is that tasks are often fairly simple and the default way to solve a task is often the shortest. If every participant in a usability experiment would use the default a normal distribution would be expected in the task results for time on task. Not all participants however find or start with the default way to solve the task and encounter more problems than others and those participants take longer to solve the task. In most usability tests there is no equivalent of this effect in which users need less time to finish the task. This leads to the normal distribution being skewed to the right.

3.1 Data exploration

In the data exploration the relation between the dependant variables is explored and the homogeneity of the variance is tested. The outliers of the data are checked, but these will be explained during the analysis, as these are the critical incidents which show problems with the usability.

3.1.1 Correlation of the output variables

A correlation analysis of all the quantitative dependant variables time on task, number of clicks, times returned to the homepage, times a link is clicked that was previously clicked and all questions from the TLX questionnaire show high and significant correlations. In appendix 2.1 a complete table with the correlation values can be found. The lowest correlation is between Times returned to the homepage and the TLX question "How successful were you in accomplishing what you were asked to do?", which has a correlation of -0,429. The highest correlation is between times on task and times

returned to the homepage, which has a correlation of 0,861. For the highest and lowest correlation the absolute values are taken into account, not whether the correlation is positive or negative.

A principal components factor analysis on these variables extracted two components behind these variables. The first component has an eigenvalue of 5,410 and explains 67,624% of the variance. The second component has an eigenvalue of 1,001 and explains 12,515% of the variance. The first component has the highest loading for time on task and number of clicks, which both have a loading of 0,901. The lowest loading is -0,729 and belongs to the TLX question "How successful were you in accomplishing what you were asked to do?". This item is the only negative loaded item for component one, which is not surprising, as it also correlates negatively with the other items. For the highest and lowest loading the absolute values are taken into account, not whether the loading is positive or negative. In appendix 2.2 a complete list of the loadings can be found.

Component 2 seems more random. It has 3 negative loadings, which are all TLX questions, but of which the TLX question "How successful were you in accomplishing what you were asked to do?" is not one. Also the highest absolute loading belongs to the times returned to the homepage and the lowest to time on task, which correlates the highest. Finding a possible explanation for both components will prove hard, but the high loadings do show all outcome variables are very similar in this experiment. For the analysis on task level, it is chosen to work with time on task as indication variable. The high correlation suggests they find similar problems. Number of clicks is not be used as this is not a design goal by itself for a website (Hornbak, 2006).

The high correlation between the different outcome variables is quite unusual, looking at recent studies. In 2007 Hornbak & Law used the data of multiple usability studies and found correlation of 0,196 between efficiency measures and satisfaction measures. Sauro & Lewis (2009) report strong task-level correlation (r = between 0,44 and 0,60) and mild at test-level correlation. This however is still a lot lower than the correlations found in this experiment. A possible explanation for this is the small sample size and simple task measures. (Kasper Hornbæk & Law, 2007; Sauro & Lewis, 2009)

3.1.2   Homogeneity of the variance

When plotting the arithmetic mean of each task-website combination against its variance, a nonlinear growth of the variance seems to appear as the mean increases. This variance increases more for each point of mean as the mean becomes higher. Serious violation of homogeneity is a major problem for regression analysis (Zuur, Ieno, Walker, Saveliev, & Smith, 2009). A curve estimation regression

The arithmetic mean of each task-website combination is plotted on the x-axis with its variance on the y-axis

analysis on the data shows that linear (R²=0,656, F=185,3), quadratic (R²=0,680, F=102,0) and exponential growth (R²=0,675, F=201,9) are each significant more likely than no growth of the variance as the mean increases.

If the mean is plotted against the square root of the variance for each website task combination a linear growth can be seen. This suggests the relation between the mean and variance is quadratic in nature. Also the quadratic regression line is nearly identical in its path to the linear regression line. This is similar for the other variables. In appendix 2.3 there can be found for the other output variables.

The arithmetic mean of each task-website combination is plotted on the x-axis with the square root of its variance on the y-axis.
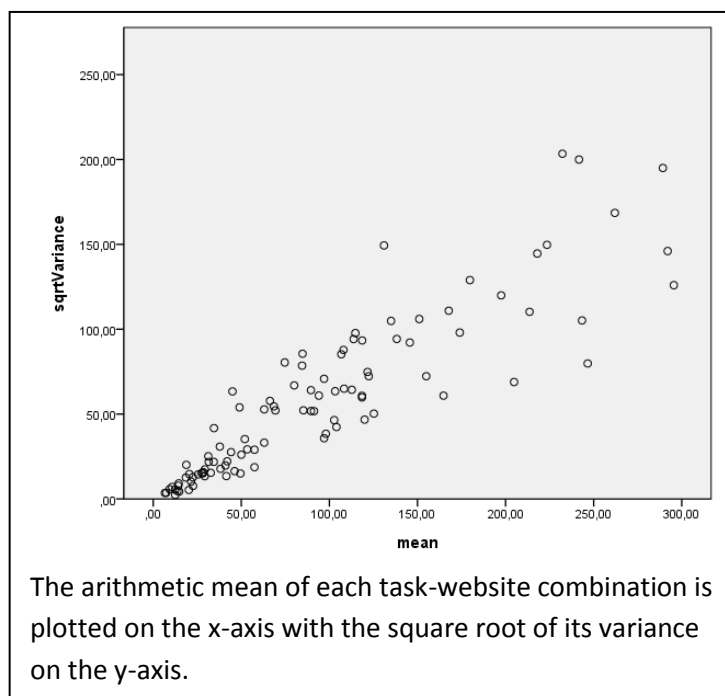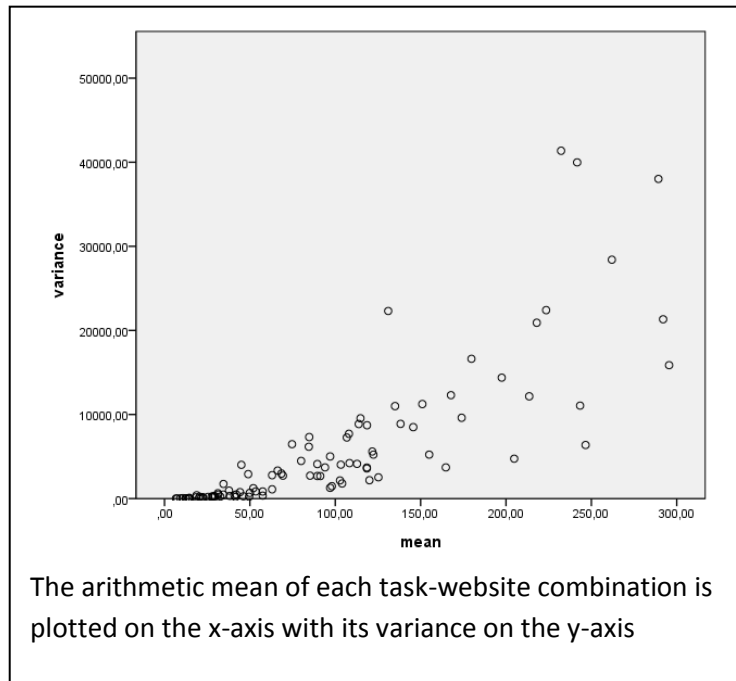
3.1.3   Conclusions of the data exploration

Because the homogeneity and normality are lacking, generalized linear model based test are unsuited as the underlying assumptions are violated (Zuur et al., 2010). The cross repeated measures design of task – website combinations, leads missing values for each participant, which makes most repeated measures unusable for analysis of this dataset. As both normality of the distribution and homogeneity variance are lacking, transformation of the data can have unexpected effects which can lead to different conclusions (Zuur et al., 2010).

This study focuses on comparing websites and finding what causes the users to become less effective or efficient. The behavior of participants which perform less in any way in more important, than which website in general performs better. Because of the quadratic relation between the mean and the variance all time on task data will plotted on a log scale y-axis. This is to compensate for the effect of increasing ranges. A log scale makes deviating ranges that are unusually large or small visible for an untrained eye.

Because of the high correlation mentioned in the previous section, the analysis of the websites will focus on the time on task. The relation between the arithmetic means and variance of the measures times returned to the homepage and times click a link previously click are similar. The TLX questions have the highest variance around the middle of the scale, which is what one would expect on a 7-point Likert scale. In the appendix section 2.3 are graphs showing the relation between mean and variance for the other variables.

3.2 Analysis of performances of each task
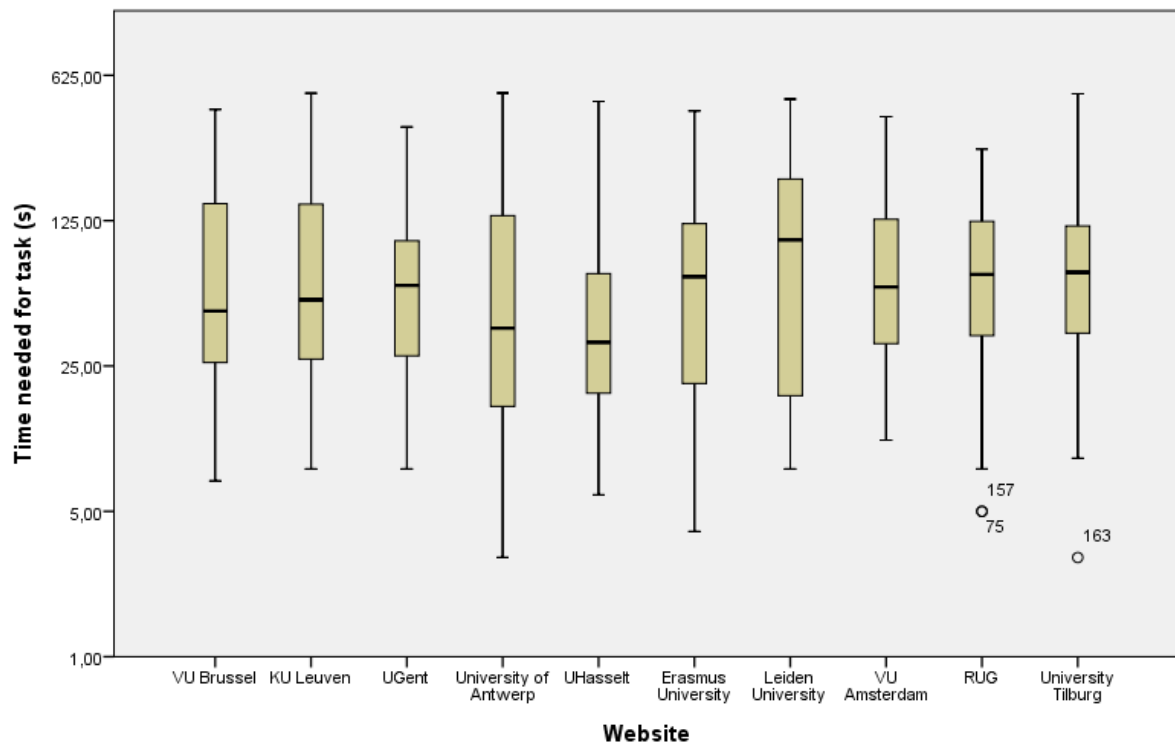
When comparing the time taken on task for all websites on all tasks combined, no big differences are found. All ranges overlap with each other. There is no single website which can be seen as the best website.

The website of UHasselt (mean 61,50, range 462) has the lowest mean score and the website of RUG (mean 90,93, range 271) has the smallest range. The highest mean belongs to Leiden University (mean 128,95, range 472) and the largest range belongs to the website of Tilburg University (mean 99,25, range 506). In appendix 2.4 the complete data for the geometric means and ranges for each website on each task can be found.

Looking at how successful people where on the different websites a little more difference shows. On the website of RUG only one mistake was made during the experiment, which results in less than 2,5% unsuccessful attempts. The website where most mistakes were made was KU Leuven where 14,6% of the attempts were unsuccessful. These results should be treated with care as different amount of data were gathered for different websites. Tasks are not in done the same quantity on each website. On the website of Erasmus University the task about the academic calendar was not done, as none was present during the time of the experiment. In appendix 2.5 the complete data for each the successfulness for each website can be found, in general and for each task. In the appendix 2.6 there are descriptions how the task can be solved on the best and worst performing websites.

3.2.1 Task 1 – How many libraries does the university have?

Task: number of libraries
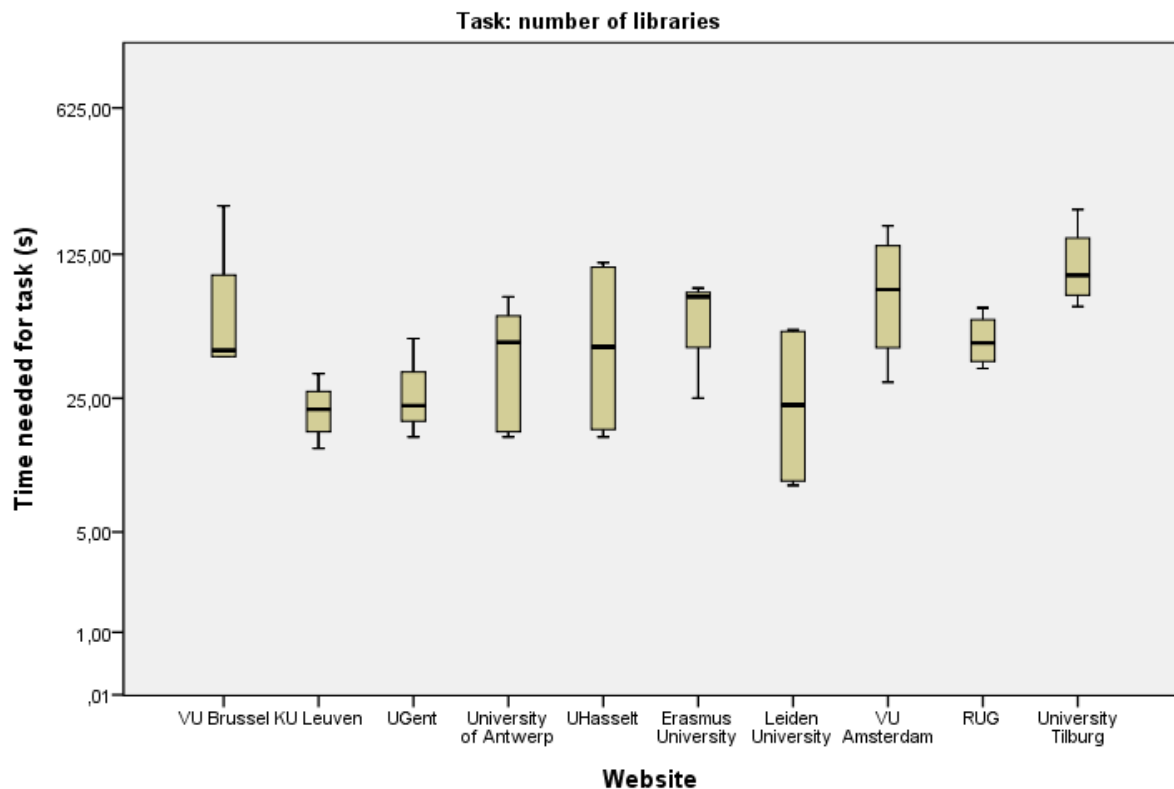
On the task "How many libraries does the university have?" scores the KU Leuven best of all the websites in this study, on time on task (geometric mean 21,54, range 19). The range of the time on task doesn't have any overlap with the websites of VU Brussel, RUG and Tilburg University. Also the range of the website of KU Leuven is the smallest. Tilburg University (geometric mean 108,85, range 135) scored the lowest in this task. It doesn't have any overlap with the website of KU Leuven, Leiden University, and RUG. Not many mistakes were made on this task, only on the website of the University of Antwerp, one person found a wrong answer.

Examination of the strengths and weakness of the websites and participant behavior

On the websites the universities which only had one library, the participants often clicked further after they reached a page with the answer. This isn't the result of a poor website design, but that the question suggests otherwise. This is the case for Tilburg University, UHasselt and Erasmus University, all websites with high averages or an unusual long range.

The website of KU Leuven has a list of with all the libraries on the first page of the library. The same goes for the university of UGent (geometric mean 26,31, range 33) which scores very similar to the website of KU Leuven, only more clicks are required to reach the library page. The website of Leiden University has on the first page as prominent link "practical information and library locations" and on the page that follows a list with library locations appears. The list ends with "other locations" which

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are shared libraries of the university. Either page is counted as a success, but the different options can explain the larger range of the results of Leiden University.

 "Directly to" links listing "University library" were only by one person clicked in the entire experiment for this task, "directly to" links listing "library" were clicked on a regular basis. This might come from that the question only mentioned a library and not a university library. However it shows that correct words have to be chosen for a link. Also in drop down menu's participants seemed to take longer to click a link "university library" than a link listing just "library".

The link "university library" was clicked on the website of UGent, which leads to a different website with a completely different lay-out. The participant immediately bounced back to the main website of UGent. On the website of UGent there is also a page with basic information of the libraries on the website for the library without having to change websites.

3.2.2 Task 2 – How many faculties does the university have?
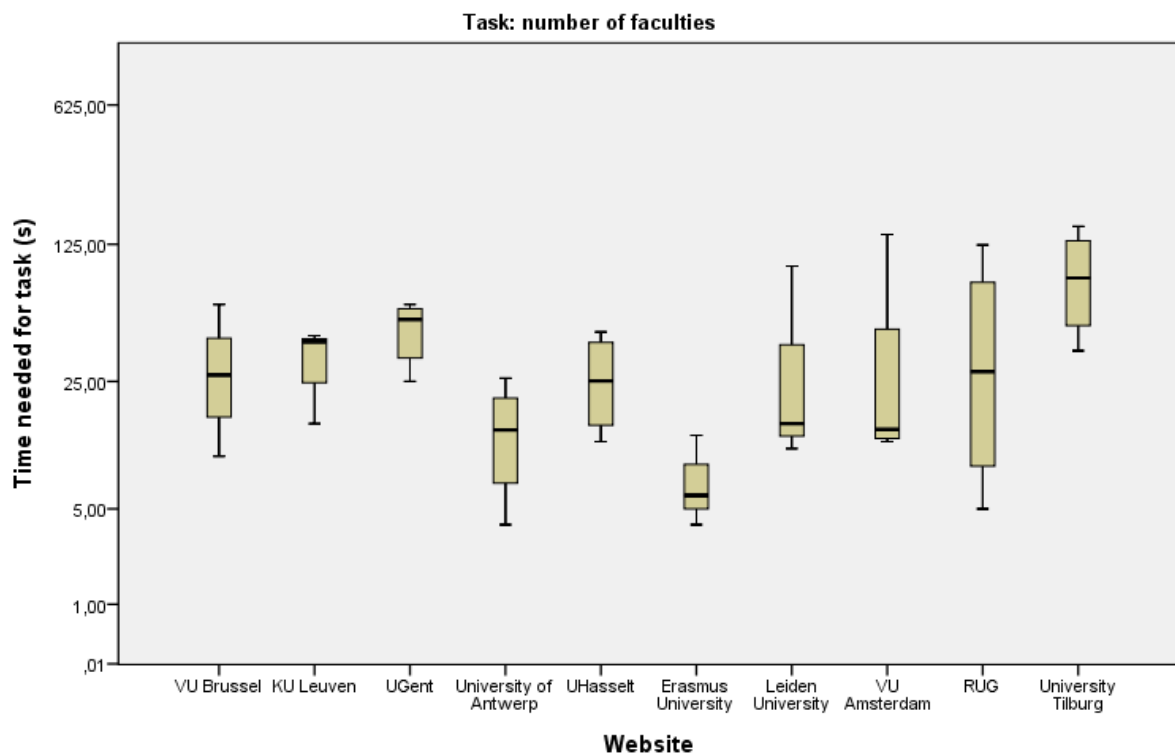
On the task "How many faculties does the university have?" the best performing website is Erasmus University (geometric mean 6,75, range 9) and in the data there's no overlap with the universities of KU Leuven, UGent and University Tilburg. The website of Erasmus University has also the smallest range of all websites. The worst performing website is the University of Tilburg (geometric mean 79,04, range 118). The data on the University of Tilburg shows no overlap with the websites of University of Antwerp and Erasmus University. On this task all participants were able to complete to the task successfully.

Examination of the strengths and weakness of the websites and participant behavior

Structure of the website doesn't seem to be the main factor for this task. The website of RUG and KU Leuven are very similar in links required and the location of the links, yet have higher means and longer ranges. Most similar to Erasmus University is the website of RUG on this task. The most notable difference is that the RUG has a rollover dropdown menu and the link faculties doesn't have to be clicked in the main navigation bar. The number of faculties is similar on both websites and unlikely the cause of the difference in spread. The participants on the website of the RUG who needed more time started looking at "information for" links and "education" before going to faculties, both are options also available on the website of Erasmus University. The website of Erasmus does have rollover dropdown menus in the main navigation bar like the website of RUG, but

not for the option faculties. There doesn't seem to be a clear cause, it might be explainable by more complicated structures such as fitt's law or Hick's law (MacKenzie, 1992; Seow, 2005) or it might be a coincidence.

The website of the university of Tilburg doesn't have the word faculties listed anywhere on the website. Only by reading text about the different research areas or about what the university focuses on, it can be found. This seems to be a poor choice when people are looking for faculties.

3.2.3 Task3 – Find the schedule of 1st year bachelor biology?
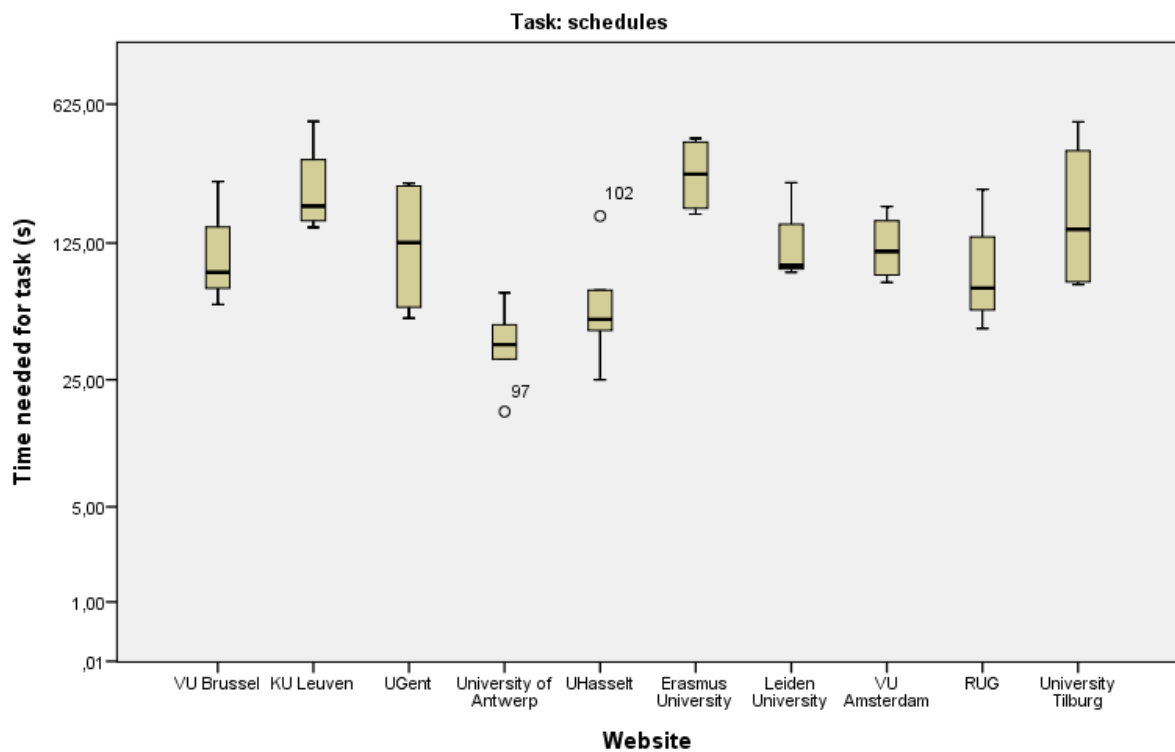
Task: schedules

On the task "Find the schedule of 1st year bachelor biology?" the best performing website is the University of Antwerp (geometric mean 36,97, range 53) in this experiment. The University of Antwerp doesn't have any overlap with the website of KU Leuven, Erasmus University, Leiden University, and Tilburg University. The website of Uhasselt (geometric mean 57,40, range 146) scores very similar to the website of the University of Antwerp. The worst performing website on this task is the website of Erasmus (geometric mean 275,89, range 246). The website of Erasmus University doesn't have any overlap in range with the University of Antwerp and UHasselt.

Looking at the success of the task completion the website of UGent deviates from the others. Only 25% of the people successfully completed the task.

Examination of the strengths and weakness of the websites and participant behavior

The schedules are usually listed under information for students or in the page of the course or both. Both links were often the first links participants tried, meaning there's not a uniform expectation and not a single place is correct. The top 2 websites both have "directly to" links outside the main navigation menus to the schedules. The "directly to" links created a clear advantage for this task.

On the website of Erasmus University the user has to change to the website of the faculty the course belongs to. All participants immediately bounced back to their previous page as a page with a new

layout and colors loaded on their first attempt. Only when they came back a second time they continued on that page. The change of website seemed to discourage the participants.

3.2.4 Task 4 – What is the central phone number of the university?

Task: telephone number
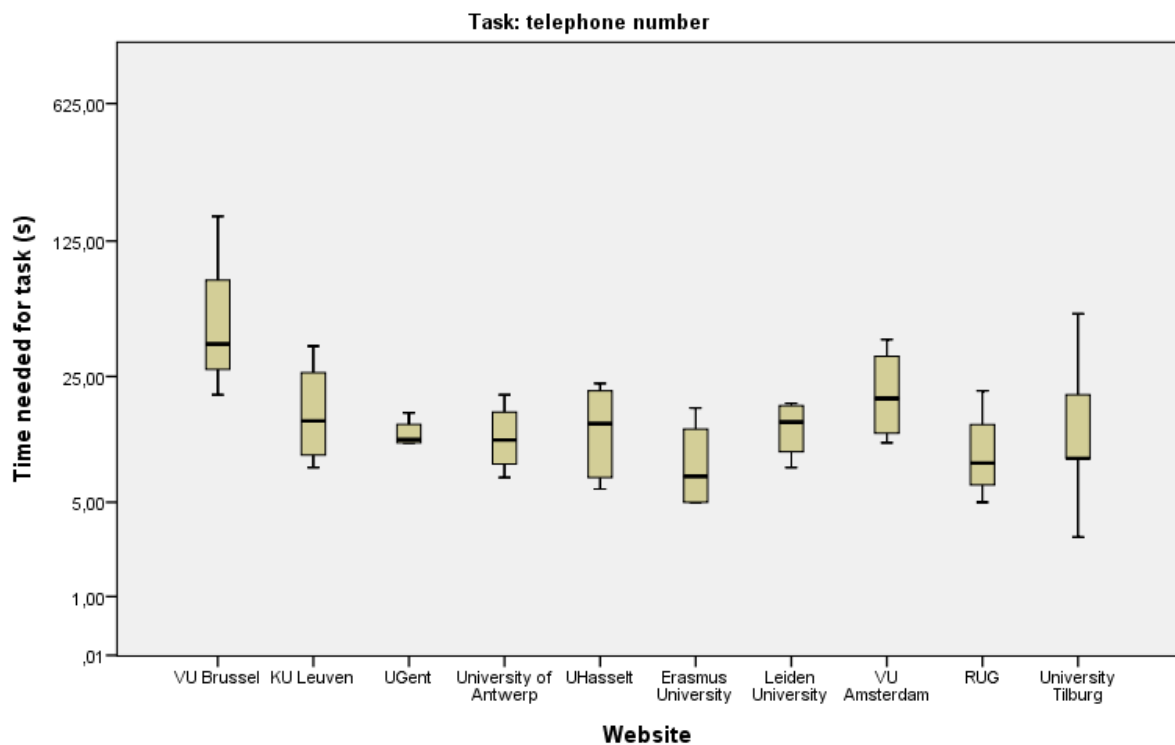
On the task "What is the central phone number of the university?" all websites have a similar mean. All websites have overlap in range and the differences are matters of seconds for most websites. The best scoring website is Erasmus university (geometric mean 8,08, range 12). The worst performing is the website of VU Brussel (geometric mean 49,90, range 147). Both in mean and range this is more than twice as large as the second worst performing website, VU Amsterdam (geometric mean 19,89, range 28). Also it is the only website on which a participant didn't complete the task successful.

All websites have a contact link in the top right of the page, except for the VU Brussel. This website has the phone number information listed at the bottom of every page and can often only be seen when the user scrolls down.

Examination of the strengths and weakness of the websites and participant behavior

The contact links at the top right of the website is common and as 9 out of 10 of the used university websites of this experiment have a contact link there, this seems to be the standard. Looking at the results, the participants are familiar with this standard location of the contact information.

While listing the phone number at the bottom of the page, does work for some people, this is not the case for everyone. The participant who made a mistake on this task would have called the central student desk as this appeared to him as the most central phone number he reported.

The website of Tilburg University also has a large unusual large range. This comes from one participant which was the fastest in the experiment and only needed 3 seconds to find the phone number. The high score was made by one of the other participants who skipped over a couple of dropdown menus and read the different options before he clicked on the contact button.

3.2.5 Task 5 – What are the opening hours of the library?

Task: opening hours library
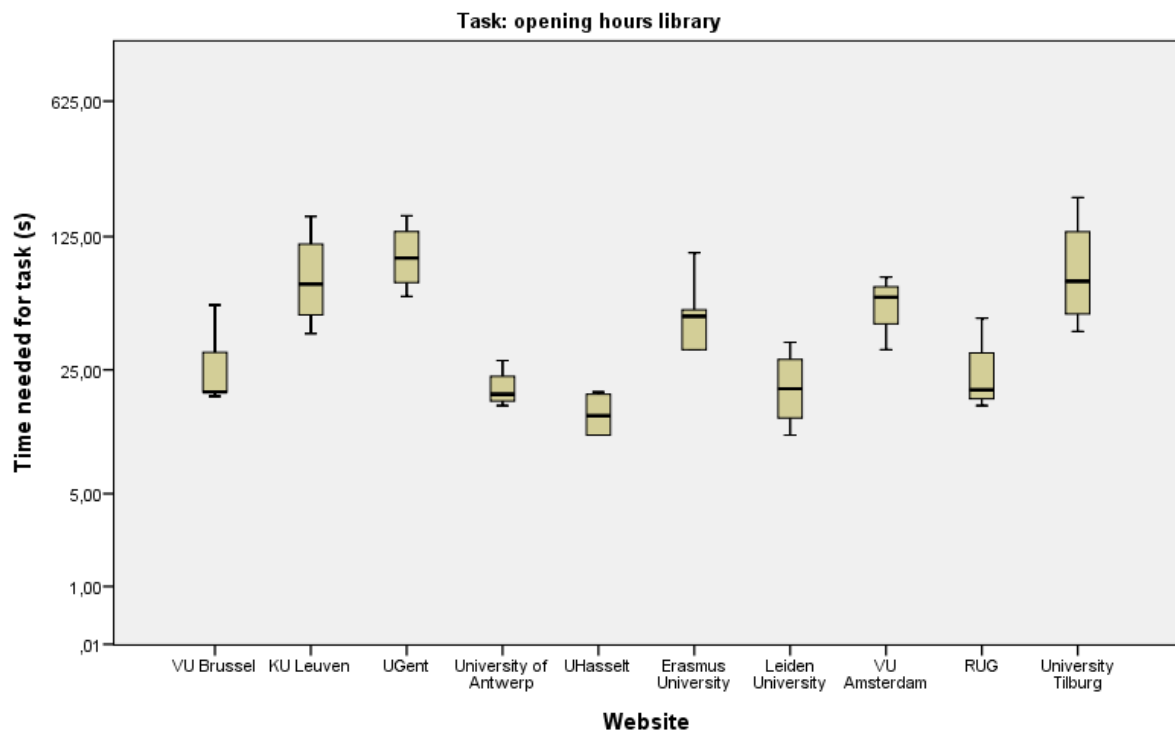
On the task "What are the opening hours of the library?" the best performing website is Uhasselt (geometric mean 14,3, range 8) and the worst performing website is Ugent (mean 97,51, range 99). The website of UHasselt has no overlap in range with the websites of KU Leuven, UGent, VU Amsterdam and Tilburg University. The website of UGent has no overlap with the website of VU Brussel, University of Antwerp, UHasselt, Leiden University and RUG.

This task was completed successfully by each participant.

Examination of the strengths and weakness of the websites and participant behavior

"Directly to" links listing "University library" were never clicked for this task, while "directly to" links listing only "library" were clicked on a regular basis, similar to what was seen in task one.

Remarkable is that the UGent and KU Leuven had the highest mean in this experiment, while these websites performed as the best in task 1. The website of Tilburg University scores poorly on this task and has a large range. The difference between the best and worst performers on this website is cause by that the link with opening hours is located outside of the main navigation options and some participants skipped past this link and only pressed the link after multiple times returning to the library page. Participants went to the library at a normal number of clicks, after reaching this point some needed longer.

3.2.6 Task 6 – Who is the current Rector (magnificus) of the university?

Task: rector
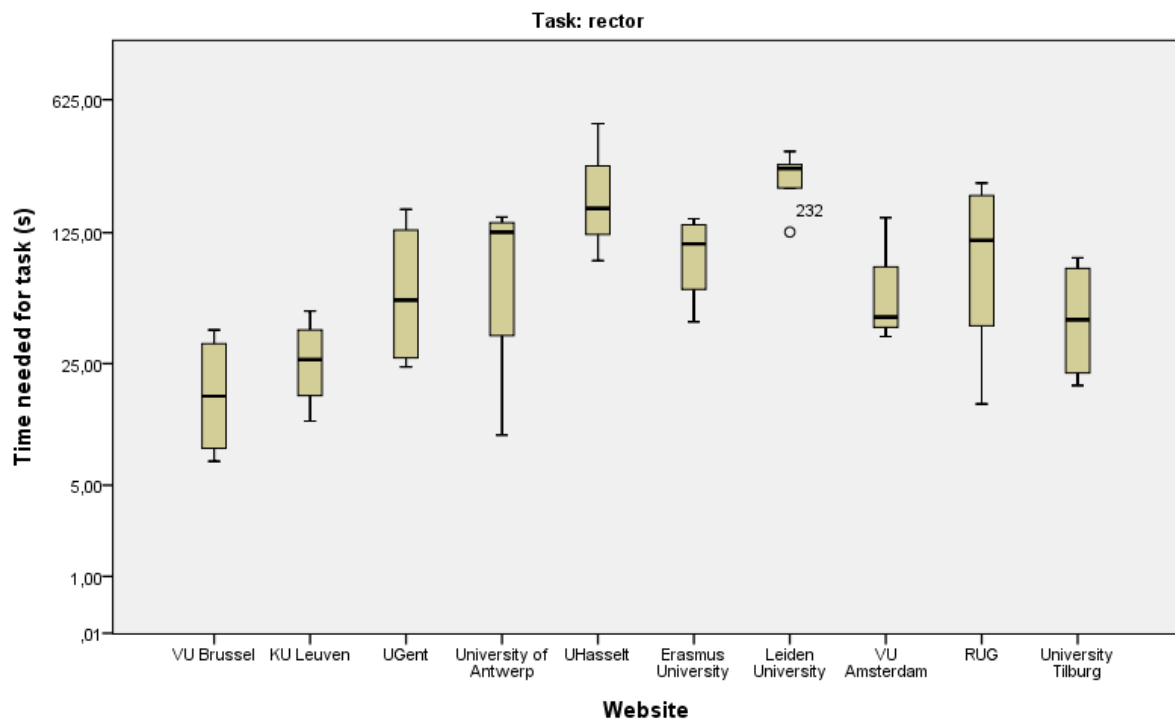
On the task "Who is the current rector (magnificus) on the university?" the website of VU Brussel (geometric mean 16,44, range 31) has the lowest geometric mean, with KU Leuven (geometric mean 25,03, range 37) as a very close second. The website of VU Brussel has no overlapping range with the websites of UHasselt and Leiden University. The worst performing on this task in this experiment is Leiden University (geometric mean 235,10, range 443). The website of Leiden University has no overlap with the websites Brussel and KU Leuven.

Only one time a participant didn't find the correct answer for this task. This was on the website of the University of Antwerp.

Examination of the strengths and weakness of the websites and participant behavior

Having the name of the rector more prominent on the site helps people find the rector sooner. VU Brussel has a link to "blog of rector Paul de Knop" on the front page. The second best performing website KU Leuven has on the page "about university" a picture of the rector with the text "Rector Mark Waer welcomes you to the university of KU Leuven".

On the Leiden University website all participants went in the least number of clicks possible to the page of management and organization. Here however they did not click on the link of "college board" immediately. They either went back to the homepage or another page they had already tried or started trying links randomly. This gave the impression that they did not know under which management part the rector was located. On the website of UGent and UHasselt similar participant

behavior was seen. On those websites fewer clicks were needed to reach the information, giving a possible explanation for why there was a lower mean time.

The websites of the University of Antwerp and RUG have an unusual large range. This can be explained by that the rector's name can be found by alternative routes. For the RUG is this the AZ-university link and on the university of Antwerp this was the foreword in the study guide, which was linked on the front page. The participants which took longer to complete the task followed the links about management and organization.

3.2.7 Task 7 –You have a complaint about how you were treated by a teacher. Find an ombudsperson or complaints desk. Make sure you have a phone number, email address of specific desk you can visit.
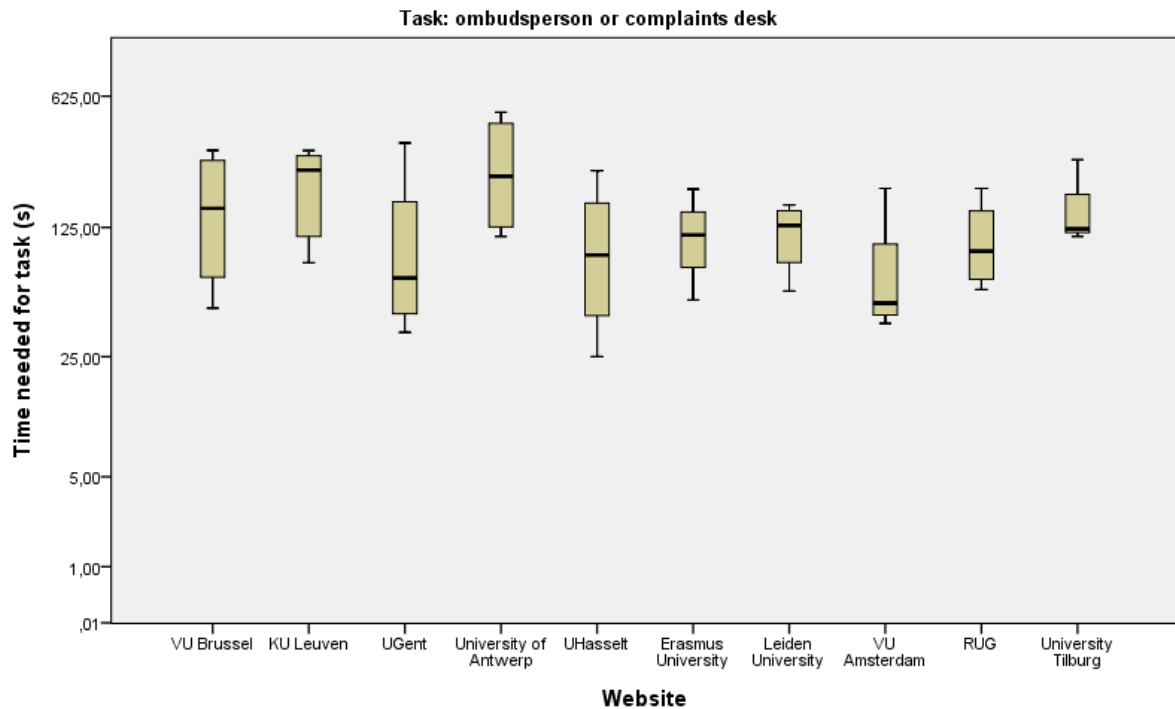
On the task where to go with your complaints, the VU Amsterdam has the best results (geometric mean 65,37, range 164) in this experiment. The worst performing website is the University of Antwerp (geometric mean 237,46, range 402). All websites are overlapping in their range.

More than on any other task errors were made. On the website of the University of Antwerp there was only one person which could complete the task. The website of RUG was the only website on which no errors were made.

Examination of the strengths and weakness of the websites and participant behavior

The differences in time for this task are less than for other tasks, however in the successfulness at which the task is completed more differences can be found. The most remarkable is the University of Antwerp, where almost all participants gave up on the task. The answer can only be found under the "directly to" link "AZ-university" on the front page. The participants which didn't find the information all looked around under student facilities and contact.

For all incorrect answers participants reported another telephone number as answer. Some of the participants reported verbally after the task, that if it wasn't the correct phone number the person answering the phone could surely tell them which phone number is the correct one. The most reported phone number was of the central student desk. Among those who didn't report a wrong

telephone number as answer, "contact" was still a popular link to visit. Except for "contact", organization and management related links were popular visits of the participants. Never tried as first option, but another link visited by the participants was the link "information for employees" or similar links.

3.2.8 Task 8 – Find a map of the university with different school buildings on it

Task: map
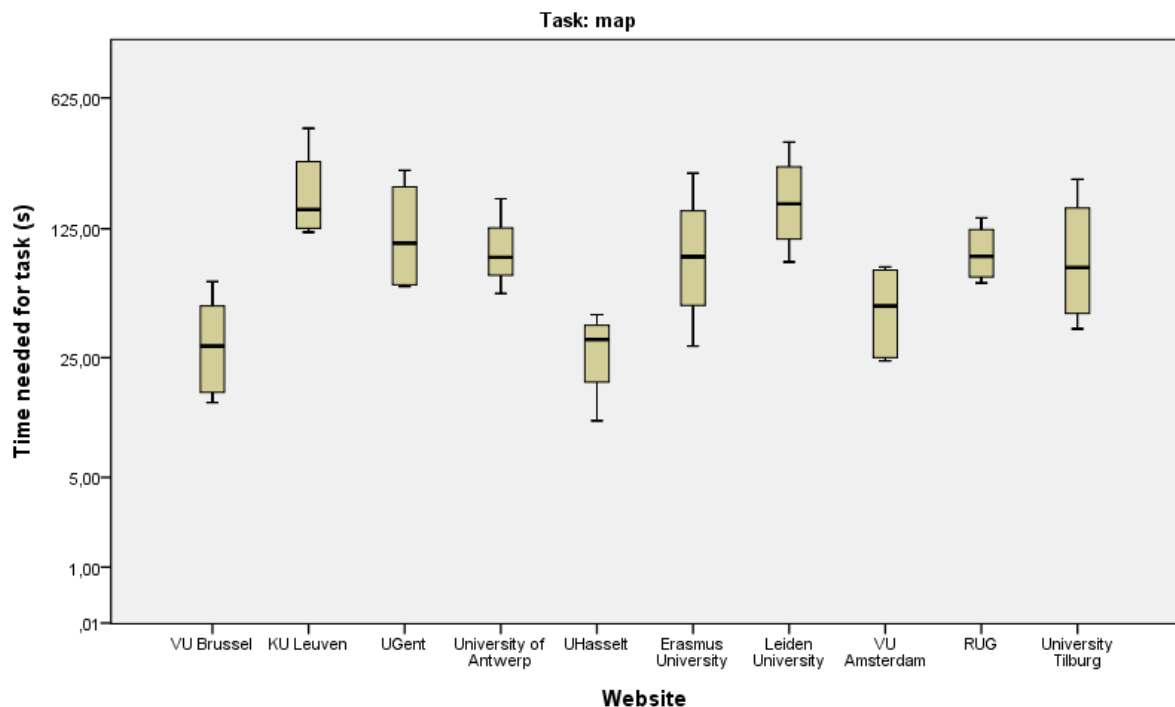
On the task "Find a map of the university with different school buildings on it" the best performing website is Uhasselt (geometric mean 26,05, range 32) with VU Brussel (geometric mean 28,79, range 51) as a close second. The website of Uhasselt has no overlapping range with the website of KU Leuven, UGent, University of Antwerp, Leiden University and RUG. The website of VU Brussel has no overlapping range with KU Leuven and Leiden University. The worst performing website is of KU Leuven (geometric mean 190,57, range 310). This website shows no overlapping range with VU Brussel, UHasselt and VU Amsterdam.

Few errors were made on this task. Remarkable is that one of the unsuccessful attempts was made on the website of VU Brussel, the second best performing website otherwise.

Examination of the strengths and weakness of the websites and participant behavior

All websites except for the VU Brussel, have the map located under the contact link. The three best performing websites of UHasselt, VU Brussel and VU Amsterdam (geometric mean 44,26, range 79) all use different words to suggest where the map is located. On the website of UHasselt the link is named "contact and location", on the website of VU Brussel there is a link of the front page "directions" and on the website of VU Amsterdam there is a link "directions/contact" in the rollover dropdown menu under "about university". The only website of these which doesn't have it instantly visible on the front page, the VU Amsterdam, also scores the lowest of the three websites.

When participants reached the contact page, links to the map in the form of illustration seemed to be faster found and clicked on, than links in just text. This however cannot be concluded with certainty as the number of clicks and location of the links was also very different.

The initial links participants tried were often "faculties", "(student) facilities", "university buildings" and "about university".

The person who retrieved incorrect information of the website of VU Brussel had mistaken the organizational chart as map of university buildings.
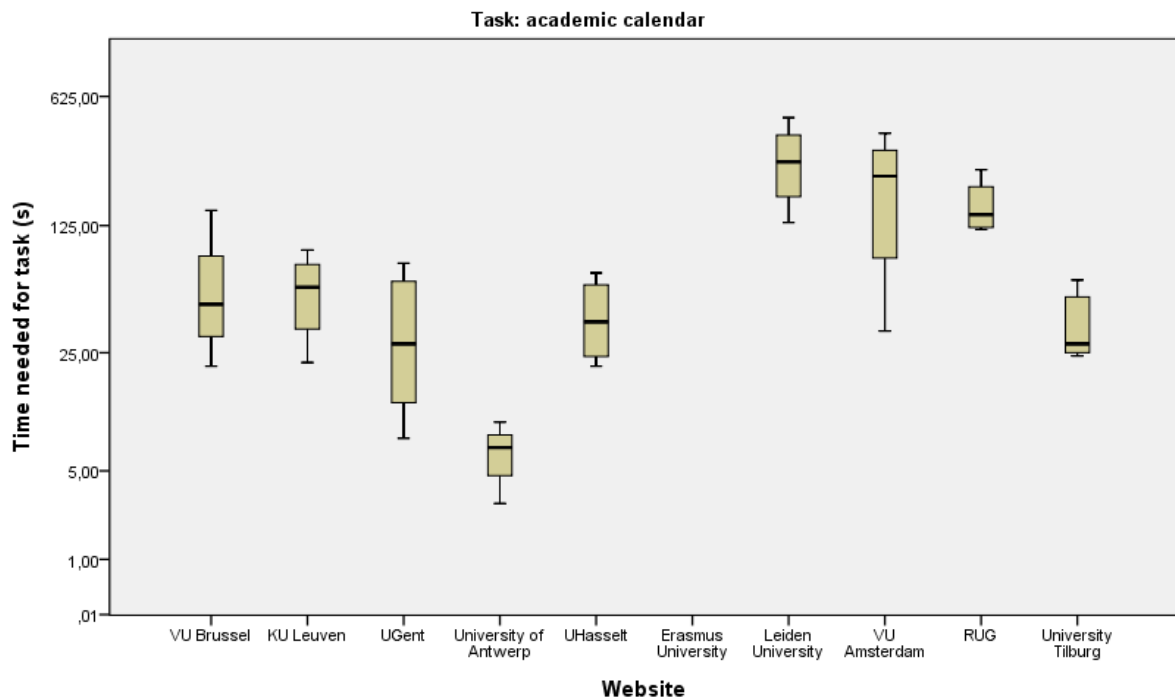
On the task "Find the academic calendar" the best performing website is the University of Antwerp (geometric mean 5,93, range 7). The websites of University of Antwerp only has overlap with the website of UGent. The worst performing website on this task is the Leiden University (geometric mean 262,430, range 350) in this experiment. In range the website has no overlap with websites of KU Leuven, University of Antwerp, UGent, UHasselt and Tilburg University.

There were no big differences in how successful the task was completed on the different websites.

On the website of Erasmus University there was no academic calendar available during the time the experiment was conducted.

Examination of the strengths and weakness of the websites and participant behavior

On the website of Leiden University all participants differed on which link they clicked first, although all eventually clicked organization and all, except one, tried "news and agenda". The link of "student portal" is only visible on the front page and was only clicked after participants had explored other links of the website first. As the link is located somewhat away from the other links, the link may have not been seen the first time they visited the website. After they found the studentportal, they never instantly went to the "AZ-university" link. This seems a poor choice to locate the information.

The academic calendar is located on many different locations on the different websites. The website of the University of Antwerpen has a "directly to" link for the academic calendar on the front page. This not surprisingly helps users find the information faster and shows a website can be specified for

a specific task. The website of UGent (geometric mean 26,84, range 70) the second best performing website has "directly to" links to the academic calendar under multiple sections, of which "information for students" and "education" were used by participants. The university of Tilburg (geometric mean 35,16, range 39), the third best performing website has it located under agenda. The "agenda" link was often tried by participants on different websites, however only seldom was the academic calendar located there.

3.2.10 Task 10 – You have personal problems and are looking for a student psychologist. Make sure you have a phone number, email address or specific desk you can visit.
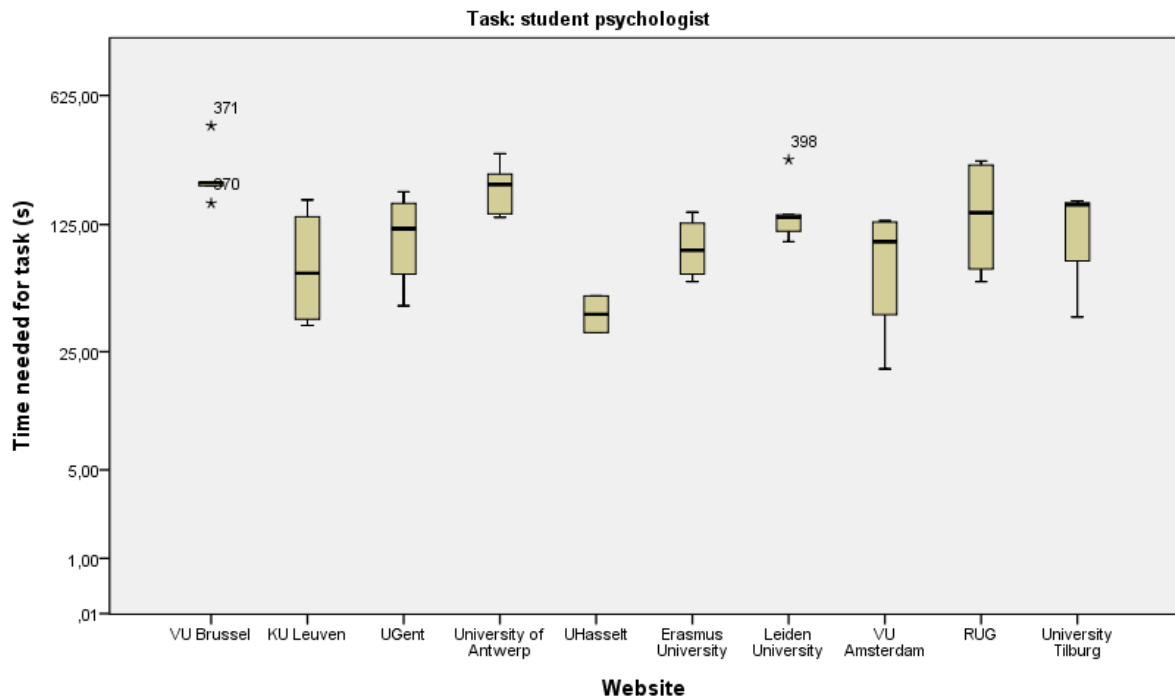
On the task about finding a student psychologist the best scoring website in this experiment is UHasselt (geometric mean 40,45, range 19). This website has no overlap in range with VU Brussel, Erasmus University, University Leiden and RUG. The worst performing website on this task is the VU Brussel in this experiment (geometric mean 228,15, range 265) and has no overlap with the websites of UHasselt, Eramus University, Leiden University and the VU Amsterdam.

Examination of the strengths and weakness of the websites and participant behavior

The website of VU Brussel doesn't have a structure very different of the other websites, however it doesn't have the word psychology, psychologist or similar word and participant doesn't click on the required link when they have the option. This could result from the fact that the question stated student psychologist.

As was also the case with task 7, a lot of participants visited the contact link as one of the first links. Also like task 7 the link for employees was often visited, however rarely as first choice.

3.3 Website features as predictor

All websites were analyzed on a set of 25 features if they were included on the website or not. A complete list with all the features used can be found in appendix 1.3.

A hierarchical cluster analysis measured on their phi 4-correlation was used to cluster the websites in different groups. Translating this into a Spree plot, there are "elbow" points at 7 and 4 clusters. As using 7 clusters means most clusters consist of only one website, the analysis will be done with 4 clusters. On the y-axis shows the number of clusters and
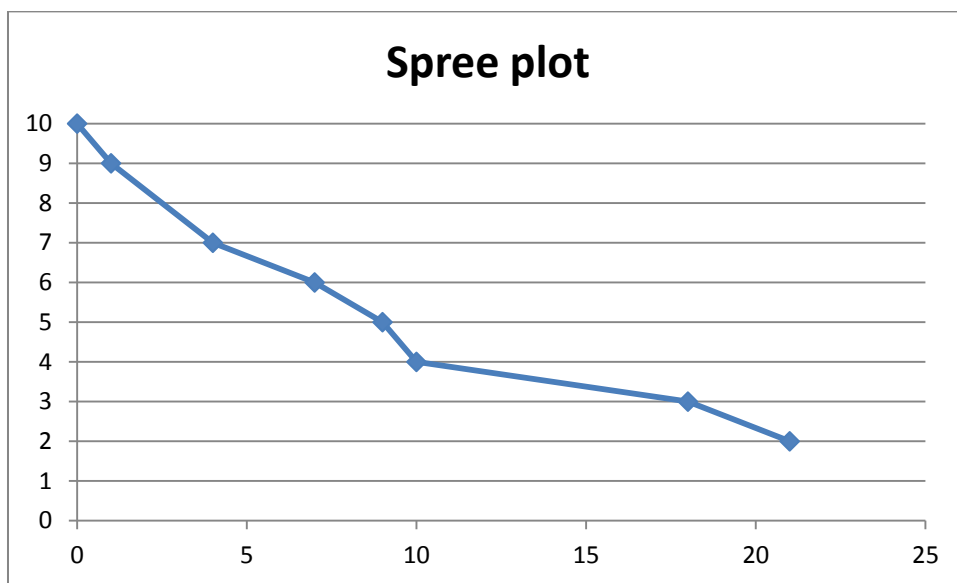
These clusters of websites would be divided as followed and have in common:

3.3.1 Cluster 1: KU Leuven, UHasselt, Erasmus University and VU Amsterdam

 All websites have a single navigation tree, participant orientated navigation is fitted into the main navigation menu, the main navigation menu is on top and is consistent over the entire website, have rollover dropdown menus and options from the main navigation bar are further explained in the body of the front page. In general these sites have a single strong structure, are

How much the geometric mean of a websites in cluster 1 deviates from the geometric mean of the task overall is plotted for each task. Each spoke represents a task.
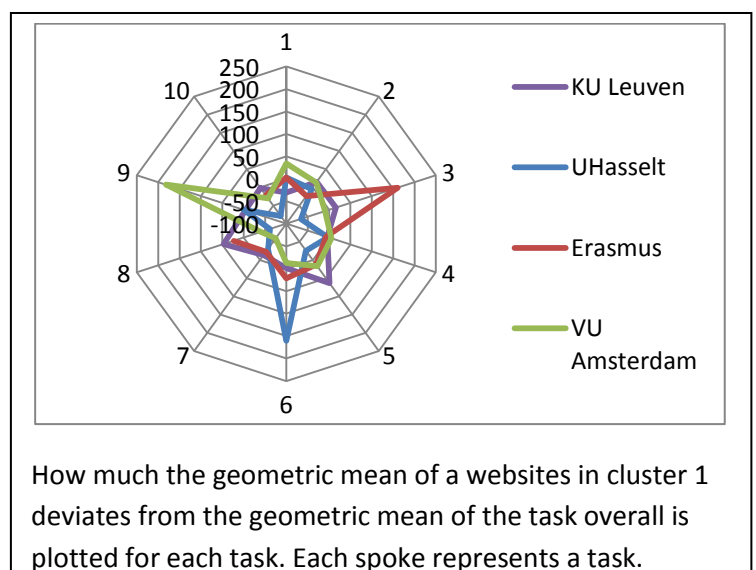
focused on displaying this structure and appear more advanced features as the other websites.

In the radar plot the difference with the overall task mean is plotted for the different websites of the cluster. The websites do not have strengths or weak points in common on the tasks.

3.3.2 Cluster 2: RUG and Tilburg University

Both websites have the main navigation menu on top as well as rollover dropdown menus. They don't offer navigation options in the body of their pages and have the university's philosophy and blogs of employees on the front page. These websites are a little less focused on structure, are technology advanced as well and the front page seems more focused on creating an image of the university for the users than other clusters.

How much the geometric mean of a websites in cluster 2 deviates from the geometric mean of the task overall is plotted for each task. Each spoke represents a task.
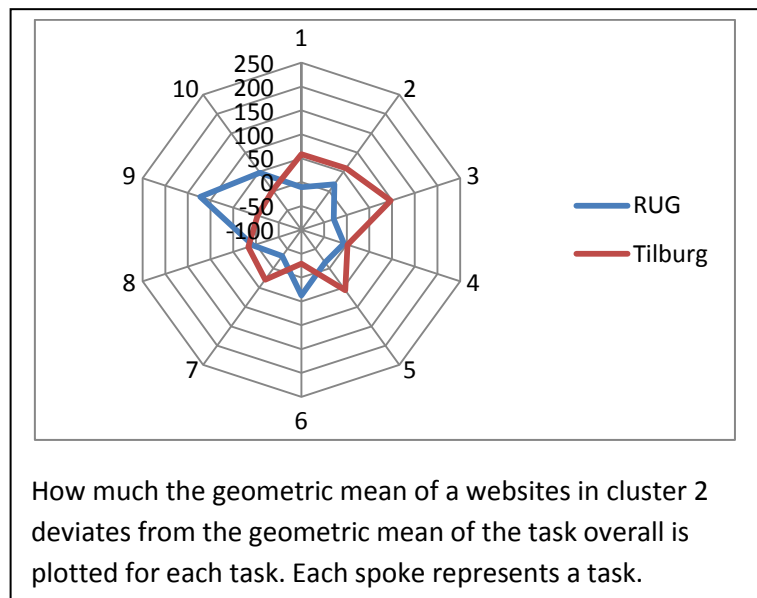
In the radar plot the difference for each task with the overall task mean is plotted for the websites of the cluster. The websites do not share similar strengths or weaknesses.

3.3.3 Cluster3: VU Brussel, Leiden University and University of Antwerpen.

All websites have a lot of navigation options in the body of the page, have "directly to" links on the front page, the options in the main navigation menu change on different pages and the websites do not have drop down menus. The websites give users multiple

How much the geometric mean of a websites in cluster 3 deviates from the geometric mean of the task overall is plotted for each task. Each spoke represents a task.
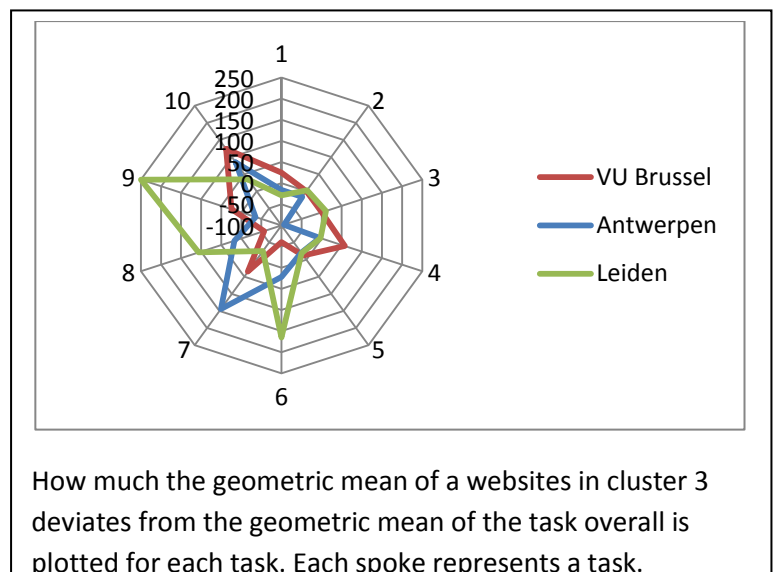
navigation structures they can use to look for information and rely on "directly to" links for smooth navigation.

In the radar plot the difference with the overall task mean is plotted for the different websites of the cluster. All websites score very close to the mean on the first 5 tasks, which are in general more common tasks. On the tasks 6-10 the websites show a very different pattern with positive and negative peaks for all websites. Each website has the peaks on different tasks. This can be explained that the websites are fast on tasks where there are specified for, with for example "directly to" links on the front page. The tasks where the website isn't specified for, the website perform less than other clusters, because of a more ambiguous navigation structure.

Only on task 5 there is a similar score of more or less 50 seconds under the geometrical mean. Other than this task, the websites in this cluster do not share common strengths or weaknesses.

3.3.4   Cluster 4: UGent

Cluster 4 exists only of one website. UGent is a unique website in that it has the main navigation menu on the leftside of the page. It has a consistent navigation bar for the entire website, but also multiple navigation trees and "directly to" links on the front page. Users have to orientate themselves different on this website than on websites from other clusters. This website or cluster, scores very close to the

How much the geometric mean of the website in cluster 4 deviates from the geometric mean of the task overall is plotted for each task. Each spoke represents a task.

mean of each task with small deviations on a couple of tasks.
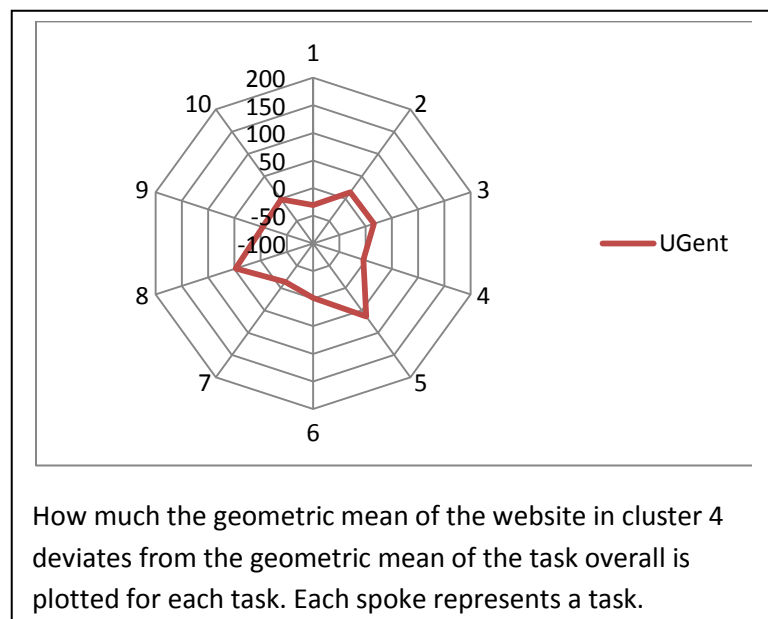
3.3.5   Comparing the clusters

Comparing all clusters to each other in their performance gives little additional information. Looking at the box plot below, it can be seen that Cluster 4 deviates from the other clusters on a couple of task. These are however the same tasks on which the website of UGent scores the best or the worst. These effects can be just as well be classified as website effects instead of cluster effects. This is most likely just as well the case for cluster 4.
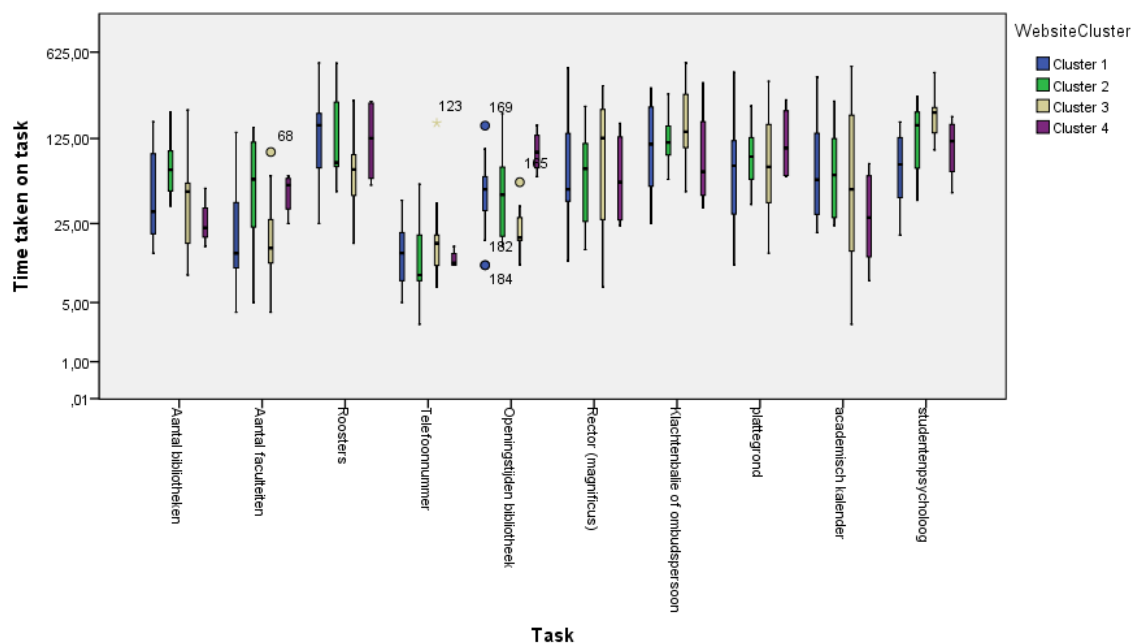
The used website features do not predict performance on specific tasks. Only in one cluster on one task there was a sign of similar scores.   The performance of the task is a matter of structure of the website. This also agrees with other findings in this study, such as lower number of clicks correlates with lower time need on a task and with information which is prominent presented on the website is faster found. Within the clusters big differences exist and from the information of which cluster a website belongs to, cannot be used to predict performances on a specific task.

3.4   Guidelines for design of university websites

All findings will be presented by a more general principle. This is followed by a short explanation of this principle and how this is linked to the data found in the experiment, followed by specific recommendations.

There is no perfect design.

There seems to be no such thing as a perfect design. No single design or feature can be linked to an overall improvement. This shows when comparing task 1 and task 5, about the number of libraries and the opening hours of the library. The websites which performed the best on one task performed the worst on the other and the other way around. It is a matter which information is presented first after the link library is clicked.

All website had a similar score when the average of all tasks was taken. There were no features linked to an overall improvement. This is also in line with the cluster analysis of the website features.

Websites can be specified for tasks
Websites with a generally ambiguous structure can still perform well on a lot of tasks as they use "directly to" links on the front page. Websites with a "directly to" link related to the task on the front page will perform better than the best organized websites for that task.

As example one can look at the task of academic calendar on the website of University of Antwerpen. The website has a cluster of information for links, a cluster of information about links and a top navigation bar with another list of option, giving the user a lot of (wrong) options where he or she can go. However users always clicked the link academic calendar on the front page and found it right away.

Another example is the rector on the websites of VU Brussel and KU Leuven. By placing the name of the rector in a more prominent location on the website, the task was performed much faster on these websites. It was not the global structure of the website which caused the better results.

The high correlation between the output variables also shows the number of clicks a user makes is connected to the time it takes to complete the task and the number of problems occur. Information where the user makes more clicks to reach is related to how often the user returns to a previous link. If the website is specified for a one piece of information and be featured on the front page, the time

needed to find the information, the number of clicks and the subjective workload all would be expected to be lower.

> *Designer need to focus on which tasks are found important and make sure that information is most visible.*

A strong (single) structure is a good start

A single navigation structure that incorporates all aspects of the university website should have, serves as a good fundament. Information that was not integrated in the websites main structure was often not retrieved well. The academic calendar on the website of Leiden University and ombudsmen on the website of University of Antwerpen could only be found under an "AZ-registry" of the website. Both websites were the worst performing website for the task in question.

In tasks where participants were required to change to another website specific for the library or faculty, the participants frequently bounced back to the original website. A second website with a new lay-out and structure seemed to be something the participants wished to avoid.

On the website of Leiden there was a student portal link at the top of the page, above the banner. Most navigation links however were located under the banner. Because of the location the link was not always found or only after longer searching on the website.

> *Create a main navigation structure that includes every piece of information.*

> *Avoid using multiple websites, especially avoid specific information being spread over multiple websites.*

Words matter

Choosing the right words for a link matters for how often they are used. People who are looking for a map of the university rarely try the contact button at their first try, however this changes if the link says direction or location as well. As people who are looking for the contact information could very well use a map, the location of the map under contact doesn't have to be a bad choice. The users looking for a map just do not expect it there.

Also when people are scanning a page for the link which takes them to the information, they seem to find "library" faster than "university library" for the tasks about library information in this experiment. This might only be the case, because of the question stated "library" instead of "university library", which happens to be one word in the Dutch language, instead of two words. However in his book *Don't make me think* of Krug (2005) advices the art of not writing and omitting useless words. Since most universities only have a university library, they can leave the university out. In the task where students were asked to look for a student psychologist, participants skipped past the links with mental health more often than links with psychologist. This agrees with research from Morkes & Jakob Nielsen (1997) that users do not read a lot on websites, they scan quickly over them.

Test if users have the right expectations of links.

Test what words have the highest link scent for a task a designer wants to specify for.

Presentation matters

Beside the right words for links, the right representation of the information can help as well. The pictures of a map moved participants to press faster than a small link "map" in text did in this study. When the opening hours were presented in a table, when participants arrived at the right page, they reported faster they found the information than websites where the information was presented in a story form text.

On multiple occasions links that weren't presented in the main navigation menu or in the body of the front page weren't found as quickly as links that were. In the experiment multiple websites have the "information for student" links located on top of the page, above the main navigation menus.

Make sure the layout is complementary to the information it is offering. Found examples:

- *Present a time table in a table*
- *A link to a map as a picture of a map*

3 Discussion

4.1 Data analysis

No pre study was conducted for which reasons the users, in this case just students, visit their university websites. As such no conclusion can be drawn from the task completion times which website would do best for everyday use. This does however show a more global idea of how information can be organized on different university websites. A website is required to work for everyday tasks, but excels if it works good for the less mundane tasks as well.

This study has only focused on how well new users perform on a website. The research design of mixing the tasks and websites differently for each participant prevented any learning effects from occurring. Since users will often visit their university website more than once, the amount of improvement of users over multiple sessions can be a good addition to the knowledge of this study.

In future research on the subject of university websites a measurement about the knowledge of universities of participants would be a good addition. As seen in the task of the rector, knowledge about universities in general can influence search browsing behavior. The most resource efficient way to measure this might be to ask for the number of years studied at a university.

The high correlation found between the measures is remarkable as mentioned earlier. This is higher than any of the meta studies about correlations of usability measures (Frøkjær, Hertzum, & K. Hornbæk, 2000; Kasper Hornbæk & Law, 2007; Sauro & Kindlund, 2005; Sauro & Lewis, 2009). One explanation is that most tasks are rather short and simple, however looking at how high the correlation is this should be treated with care. This remains a subject future research can look into.

4.2 Method reflection

Even though this study has a large quantitative aspect, the conclusions have to be regarded with similar approach as qualitative study has to be. The number of data for each combination of website and task is on average 4. Looking at what participants did who took longer on the task does show with which aspects a target group users can struggle of a website.

This design where multiple websites are compared has shown strengths as well as weaknesses in this study. On the level on specific tasks it shows what websites perform well or bad and if bad, it can be seen what participants do when they perform badly. Good performances are harder to explain with this setup. It can be noticed that users instantly follow the right links, however this is expected to be default by design. One can't observe why something works, only that something that it works on that website. This analysis is better at spotting critical incidents.

The clustering of the websites on different features did not provide a lot of results in this study. Using different features to analyze the websites might provide different results. More success would likely be gained when the websites used in the experiment are selected based on specific features or even categories they can be classified in.

A test design like this requires a lot of test users. To have 1 piece of output for each website and task combination you need at least the number of website times the number of tasks as participants. If the focus is on comparing at task level the test benefits from less tasks and websites, as less test users are required to have a reasonable number of data for each website task combinations. Also the more websites one tries to compare in structure, the more complicated the analysis becomes. For the creation and analysis of clusters of websites more tasks and more websites are preferred. More websites will show more clearly if specific patterns are coincidence or not. More tasks allow clusters to differ more from each other. The clustering of websites on features did not produce usable results during this study. This technique however might produce other results with different features, other interfaces or different tasks.

Clustering the tasks and websites as they are selected can allow for extra dimensions which can be used for conclusions. Clusters of websites can score distinct on specific different clusters of tasks or show more variances on different tasks.

As variances and ranges increase exponentially with the mean of the task, the longer the tasks takes the more overlap in output data will usually have. As variances increase more than the mean does, differences can become less visible. If there is not a big distinction in the structure on the different websites for a specific task, the longer a task takes, the less difference will show.

In future research on this subject MultiVariate Testing (MVT) could be included to test more specific influence of features. The website as a whole might be too complex to capture into features, specific pages or sections might be more feasible. For example it could be used to determine what features influence can reduce the time between the moment user reaches the page with the desired information and the moment he realizes the page contains the information he is looking for. As task

completion time can be divided into multiple stages this allows for more opportunity to distil the difference of websites to a minimum of features.

MVT is growing in popularity in advertisement orientated website testing and has been used for decennia in economic studies about consumer behavior (Kohavi, Longbotham, Sommerfield, & Henne, 2009). It has often been used to determine what kind of webpage layout or product placement in a shelve leads to the highest sales. In studies about usability and psychology related articles the MVT is rarely used. Most data for these tests can be acquired without having to set up a usability test lab. By monitoring behavior, clicks and page displays this can be recorded for every visitor of the website (Atterer, Wnuk, & Schmidt, 2006). This is an attractive and efficient way to acquire data as no researcher is required during the data gathering, multiple users can be recorded at once and it is non-invasive to the user. However there are some drawbacks as well, when measuring every visitor the problem arises that there is no way to be certain what information they were searching for and if they found where they were looking for. Also there is no way to know what the user is doing when he is on the website. He might be spending a lot of time on the website because of a poor design, but he could just as well be distracted by a phone call. Being non-invasive is often seen as an improvement on the validity of a experiment, it can be a danger to is as well. For some specific pages or specific tasks these problems are no real danger, for a more global analysis of the website would flourish by using test users and giving them specific tasks.

MVT in advertisement works with multiple versions of a single page and determines which is most successful. The versions differ from each other on multiple aspects or variables, for example font color and font size used. There could be 4 versions of the page, one with a blue font size 12, one with size 18, one with a black font size 12 and one with a black font size 18. By testing all 4 versions both variables can be tested, as well as their interaction effect.

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Optimizing university websites in terms of usability

The appendix

Jop Havinga
11/8/2011

APPENDIX – OPTIMIZING UNIVERSITY WEBSITES IN TERMS OF USABILITY

TABLE OF CONTENTS

1. Ga naar de website van universiteit Brussel http://www.vub.ac.be/ en beantwoord de volgende vraag. Hoeveel bibliotheken heeft de universiteit?

2. Ga naar de website van universiteit Leuven http://www.kuleuven.be/ en beantwoord de volgende vraag. Hoeveel faculteiten heeft de universitei?.

3. Ga naar de website van universiteit Gent http://www.ugent.be en beantwoord de volgende vraag. Zoek het rooster op van eerste bachelorjaar van de opleiding biologie? (indien meerdere, is de eerste goed)

4. Ga naar de website van universiteit Antwerpen http://www.ua.ac.be/ en beantwoord de volgende vraag. Wat is het centrale telefoonnummer van de universiteit?

5. Ga naar de website van universiteit van Hasselt http://www.uhasselt.be en beantwoord de volgende vraag. Wat zijn de openingstijden van de bibliotheek? (als er meerdere zijn, is de eerste goed)

6. Ga naar de website van Erasmus universiteit www.eur.nl en beantwoord de volgende vraag. Wie is de huidige rector (magnificus) van de universiteit?

7. Ga naar de website van universiteit van Leiden http://www.leidenuniv.nl/ en beantwoord de volgende vraag. Je hebt een klacht over hoe je behandelt bent door een docent en je zoekt een klachtenbalie of ombudspersoon. Waar kan je naar toe gaan, bellen of emailen voor je klacht? Zorg dat je in iedergeval een telefoonnummer, email adres of specifieke balie hebt gevonden waar je naar toe kan.

8. Ga naar de website van de vrije universiteit amsterdam www.vu.nl en beantwoord de volgende vraag. Zoek een plattegrond met de verschillende schoolgebouwen erop.

9. Ga naar de website van de Rijksuniversiteit Groningen www.rug.nl en beantwoord de volgende vraag. Zoek de academische kalender van de universiteit op.

10. Ga naar de website van universiteit van Tilburg http://www.tilburguniversity.edu/nl/ en beantwoord de volgende vraag. Je hebt persoonlijke problemen en wilt hier met iemand over praten. Waar moet je naar toe mailen of bellen als je een afspraak wilt maken met een studenten psycholoog?

TLX vragenlijst

Taak 1

Hoe mentaal belastend was de taak?

Erg weinig   1   2   3   4   5   6   7   Erg veel

Hoe succesvol heb je de taak volbracht die je gevraagd werd te doen, voor je gevoel?

Weinig succesvol 1   2   3   4   5   6   7   Erg succesvol

Hoe hard heb je moeten werken om de taak op dit niveau te voltooien?

Helemaal niet   1   2   3   4   5   6   7   Erg hard

Hoe geïrriteerd was je tijdens de taak?

Erg weinig   1   2   3   4   5   6   7   Erg veel

1.3   WEBSITE FEATURES

FEATURE	EXPLAINATION
Navigation menu on top	Was the main horizontal navigation menu on the top of the front page
Navigation menu of the left	Was the main vertical navigation menu on the left side of the front page
Navigation menu in the body of the page	Was the main navigation menu in the body he front page
2nd step navigation on the left side of the page	After the first click in the navigation, were second options, more in depth, located on the left side of the page
Consistent navigation menu	Was there a navigation menu on a consistent place, with consistent options
Consistent place navigation menu	Was there a consistent place for the navigation menu
Dropdown menu's	Did the website use dropdown menu's
Student portal inside main navigation	Was the student entry link located in the main navigation menu
Employee portal inside main navigation	Was the employee entry link located in the main navigation menu
Directly to links	Did the website use directly to links on the front page, not connected to the main navigation structure
Multiple navigation trees	Did the website have more multiple navigation trees. Example, one menu on the left with "information for" and one menu on the right with "information about"
Home button logo	Was there consistent a link in form of a logo on top of the site which returned the users to the homepage
Home button picture	Was there consistent a link in form of text on top of the site which returned the users to the homepage
Sitemap	Was there a sitemap link on the front page
AZ university	Did the website of a AZ-university link on the front page
FAQ	Was there a FAQ link on the front page
Faculty link FP	Was there a faculty link on the front page
Library link FP	Was there a library link on the front page
Contact button on top	Does the website have a contact button on the top of the page
Main navigation explained in body	Were the options from the main navigation menu further expanded in the body of the front page
Campus events FP	Were upcoming campus events listed on the front page
Press releases FP	Were press releases of the university displayed on the front page
Philosophy university FP	Was the university displayed on the front page or prominently linked to
Alumni in the news	Is news about alumni displayed on the front page
Blogs FP	Was or were there blog(s) or links to blogs on the front page

2. APPENDIX RESULTS

2.1   Correlations among the output variables

2.2   Principal component analysis

2.3   Testing homogeneity

      2.3.1   Time needed on task

      2.3.2   Number of clicks

      2.3.3   Times returned to the homepage

      2.3.4   Times a pervious visited link

2.4   Geometric mean and range for task-website combinations

Successfulness

2.6   Descriptions of the default way to find the answer for each task – on the best and worst performing website

      Task 1 – How many libraries does the university have?

      Task 2 – How many faculties does the university have?

      Task 3 – Find the schedule of 1st year bachelor biology?

      Task 4 – What is the central phone number of the university?

      Task 5 – What are the opening hours of the library?

      Task 6 – Who is the current Rector (magnificus) of the university?

Task 7 - You have a complaint about how you were treated by a teacher. Find an ombudsperson or complaints desk. Make sure you have a phone number, email address of specific desk you can visit.

Task 8 – Find a map of the university with different school buildings on it

Task 9 – Find the academic calendar

Task 10 – You have personal problems and are looking for a student psychologist. Make sure you have a phone number, email address or specific desk you can visit.

		Time needed for task (s)	Number of clicks	Times returned to the homepage	Times previous used link is clicked	TLX - mental load	TLX - percieved succes	TLX - effort	TLX - frustration
Time needed for task (s)	Pearson Correlation	1	,861**	,652**	,675**	,701**	-,632**	,713**	,648**
	Sig. (2-tailed)		0	0	0	0	0	0	0
	N	403	403	403	403	403	403	403	402
Number of clicks	Pearson Correlation	,861**	1	,787**	,839**	,629**	-,520**	,665**	,597**
	Sig. (2-tailed)	0		0	0	0	0	0	0
	N	403	403	403	403	403	403	403	402
Times returned to the homepage	Pearson Correlation	,652**	,787**	1	,636**	,431**	-,429**	,462**	,458**
	Sig. (2-tailed)	0	0		0	0	0	0	0
	N	403	403	403	403	403	403	403	402
Times previous used link is clicked	Pearson Correlation	,675**	,839**	,636**	1	,538**	-,446**	,531**	,500**
	Sig. (2-tailed)	0	0	0		0	0	0	0
	N	403	403	403	403	403	403	403	402
TLX - mental load	Pearson Correlation	,701**	,629**	,431**	,538**	1	-,614**	,849**	,743**
	Sig. (2-tailed)	0	0	0	0		0	0	0
	N	403	403	403	403	403	403	403	402
TLX - perceived success	Pearson Correlation	-,632**	-,520**	-,429**	-,446**	-,614**	1	-,587**	-,610**
	Sig. (2-tailed)	0	0	0	0	0		0	0
	N	403	403	403	403	403	403	403	402
TLX - effort	Pearson Correlation	,713**	,665**	,462**	,531**	,849**	-,587**	1	,773**
	Sig. (2-tailed)	0	0	0	0	0	0		0
	N	403	403	403	403	403	403	403	402
TLX - frustration	Pearson Correlation	,648**	,597**	,458**	,500**	,743**	-,610**	,773**	1
	Sig. (2-tailed)	0	0	0	0	0	0	0	
	N	402	402	402	402	402	402	402	402

**. Correlation is significant at the 0.01 level (2-tailed).

2.2 PRINCIPAL COMPONENT ANALYSIS

COMMUNALITIES FOUND IN THE ANALYSIS

	Initial	Extraction
Time needed for task (s)	1	0,82
Number of clicks	1	0,938
Times returned to the homepage	1	0,79
Times previous used link is clicked	1	0,781
TLX - mental load	1	0,842
TLX - percieved succes	1	0,611
TLX - effort	1	0,844
TLX - frustration	1	0,785

Extraction Method: Principal Component Analysis.

COMPONENT LOADINGS

Component Matrix[a]

	Component	
	1	2
Time needed for task (s)	0,901	0,093
Number of clicks	0,901	0,356
Times returned to the homepage	0,734	0,501
Times previous used link is clicked	0,786	0,404
TLX - mental load	0,842	-0,365
TLX - percieved succes	-0,729	0,281
TLX - effort	0,854	-0,338
TLX - frustration	0,812	-0,354

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

2.3   TESTING HOMOGENEITY

2.3.1   TIME NEEDED ON TASK

Regression analysis for linear, quadratic and exponential growth of the variance

Model Summary and Parameter Estimates

Dependent Variable:variance

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	,656	185,303	1	97	,000	-3044,632	92,335	
Quadratic	,680	102,025	2	96	,000	-856,899	36,533	,213
Exponential	,675	201,888	1	97	,000	160,200	,023	

The independent variable is mean.

GROUP MEAN PLOTTED AGAINST THE VARIANCE

13
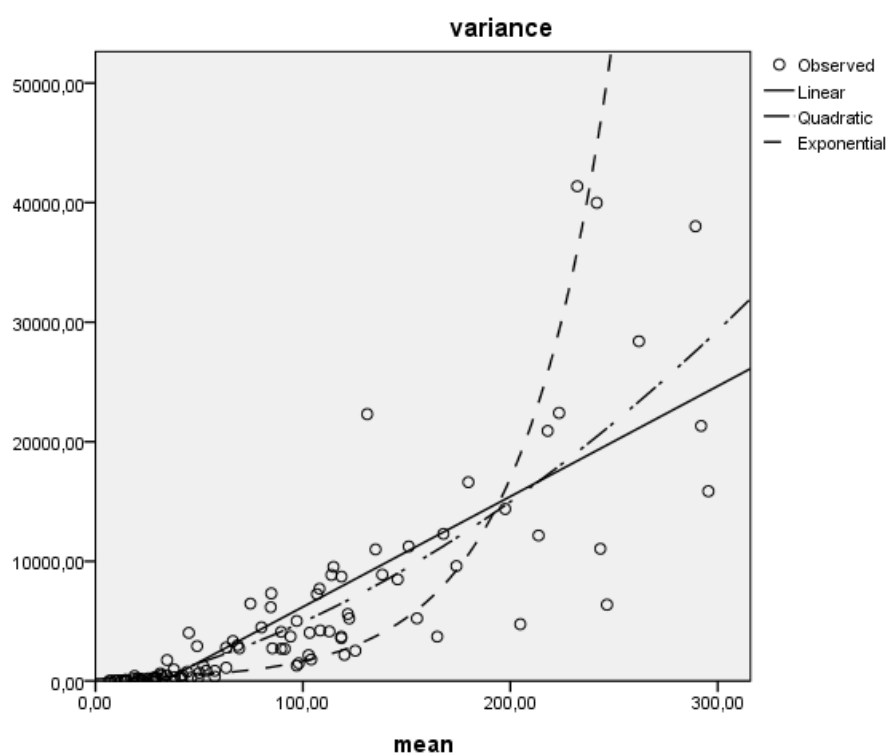
sqrtVariance
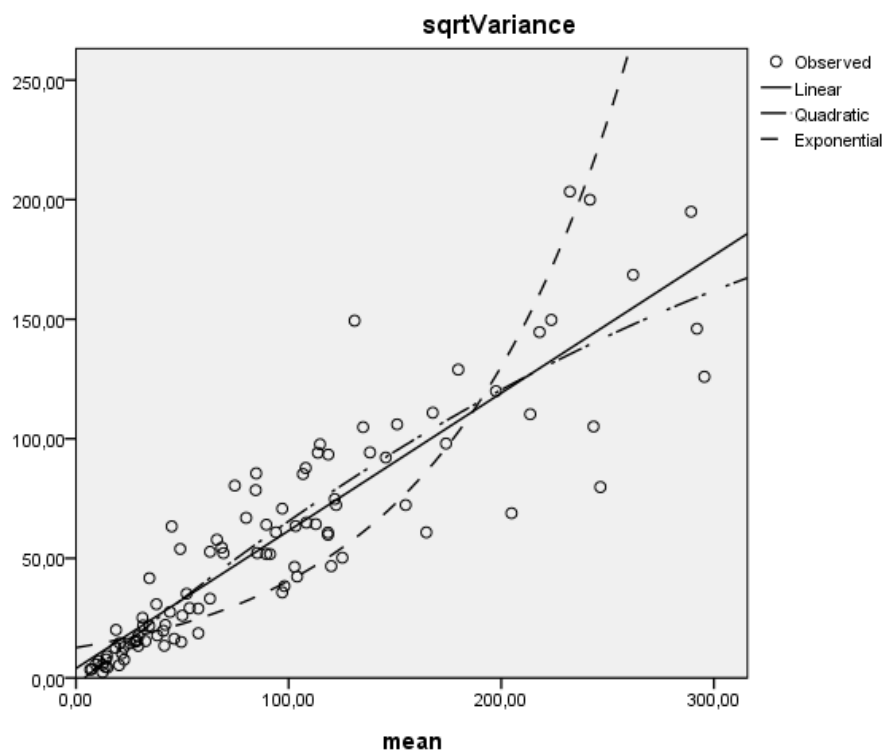
2.3.2   NUMBER OF CLICKS

GROUP MEAN PLOTTED AGAINST THE VARIANCE
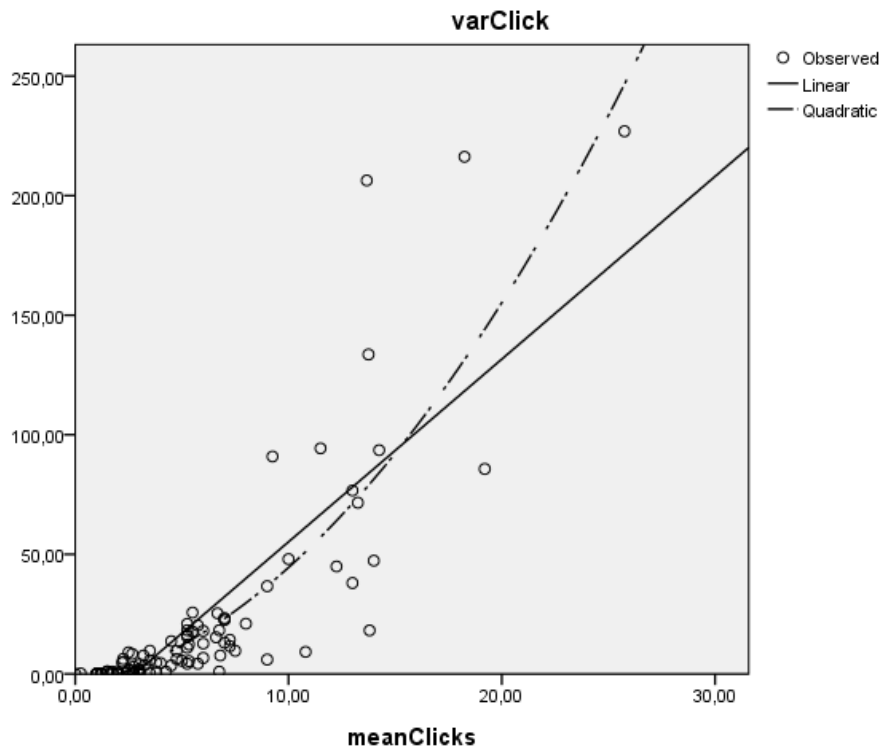
GROUP MEAN PLOTTED AGAINST THE SQUAREROOT OF THE VARIANCE
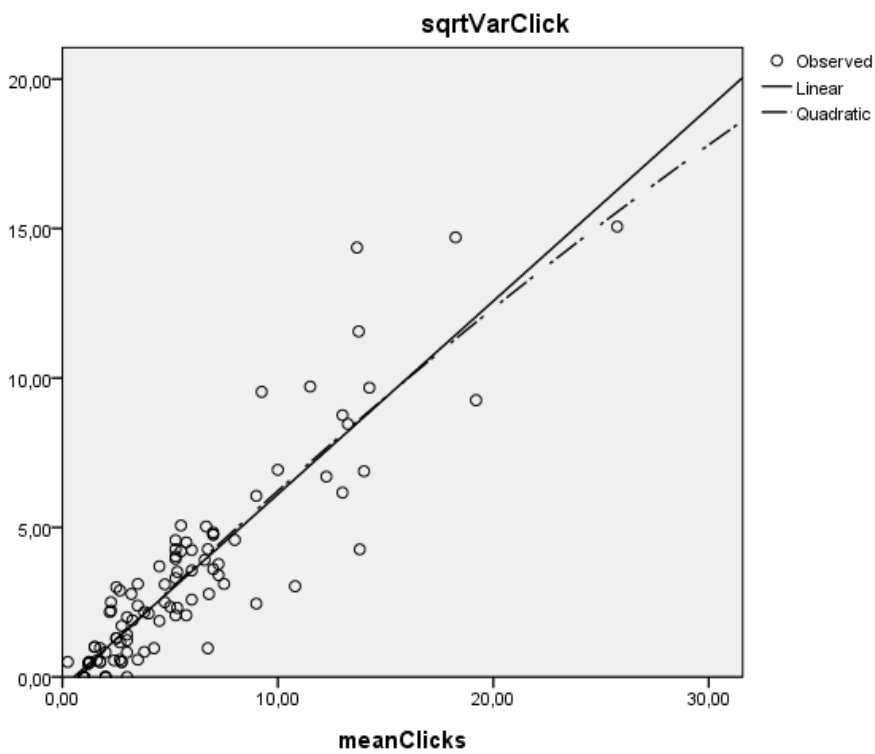
2.3.3 TIMES RETURNED TO THE HOMEPAGE

GROUP MEAN PLOTTED AGAINST THE VARIANCE
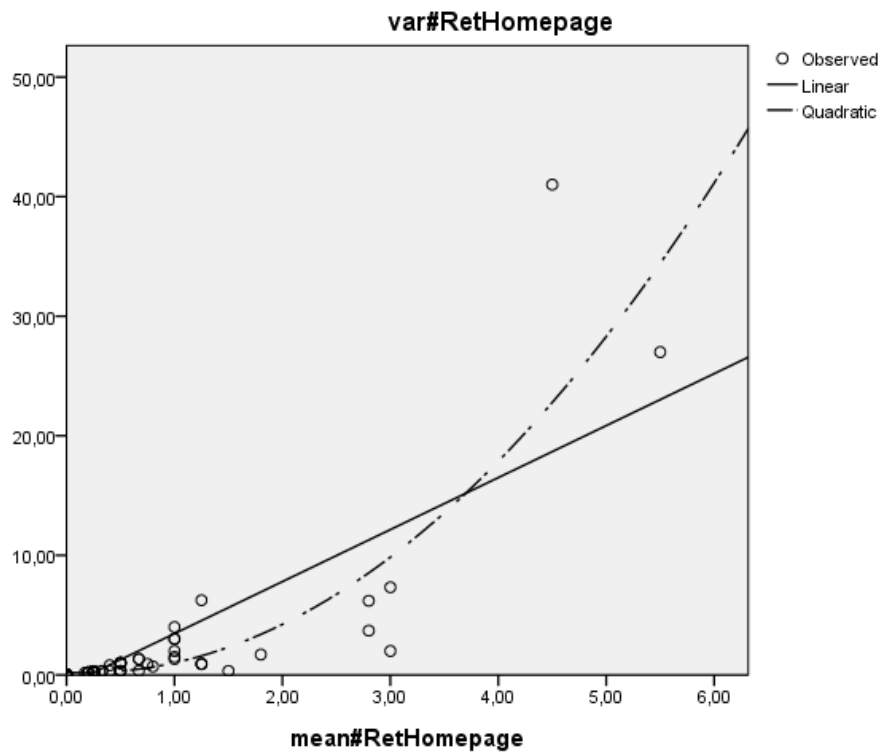
var#RetHomepage

GROUP MEAN PLOTTED AGAINST THE SQUAREROOT OF THE VARIANCE

sqrtVar#RetHomepage
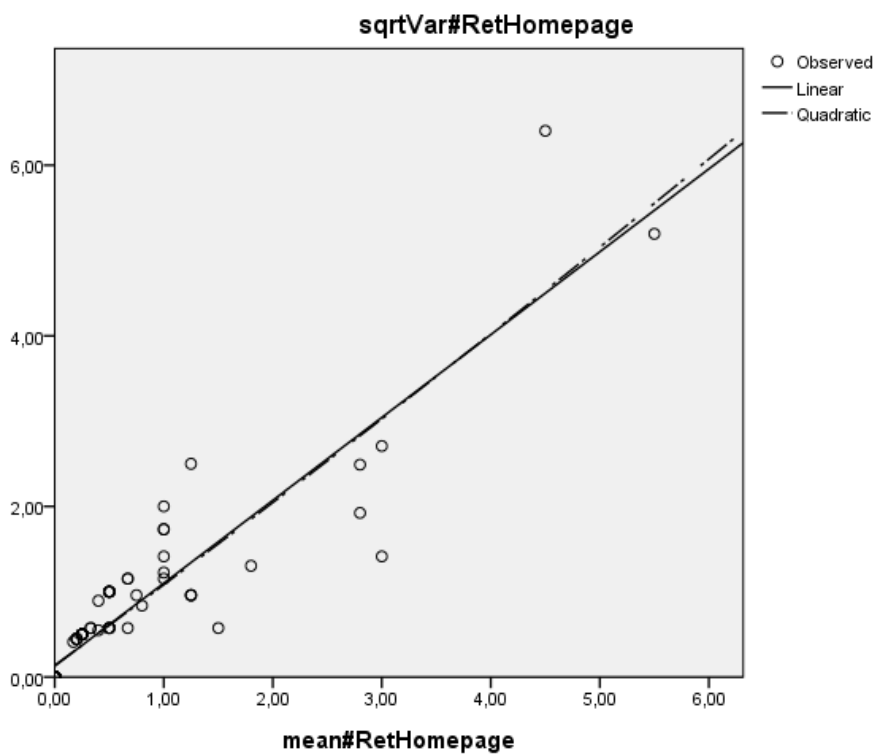
2.3.4 TIMES A PERVIOUS VISITED LINK WAS CLICKED

GROUP MEAN PLOTTED AGAINST THE VARIANCE
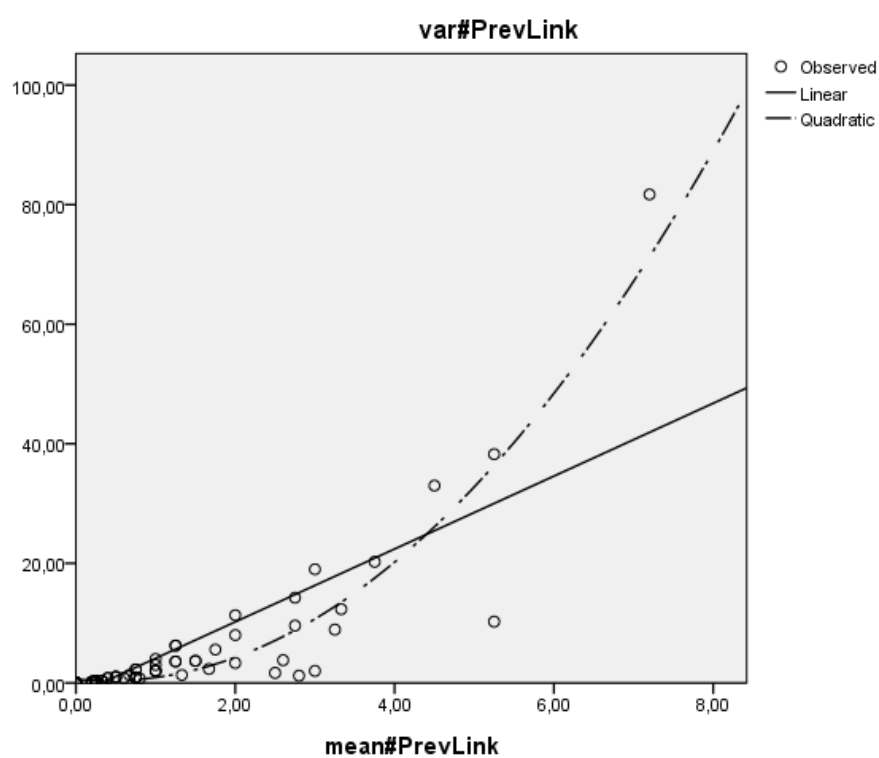
GROUP MEAN PLOTTED AGAINST THE SQUAREROOT OF THE VARIANCE
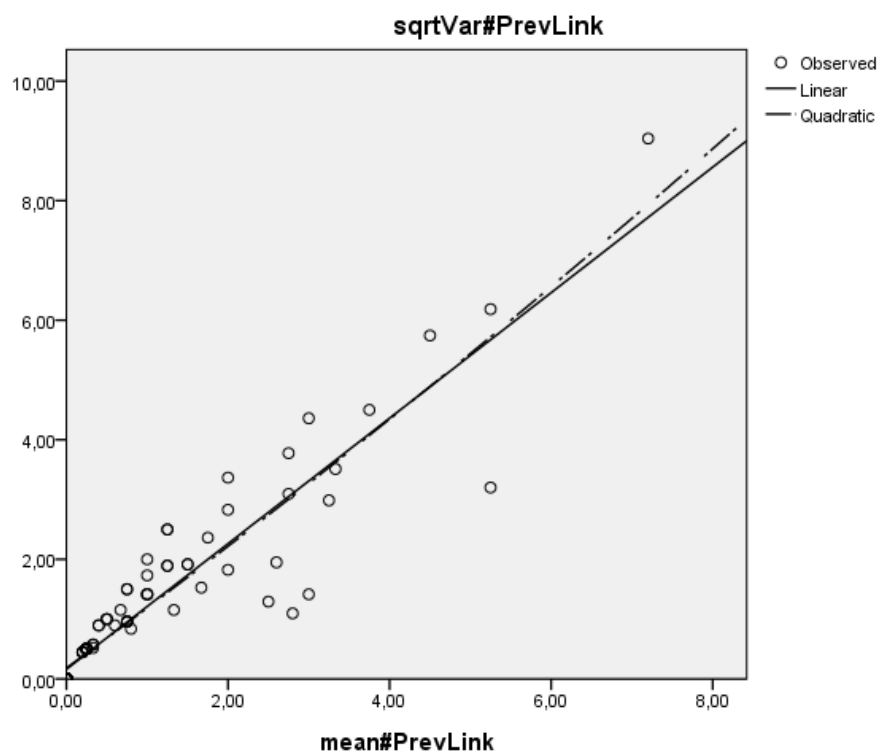
2.4 GEOMETRIC MEAN AND RANGE FOR TASK-WEBSITE COMBINATIONS

Geometric mean for each task – website combination

	1	2	3	4	5	6	7	8	9	10
VUB	62,8	26,05	111,05	49,9	25,53	16,44	138,38	28,79	50,91	228,15
KU Leuven	21,54	29,67	230,44	15,64	74,44	25,03	184,93	190,57	50,91	72,24
Ugent	26,31	43,38	119,1	12,3	97,51	58,56	85,63	114,43	26,84	104,58
Antwerpen	36,23	11,94	36,97	11,59	19,69	70,11	237,46	96,54	5,93	196,37
Uhasselt	43,38	24,05	57,4	12,3	14,3	190,57	83,93	26,05	37,71	40,45
EUR	55,15	6,75	275,89	8,08	48,42	92,76	105,64	86,49		92,76
Leiden	22,42	22,2	129,02	13,07	19,69	235,1	111,05	172,43	262,43	144,03
VU	77,48	23,81	117,92	19,89	54,6	56,83	65,37	44,26	162,39	71,52
RUG	47,94	26,31	87,36	9,3	23,1	79,04	100,48	91,84	157,59	137
KTU	108,85	79,04	170,72	12,06	80,64	42,52	157,59	83,93	35,16	101,49

Range for each task – website combination

|	1	2	3	4	5	6	7	8	9	10
VUB	173	52	194	147	37	31	276	51	130	265
KU Leuven	19	28	362	28	120	36	240	310	70	135
Ugent	33	37	198	5	99	142	319	196	70	143
Antwerpen	62	22	53	13	12	141	402	125	7	166
Uhasselt	98	33	146	17	8	379	226	32	48	19
EUR	61	9	246	12	71	106	149	219	.	85
Leiden	45	86	163	10	24	209	108	280	350	180
VU	141	128	112	28	45	115	164	54	362	111
RUG	34	119	187	16	31	213	144	79	132	215
KTU	135	118	432	50	159	73	175	194	39	129

2.5 SUCCESSFULNESS OF EACH WEBSITE

combined	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	90,2%	85,4%	87,8%	87,8%	95,0%	94,4%	87,8%	95,1%	97,6%	92,7%
Given up	4,9%	9,8%	7,3%	7,3%	0,0%	2,8%	4,9%	0,0%	0,0%	2,4%
incorrect	4,9%	4,9%	4,9%	4,9%	5,0%	2,8%	7,3%	4,9%	2,4%	4,9%

Task 1	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	100,0%	100,0%	100,0%	80,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Given up	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	,0%	,0%	,0%	20,0%	,0%	,0%	,0%	,0%	,0%	,0%

Task 2	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Given up	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%

Task 3	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	100,0%	75,0%	25,0%	100,0%	100,0%	75,0%	66,7%	100,0%	100,0%	100,0%
Given up	,0%	25,0%	50,0%	,0%	,0%	25,0%	33,3%	,0%	,0%	,0%
incorrect	,0%	,0%	25,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%

Task 4	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	66,7%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Given up	33,3%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%

Task 5	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Given up	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%

Task 6	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	100,0%	100,0%	100,0%	75,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Given up	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	,0%	,0%	,0%	25,0%	,0%	,0%	,0%	,0%	,0%	,0%

Task 7	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU

Success	75,0%	60,0%	75,0%	25,0%	75,0%	66,7%	50,0%	75,0%	100,0%	50,0%
Given up	25,0%	20,0%	,0%	75,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	,0%	20,0%	25,0%	,0%	25,0%	33,3%	50,0%	25,0%	,0%	50,0%

Task 8	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	80,0%	75,0%	75,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	80,0%
Given up	,0%	25,0%	25,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	20,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	20,0%

Task 9	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	100,0%	75,0%	100,0%	100,0%	75,0%		75,0%	75,0%	100,0%	100,0%
Given up	,0%	25,0%	,0%	,0%	25,0%		25,0%	25,0%	,0%	,0%
incorrect	00,0%	,0%	,0%	,0%	,0%		,0%	,0%	,0%	,0%

Task 10	websites									
	VUB	Leuven	UGent	Antwerpen	UHasselt	EUR	Leiden	VU	RUG	KTU
Success	80,0%	75,0%	75,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	80,0%
Given up	,0%	25,0%	25,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%
incorrect	20,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	,0%	20,0%

2.6 DESCRIPTIONS OF THE DEFAULT WAY TO FIND THE ANSWER FOR EACH TASK – ON THE BEST AND WORST PERFORMING WEBSITE

Task 1 – How many libraries does the university have?

Task 2 – How many faculties does the university have?

Task 3 – Find the schedule of 1st year bachelor biology?

Task 4 – What is the central phone number of the university?

Task 5 – What are the opening hours of the library?

Task 6 – Who is the current Rector (magnificus) of the university?

Task 7 - You have a complaint about how you were treated by a teacher. Find an ombudsperson or complaints desk. Make sure you have a phone number, email address of specific desk you can visit.

Task 8 – Find a map of the university with different school buildings on it

Task 9 – Find the academic calendar

Task 10 – You have personal problems and are looking for a student psychologist. Make sure you have a phone number, email address or specific desk you can visit.

THE BEST WEBSITE - KU LEUVEN:

On the top of the front page there's a horizontal navigation bar with 10 different options, of which one option is library. This leads to a page which offers links to multiple aspect of the library of the university, among this there's a list with links to page for each library location of the university.

THE WORST WEBSITE - TILBURG UNIVERSITY:

On the front page there is a horizontal navigation bar with a rollover dropdown menu. Under "about the University" there's an option for "University library". On the page of the university library right below the website navigation there is a space with a picture of the library, a short text and 2 picture links with "opening hours" and "contact" written on the pictures. Below that there is a small menu on the left side of the page, some basic information about borrowing books and using the catalogue of the library in the body of the page and on the right of this a student- and an employee-link followed by a search bar and "directly to" links. When clicking the link opening hours a page with tables pop up explain the different opening hours, from this can be deducted there is only one library. On the page of "University library" there's also the option to click "collections" in the navigation menu on the left side of the page. In the body of the page it links to, there's written in a small text that there are 7 collections under one roof.

TASK 2 – HOW MANY FACULTIES DOES THE UNIVERSITY HAVE?

THE BEST WEBSITE - ERASMUS UNIVERSITY:

On the front page the main navigation bar is on top and has the option "faculties", when this one is clicked, it leads to a page with a list of all faculties.

THE WORST WEBSITE - TILBURG UNIVERSITY:

On the front page the main navigation bar is on top and has the option "Research" and in the rollover dropdown menu appears a list in which the faculties are listed, among other things as well. When "About the university" is selected from that navigation bar, the user is direct to a page where is explained as part of a text what the research faculties are. The word faculty however isn't used in the explanation.

TASK 3 – FIND THE SCHEDULE OF 1ST YEAR BACHELOR BIOLOGY?

THE BEST WEBSITE - UNIVERSITY OF ANTWERP:

On the front page the main navigation bar is on the top, which doesn't contain words which can be quickly linked to college schedules. In the body of the page there is a block of "directly to" links of which one contains college schedule. After which the right faculty has to be chosen and after that the right bachelor study has to be chosen. This leads to a page with links to different schedules for each year of the particular bachelor study.

THE WORST WEBSITE - UHASSELT:

On the front page the main navigation bar is on the top and in the body of the page the options of the top navigation bar after further explained. Under "Education" there is the option "Studies" which leads to a page with the different bachelor and master programs the university offers, sorted by faculty. This link can be reached from the top navigation bar, as well as the body of the front page. When selecting biology this leads to the page of the study biology. Here is the option study program listed as one of the few options in the body of the page. This leads to a new page where there is the option to open the schedule for the first year or 2nd and 3rd year of the bachelor biology. It is also possible to go to "information for students". In a menu on the right of the page there's a box with "useful links" which contains schedules. On the pop-up page that appears 1st year biology can be selected from a dropdown menu.

TASK 4 – WHAT IS THE CENTRAL PHONE NUMBER OF THE UNIVERSITY?

All websites have a contact link in the top right of the page, except for the VU Brussel. This website has the phone number information listed at the bottom of every page and can often only be seen when the user scrolls down.

TASK 5 – WHAT ARE THE OPENING HOURS OF THE LIBRARY?

THE BEST WEBSITE - UHASSELT:

On the front page the main navigation menu is on the top and in the body of the page the options of the top navigation bar after further explained. In the top bar there is the option "library", which leads to a page where the body contains 4 clusters of different navigation options, under the cluster "about library" there is a link "opening hours" which leads to the answer.

THE WORST WEBSITE - UGENT:

This website offers multiple ways which lead to the answer. There is a "directly to" section on the right of the page which has a link to a special website for the library of the university. This is a different website with a different layout and navigation structure. In the news section of the right side of the page, there is a link which leads to the opening hours. Another option is to go to "for student" or to "facilities" which both lead you to pages of the library website, within the structure of the website. Here a specific library has to be chosen, which in turn opens the website specific for the university library and there is a link to opening hours.

TASK 6 – WHO IS THE CURRENT RECTOR (MAGNIFICUS) OF THE UNIVERSITY?

THE BEST WEBSITE - VU BRUSSEL:

On the front page there's a navigation bar on the top, other navigation options in the body of the page and on the left there's a list with "directly to" links. The first link in the "directly to" list is "website rector Paul De Knop", which gives the answer on the front page.

THE WORST WEBSITE - LEIDEN UNIVERSITY:

On the top of the frontpage there's a horizontal navigation bar where "about university" has to be clicked. This leads to a page where in the body multiple labeled clustered navigation options are given. The links "organization" in cluster "contact & organization" leads the user to a page where is explained which faculties the university has and what other kind of organization organs the university has. After the text explaining this, there's a link "management and organization", which leads to a page with links to the different kind of organization organs the university has. The link "college board" leads to the page where the information can be found.

TASK 7 - YOU HAVE A COMPLAINT ABOUT HOW YOU WERE TREATED BY A TEACHER. FIND AN OMBUDSPERSON OR COMPLAINTS DESK. MAKE SURE YOU HAVE A PHONE NUMBER, EMAIL ADDRESS OF SPECIFIC DESK YOU CAN VISIT.

THE BEST 2 WEBSITES VU AMSTERDAM AND RUG

VU Amsterdam: On the top of the front page there's a horizontal navigation bar with rollover dropdown menus. Under the option "students" there's a link "complaints and regulations" which leads to a page which explains the different kind of complaints and a link to contact information for each kind of complaint.

RUG: On the front page there's a horizontal navigation bar at the top, with rollover dropdown menus and in the body of the page there are the options from the navigation bar at top further explained. The first option of the navigation bar on the top is "Information for" when scrolling over this the option "students" appears. In the body of the front page this can also be selected. On the student page there is a different navigation bar on top where "regulations, complaints and representation" is an option. In the drop down menu there is an option for "complaint, objection and appeal". This option can also be chosen in the body of the student page. On the complaint, objection and appeal page there is an address where can be written to and there are multiple links where different type of complaints can be registered.

THE WORST WEBSITE - UNIVERSITY OF ANTWERP:

On the frontpage there's a list with "directly to" links, under which "AZ-university" is listed, where the link "ombudsperson" with information about complaints and contact information. Aside from this route there seems to be no other way to reach this information.

TASK 8 – FIND A MAP OF THE UNIVERSITY WITH DIFFERENT SCHOOL BUILDINGS ON IT

THE BEST WEBSITE - UHASSELT:

On the front page there is a horizontal navigation bar with different options. The different links have rollover dropdown menus with different links for each subject. In the body of the page some of the options from the main navigation menus are further explained. Under the link "about UHasselt" there is the option "contact and location". This link can also be clicked in the body of the front page. The "contact and location" page uses 2 pictures as links to 2 different types of maps, both offer the information.

THE WORST WEBSITE - KU LEUVEN:

On the front page is a horizontal navigation bar on top and in the body of the page the options in the top navigation bar are further explained, either in text or with additional links. Above the top navigation bar there is a banner with above that a link to the contact information. The contact page shows different addresses and phone numbers of the different buildings. There is also a link "digital city map", this link leads to a map of the city with different locations of the school noted. The different districts on the city can be clicked.

THE BEST WEBSITE – UNIVERSITY OF ANTWERP:

On the front page there's a horizontal navigation menu on the top and in the body of the page multiple clusters with links. In the body of the page there's a link "academic calendar" under "directly to".

THE WORST WEBSITE - LEIDEN UNIVERSITY:

There's a navigation menu on the top of the front page with short texts and more navigation links in the body of the page. Outside all of this there is the "student portal" above the banner, next to "employees portal". This "student portal" page has a navigation menu with different options as top menu on the front page and the body of the page is filled with news items and two lists of links. In one list of links there's "Index A-Z" which leads to a page with all letters of the alphabet. The "K" leads to a list in which there's a link to the (academic) "kalender", the Dutch word for calendar.

TASK 10 – YOU HAVE PERSONAL PROBLEMS AND ARE LOOKING FOR A STUDENT PSYCHOLOGIST. MAKE SURE YOU HAVE A PHONE NUMBER, EMAIL ADDRESS OR SPECIFIC DESK YOU CAN VISIT.

THE BEST WEBSITE - UHASSELT:

On the front page there's a horizontal navigation bar on top with a rollover dropdown menu's and in the body of the page the navigations options are further explained in different clusters. Under "education" there's "support and facilities" which leads to a page with links about different areas and kinds of support and facilities in the body, as well as the same links in a menu on the left of the page. The option "support and guidance" leads to a page with different kinds of guidances offered, of which one is "psychosocial guidance", which leads to the information.

THE WORST WEBSITE VU BRUSSEL:

On top of the website there's a navigation bar, in the body of the page there are navigation options and on the left side there is a list of "directly to" links. In the body of the page there's a link with "student facilities" which leads to a page with 5 clusters of links in the body. Among these there's "medical and psychological care" which leads to the page with the information.