

Project Report: Users' satisfaction about Dalarna University's Homepage

ST3012 Data Collection

Authors: Péter Tempfli, Tobias Weiß
{v19pette, v18tobwe}@du.se



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1 Abstract

We write as very last thing **Keywords:** foo bar

2 Introduction - Tobias

Not long time ago, Dalarna University decided to update the website layout to cutting-edge web technologies. To set up a website is easy but who guarantees that the users are satisfied with it? With this project we help to increase the understanding of user needs and how well these needs are suited by the prevailing system.

2.1 Research Question

Users' satisfaction is a very broad topic and the scope has to be narrowed down carefully. A survey about general satisfaction would be doomed to fail. It either would be too big and comprehensive or too general and vague. Both would lead to missing and/or imprecise information. Therefore, this project focuses on functionality aspects of the "search personal" page. Following main questions were raised:

1. If "find personal" is accessed, then the path is intuitive and quick?
2. If "find personal" page is visited, then the required data is found quickly?
3. If "find personal" page is visited, then a up-to-date front-end is displayed?
4. If a filter is used, is it intuitive to add the needed one?
5. If more than one filter is needed, is it clear what is the relation between two filters?
6. Is it intuitive to remove a filter?

In order to answer these questions a survey among the website users is conducted.

3 Methodology

A qualitative survey [1] with quantified questions is suggested as functionality remains a subjective impression. For quantification a five-point Likert scale [2] is used. The scale is not directly visible to the subject as questions can be answered with sentences like "I fully agree", "I agree", etc. There is a discussion [3] whether five-point Likert scales are a sound method or not. This research sticks to it as more sophisticated methods [4] seem unhandy and are not easily adaptable in the system, which is used for data collection.

3.1 Research design

A Google docs online form is chosen to conduct the research. It seems to be used in other educational context [5] but is not suggested in research beyond a Master thesis level. Dalarna University offers a survey tool which should be used instead in a real context.

3.1.1 Population - Tobias

The population are all human beings who have visited the Dalarna University website in the past and who will visit it in the future. One can estimate their number by analyzing server logs but still has to narrow down the time (visitors during the last month) and make certain assumptions.

3.1.2 Sampling size - Tobias

As no previous data is available, one has to assume the most conservative P value of $P = 0.5$. Furthermore, the standard values of 10% for error level and 95% for the confidence interval are assumed. Therefore, the sampling size is calculated as shown in equation 1.

$$n = Z_{\alpha}^2 \frac{P(1 - P)}{(\hat{p} - P)^2} = 1.96^2 \frac{0.5(1 - 0.5)}{0.1^2} = 96 \text{ subjects} \quad (1)$$

3.1.3 Designing the experiment - Peter

In order to have a correct, measurable outcome, the environment of the experiment should be designed using well known, scientifically reliable techniques. We have to ensure the following principles:

1. **Randomization.** We need to have objective effect, yet also need to give room for statistical inference
2. **Replicable experiment** Our experiment should be replicable; so we can study different outcomes from the *same experiment*.
3. **Controllable** A designed experiment makes sure that the effect are caused by factors, which are known by the researchers.

We are testing one environment, but we have more than one sub-sections in our population group. We can argue that we have *at least* one dimension of sub-group in this population (status: student, teacher, researcher...); and it is also easy to see, why we could create more than one dimensions of the sub-populations (age, sex, etc..)

The other dimension is the behavior which the site visitors conduct on the site – not every visitor behaves the same way, thus some visitors experience aspect of the site, which others might not. The list of possible behaviors is probably endless, so we need to focus on very broad, but still distinctive usage patterns, such as:

- Simple person search, user found
- Simple person search, filter used
- Simple person search, combination of filters used

So we can see that we have *at least* 2 sources of variability : user group and user behavior. It is impossible to test every combination of these blocks, but if we still want to know, which block is responsible for some effect in the final outcome. For our case, if we stick with the 2-dimensional population model, the Latin Square Design is a good candidate.

The LSD design (see formula 2) orders outcome data into tables, and from these matrices builds a model, which is used for a linear regression:

$$y_{i,j,c} = \mu + \tau j + \beta i + \gamma c + \epsilon_{i,j,c} \quad (2)$$

If we only calculate the mean of the whole survey, we can't tell anything specific about sub-groups. However, once we have the regression ran, we have all the coefficients for every block; so in our case, we know, how much a sub-group likes more, or likes less a given feature. The linear model also tells the significance levels of these coefficients.

3.1.4 Data collection plan - Tobias

As the survey is not carried out on the full sample size but just on a few show cases, we send an E-Mail or WhatsApp message with link to the Google forms document and explanation to some of our classmates.

In reality, an implementation of sequential sampling as described by Fan et al. [6] is suggested directly on the website. If users search persons a binomial approach can be applied. If the user is selected, a overlay with an invitation to the survey can be displayed. Still, it remains questionable if the structure of respondents is representative and delivers an unbiased view as humans tend only to report unwanted results [7]. Maybe incentives to answer the questionnaire have to be introduced.

3.1.5 Statistical Indicators - Tobias

The analysis will heavily relate on cross tables. Besides means and medians, χ^2 coefficients [8] (as shown in formula 3) and contingency coefficients [9] (as shown in formula 4) are calculated in order to determine the level of independence among the variables. These measures are important to see whether the questions are answered in a different way among the user groups (pupils, students, researchers, etc). Technically, the calculations will be performed in R using the `assocstats` function from the package `vcd`.

$$\chi^2 = \sum_{r=1}^k \sum_{s=1}^t \frac{(m_{r,s} - n_{r,s})^2}{m_{r,s}} \quad (3)$$

$$K = \sqrt{\frac{\chi^2}{n + \chi^2}} \quad (4)$$

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A pairwise correlation coefficient [10] (as shown in equation 5) is computed to show if some of the questions can be abandoned in the future.

$$r_{x,y} = \frac{s_{x,y}}{\sqrt{s_x^2 \cdot s_y^2}} \quad (5)$$

3.1.6 Data Quality Assurance - Tobias

The DESAP checklist is used to keep track of the Project's data quality. "DESAP is the generic checklist for a systematic quality assessment of surveys in the European Statistical System (ESS). It has been designed as a tool for survey managers and should support them in assessing the quality of their statistics and considering improvement measures. During its development, the checklist has been tested in a pilot study covering a large variety of survey areas. It is fully compliant with the ESS quality criteria and comprises the main aspects relevant to the quality of statistical data [11]".

3.1.7 Ethical considerations - Peter

While the main goal of a research is to answer questions and provide meaningful results, it is also crucial that we conduct the research in an ethical manner.

As American Statistical Association's Ethical Guidelines ([12]) states, an ethical research should be transparent, reproducible and valid. The researchers should also think ethically about every stakeholder of the given project, so avoid or minimize harm; and not to pursuit unethical ends.

The Guidelines of the American Statistical Association are mostly similar to the guidelines of the RESPECT Code ([13]); the main ideas are the following:

- **Consideration about the data.** The data should be objective and valid. The researcher should know the implicit biases and limitations of the data.
- **The research subject.** The researcher should consider the rights and the interests of the involved research subjects.
- **The team colleagues.** The research is a team-work, so the researcher should consider the rights and interests of the team members.
- **Other statisticians.** A researcher should share data and methods if possible; should consider the interest of the scientific community.
- **Employers, customers or other commercial stakeholders.** The researcher should work in a moral way also in a commercial environment; should try to work an ethical work environment; and should strive to professionalism.

In terms of our project, the we should consider the following:

- We should to try to design an experiment where the data is not biased; so we need to use proven experiment design techniques.
- We should not cause any harm to the university website, so we should think, if the extra traffic by our experiment slow down the servers.
- We should respect the right and interests of the people involved; so need to make sure, that all of their personal data and behavior during the research is cared carefully.
- As the key question in the survey is how to improve it's' website, we need to try to cum up with meaningful, valid, and valuable answers.
- During the research we need to make sure that all of the university employees, as well as the team members are cared morally.
- The team members should act professionally, so they won't hurt the image and the interests of the scientific community.

3.1.8 Legal considerations - Peter

As we research European Union subjects, and we store their personal data, we need to act accordingly to the The EU General Data Protection Regulation (GDPR) [14]. The researchers in this case are the Data Processors; because they are handling and storing the subjects's personal data, which is in this case is 1, Name 2, Email 3, IP address. This is, according to the law, personal data, because the subjects can be directly or indirectly identified using these data points. It is important to understand that pseudonymised can also count as personal data; and the process itself of data-transformation is a personal data handling act.

The GDPR demands from the researchers that the handle of personal data should be lawful, fair and transparent. These guidelines can be found at universities and at other research groups.

In order to deal with the personal data, first of all, the subject should give a consent. The consent should be:

- Freely given
- Specific
- Informent
- Unambiguous
- An affirmative action

There can be other bases for personal data processing (Contract, Legal Obligation, Vital interest, Public task, Legitimate interest), but we are not dealing with these here in detail.

In our case, in the survey, on the first question, we need to describe the goals of our research; the data which we are collecting about the individuals; and as for a consent with a checkbox which states 'Yes, I agree'. Once the research subject agreed, we can follow with the following questions.

———- How do we store the data? What is the problem with Google forms. (Maybe write that in a real research we would use our own form/tool!)

3.1.9 Analysis plan

All questions follow the same scheme. A dummy cross table is represented by table 1.

Table 1: Dummy cross table for all questions

	I fully agree	I agree	I mainly agree	I partly disagree	I disagree	Σ
pupil	0	0	0	0	0	0
student from other institution	0	0	0	0	0	0
researcher from other institution	0	0	0	0	0	0
student @DU	0	0	0	0	0	0
researcher/employee @DU	0	0	0	0	0	0
other	0	0	0	0	0	0
Σ	0	0	0	0	0	0

4 Analysis

4.1 Pilot

4.2 Absolute and Relative Frequencies

4.3 (Co-)variances

4.4 Independence

5 Conclusion

References

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Appendices

Survey Guideline

Information about the questions

Survey Questions

Only absolute relevant questions

DESAP checklist

Checklist can be found in the git folder