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

ST3012 Data Collection

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DALARNA UNIVERSITY

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Contents

1 Abstract

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

2 Introduction

The website of an organization is its figurehead. 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?

2.1 Research questions

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 aspects of the "search personal" page. In oder to answer these questions a survey among the website users is conducted. Following main questions are raised:

1. **User friendliness:** When "find personal" is accessed, the navigation path is intuitive, quick and the front-end appears up-to-date?

2. **Efficiency:** If "find personal" page is visited, then the required data is found quickly?

3. **Filtering facility:** If a filter is used (added or deleted), the process intuitive and is it clear which relation/hierarchy between filters prevails?

2.2 Goals

In order to get deeper knowledge of the user needs a series of steps have to be executed:

- Define methodology, including sampling size, experiment design, survey tool
- Design the survey form, including survey questions guideline
- Assure data quality via DESAP checklist
- Analyze data with the prepared methodology
- Present the findings within report and presentation

2.3 Final aim

With this project we help to increase the understanding how well user needs are suited by the current "find personal" system. The project shows where the weaknesses and strengths are. It can be used to determine if changes are necessary or not.

3 Methodology

3.1 Designing the experiment

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 1) orders outcome data into tables, and from these matrices builds a model, which is used for a linear regression:

$$y_{i,j,c} = \mu + \tau j + \beta i + \gamma c + \epsilon_{i,j,c} \tag{1}$$

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.

3.2 Population

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.

3.3 Sampling size

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 2.

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

3.4 Quantification and scale

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. It is quantified in a bipolar way as shown in figure 1. 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.

Table 1: Response scale

Semantic text	I fully agree	I agree	I mainly agree	I partly disagree	I disagree
Quantification	2	1	0	-1	-2

3.5 Survey tool

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. Still, the use of Google forms remains questionable. There are many arguments pro and contra using it. On one hand using Google forms is cheap, easy and fast. The data might even be more secure as on local servers as Google probably has good security and backup strategies. On the other hand one gives the data away to Google and can not be fully aware anymore what happens to it. Dalarna University also offers a survey tool which should be used instead in a real context.

3.6 Data collection plan

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.

3.7 Statistical indicators

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`.

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

$$K = \sqrt{\frac{\chi^2}{n + \chi^2}} \tag{4}$$

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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.

$$r_{x,y} = \frac{s_{x,y}}{\sqrt{s_{x^2} \cdot s_{y^2}}} \tag{5}$$

3.8 Data quality assurance

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]".

3.9 Ethical considerations

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 design an experiment where the data is not biased; so we need to use proven experiment design techniques.
- We do not cause any harm to the university website, so we should think, if the extra traffic by our experiment slow down the servers.
- We 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 come 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.

3.10 Legal considerations

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
- Unambigous
- 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 check box which states 'Yes, I agree'. Once the research subject agreed, we can follow with the following questions.

3.11 Analysis plan

All questions follow the same scheme. A dummy cross table is represented by table 2. All results will be displayed using slightly modified versions of this table. Google forms offers an easy CSV export function. The data is downloaded and subsequently the statistical indicators listed above are calculated.

Table 2: 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 Independence

4.4 (Co-)variances

5 Conclusion

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Appendices

Survey Guideline

Information about the questions

Survey Questions

1. Navigation to the "personal search" page is intuitive and fast?
2. Loading time after entering the search term is quick?
3. Information you are looking was found immediately?
4. It is intuitive to add/remove filters?
5. If more than one filter is needed, is it clear what is the relation between two filters?
6. Do you have any improvement suggestions?

DESAP checklist

The DESAP checklist can be as a separate document.