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The Impact of Navigation on Survey Completion Rate

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ABSTRACT

There are several tools for creating online surveys. However, guidance is lacking for some of the decision-making regarding the survey design. This study aims to investigate if one of these choices, navigation, has an impact on the surveys completion rate. We developed our own tool that gave every other respondent one of two different designs. This lets us gather more information than tools such as Google Forms and SurveyMonkey.

A qualitative approach was used and we let the students of a course at KTH answer questions about that course without having knowledge of this project.

No conclusions could be made due to some unexpected behaviours which will be explained later in this paper.

SAMMANFATTNING

Det finns ett antal verktyg online för att skapa undersökningar. Det saknas dock riktlinjer för formgivning och val av komponenter. Med denna studie undersöks om en av dessa komponenter, navigation, har någon inverkan på en undersöknings svarsfrekvens. Vi utvecklade ett eget verktyg som distribuerade varannan svarande en utav två olika design. Detta tillåter oss att samla in mer information än de verktyg som finns online. Exempel på sådana verktyg är Google Forms och SurveyMonkey.

Ett kvalitativt tillvägagångssätt användes där vi lät aktiva studenter i en kurs på KTH svara på frågor angående kursen. De svarande visste inte om att de deltog i en studie.

Inga avgörande slutsatser kunde tas på grund av oväntat beteende.

Author Keywords

Pagination; Scrolling; Survey; Completion rates;

1. INTRODUCTION

There are different survey methods which have emerged over time. For example, paper surveys sent out through traditional mail and fax, phone interviews and web-based surveys such as e-mail and online surveys. Web-based survey methods such as online surveys allow for more innovation. They can contain visuals like images, video and audio can also be integrated. As well as alerts if respondents skip or answer incorrectly [15]. In the early 2000s, the amount spent on online surveys in the USA reached over \$900 million [16].

Since then, online surveys have become an important tool in market research, academics and political opinion polling, dramatically lowering the cost per answer [15] compared to more traditional data collection methods such as traditional mail and phone interviews.

With advances in techniques and technologies, questionnaire design and data analysis have radically been enhanced. Novice users have access to online tools such as Google Forms and SurveyMonkey where the initial survey layout is already designed.

Given the ease of setup with online tools for non-expert users and tools to generic¹ to properly aid the user. Will their choice of layout affect the completion rate, number of completed surveys?

Despite the advances made, major weaknesses remain. For example, declining completion rates, missing data, survey length, privacy issues and mistrust. Another problem that is encountered with online surveys is their low response rates, number of opened surveys. Reports show that online surveys response rates, at its best, are equal to other methods². Previous research has also shown a wide variation in response rates [17]. With low response rates there is a threat to findings reliability due to the inability to reflect the population.

Suggestions have been made that more studies are needed to isolate reasons for low response rates [16].

2. BACKGROUND & THEORY

Researchers have been using various methods of data collection, such as telephone and e-mail. In the past decade, web surveys have gained significant popularity as a method of conducting surveys [1, 2]. Compared to traditional modes of surveys, web surveys have their advantages. One of them being more design options [6]. They do, however, often have specific challenges such as losing participants and having low response rates that could lead to biased results [1, 7, 8].

There have been studies done on how design affects survey response rates. For example, H. Sauermann and M. Roach [21] investigated options to increase response rates in their paper "Increasing web survey response rates: An experimental study of static and dynamic contact design features". Their paper delves into more areas than ours, such as incentives, personalisation i.e. displaying the survey takers name and how send-out times played a role. Their results point towards an increased response rate, in some cases as high as 100%, from a 24% response rate to 48%. Important to note though is the percentage of people who finished the survey after clicking through the survey link is 84.7% which is where our effort and investigation will be aimed at.

Pagination is the closest equivalent to a paper survey. Not unique to the medium compared to infinite scroll which is only possible in a digital medium. As aspect ratios have changed [23] work has been undertaken investigating how to best use the increased screen real estate. Old design holdovers from the paper medium are still affecting design and layout choices with one column designs that resemble a paper that leaves plenty of whitespace on any widescreen display.

Previous literature has been discussing pagination and scrolling questionnaires as two types of layouts [2, 3, 4]. Scrolling designs display all the questions within one single view. Respondents need to scroll from top to bottom to view the whole survey and give answers. Suggestions are that scrolling design requires less

¹ Tools set up to make as many different kinds of surveys and questionnaires possible. Thus, will let the user do a bad design choice for their survey. Extreme would split up 10 single choice questions over 10 pages.

² e.g. mailout, phone and in person.

computer time and resources. It is said to provide a richer context for respondents because all questions are on one page [5].

In contrast, pagination designs put one or a few related questions within one view. Respondents have to press a “next” button in order to proceed to the next question. Advantages of this design were pointed out as allowing respondents to skip questions not applicable to them. Also, reminding respondents to give consistent responses in correct format and range [3].

Some researchers prefer that there is one question per page [18]. This because the respondent focuses on one single question at a time. With this approach, there is a chance that the respondents are affected by the order of the questions i.e., their answer is influenced by previous question [18].

Confidence that collected data reflects the population accurately requires high response and completion rates [18].

Reviews have been conducted with the purpose to propose design methods for higher completion rates. Manfreda and Vehovar [9] proposed some aspects that, according to them, are vital to increasing responses and corresponding completion rates. For instance, a pre-notice before the initial invitation can be used to increase the overall completion rates. Another suggestion of theirs to increase completion rates is to avoid open-ended and “difficult to answer” questions [9]. Their conclusions confirm previous results. Pre-notice was found to significantly increase completion rates in a meta-analysis by Cook et al [14].

According to Petrovčič, Petrič & Manfreda [19], completion rates often are associated with an authority as a decisive factor whether or not a respondent should take a survey -that is, that the survey being associated with a person who is an acknowledged authority can enhance trust from the potential respondent. This can make the survey perceived as more honest and trustworthy, which can influence the respondent positively on their decision.

It is to expect from web surveys, compared to offline surveys, that respondents need to perceive legitimacy and trust. This is because with online environments, insecurity increases due to the geographical distances as well as other impersonal factors [19].

2.1 Related Work

Knowledge about a survey’s optimal design and layout are limited [20]. It has been suggested to avoid complex sentences, that increasing the length of the questions improves the quality of the respondents answer [20].

There have been some studies [6, 10, 11, 12] prior to this one on pagination contra scrolling. Usually, it is assumed that scrolling and pagination are suited for different types of surveys, scrolling for information lying relatively close together, and pagination for information farther apart [10].

In early studies, the results differed. Some reported higher completion rates with longer completion time when using pagination. While these are the results that were found in some studies, others found no difference between the two versions [12].

Schwars, Beldie and Pastoor [10] conducted an experiment to clarify which of these designs were better suited for non-experienced users. The subjects performed three tasks which occupied two views: Reading, line search and sorting. Schwarz et al. found in their experiment that scrolling was not superior to pagination in either case. For inexperienced users doing these tasks, scrolling did not have any advantages. An explanation for that could be the fact that scrolling allows no absolute like pagination does [10].

An experiment on students conducted by Peytchev et al. [3], similar to ours, had two design versions: Pagination and scrolling. They were distributed using the subjects’ student email. The invitations and welcome screens for the two versions were identical. In their study, the subjects believed they participated in a survey about tobacco, alcohol and drugs. They did not know that the actual study was about the difference in pagination and scrolling.

With more survey content, five screens, they found a similar result as Schwars, Beldie and Pastoor. Their completion rates did

not differ significantly between pagination and scrolling. Among all those who opened the survey, there was only one percent difference between the two versions [11].

Evans & Mathur [17] suggest practices that should be applied to increase completion rates. In contrast to other studies, they suggest limiting the number of times one should contact respondents. They also noted that the amount of questions is not necessarily affecting completion rates -rather, the amount of time and effort needed in order for them to complete the survey.

According to Sue & Ritter [18], people’s frustration towards surveys is due to their lack of computer knowledge and the survey’s poor design. They argue that this often leads to lower completion rates. In regard to whether one should use scrolling or pagination, guidelines regarding usability suggest minimising scrolling. Research regarding completion rates shows that the difference between pagination and scrolling is ambiguous. Some studies state that scrolling is a burden for respondents while others claim that clicking is bothersome [18].

Sue & Ritter [18] also claims that when respondents feel lost in a survey, the completion rates decrease. By using a progress indicator, these break-off rates can be decreased if placed strategically. When a progress indicator is placed at the bottom of a page, respondents can perceive the survey as being longer.

There is evidence that suggests that respondents are more prone to take a survey when an authority is associated with the survey, because this instils reliability with the survey. In addition, there is evidence suggesting that participation regarding scientific web surveys is higher than marketing surveys [19].

One experiment [19] examined the effect of an acknowledged authority on completion rates. There were two versions of the invitation to their survey, the only difference was exposure to authority. Respondents who received the invitations signed by a perceived acknowledge authority had higher response rates. On the other hand, another study [22] did not find a significant difference between invitations with or without a signature of an authority. Porter and Whitcomb explained their results that their subjects, students, did not recognise the authority [22].

3. RESEARCH QUESTION & DELIMITATIONS

3.1 Research Question

Is there a significant difference between pagination and scrolling while taking a survey?

3.2 Hypothesis

Our null hypothesis, H0: there is no significant difference between pagination and scrolling, which we oppose to the alternative hypothesis H1: there is a significant difference between pagination and scrolling.

3.3 Delimitations

Online surveys are a vast subject, with countless factors that could be reviewed and investigated regarding their completion rates, such as follow-up contacts, personalized contacts and pre-contacts were shown to be affecting completion rates positively. Reviews have also shown that the amount of completion rates decreases with longer surveys and sensitive topics [9].

That is why we’ve decided to only investigate one factor: navigation.

The arrangement and composition of the questions in the survey, as well as the topic and choice of font, are not to be investigated. Also, we will not put any emphasis on the colours we decide to use.

3.4 Definitions

Pagination: When one or several related questions are placed in the same view, and the respondent has to click a button to continue. This submits the answers before the next question/s appear. This is referred to as screen-by-screen in earlier work.

Scrolling: All questions displayed in one view -the respondent has to scroll down in order to continue. All questions have to be answered before submitting.

Completion rate: The number of respondents who completes the survey with the submission of their answers.

4. METHOD

To be able to investigate and properly measure completion rates under normal circumstances, we set up our own survey tool. This is because existing survey tools lack the ability³ to measure the amount of opened surveys and their completion rate. Our own survey tool lets us measure the number of surveys opened, as well as the degree of completion without the user necessarily submitting their response, and accurately⁴ measures the time it took.

With these variables, we can see whether or not there is a significant difference in completion rates between pagination and scrolling. Constructing our own survey gives us the chance to decrease biased answers, emulating a real-world survey. By collecting the completion time for each survey, we are able to see if time could be a crucial factor in favour of either pagination or scrolling.

The survey was conducted online in a non-controlling environment with no time limit. This is to emulate a survey the subjects could encounter in the real world.

The survey questions were about course content, such as computer laboratories and seminars. This to ensure that everyone would be able to answer our survey.

In order for us to see a difference, we need two versions of our survey. One with pagination and the other with scrolling. To ensure that none of the versions is overrepresented, each version was assigned every other in equal proportions.

4.1 Respondents

With completion rates as the main factor of our study, we didn't want the subject to see the survey as compulsory.

We were able to use the course DH2642 Interaction Programming and the Dynamic Web at KTH. With this opportunity, we could present our survey as if it were a normal part of course evaluation. Because of this, we got access to 163 test subjects, who are students between the ages of 20-47⁵.

4.2 Invitation

The initial invitation to the survey included the information that it was not the official course evaluation. Information about the subject was also presented in the invitation. The invitation can be found in the appendix [Appendix 2].

The distribution of our survey was done through a group message on the Canvas platform, the learning management system used at KTH, to 163 students. This was to ensure that everyone got the exact same information.

4.3 Components

While modelling the survey tool, we used previous studies' [2,3,5] guidelines regarding design choices. When requesting answers, radio buttons are used as they are considered the best choice

for web surveys with single choice questions [12]. This is also recommended for surveys executed on mobile devices. It is expected that typing information on mobile devices could burden the user [12].

As pagination displays one question at a time, respondents can't browse through the survey as with the scrolling design. In order to estimate the duration, we chose to use a progress indicator [13]. For us to keep pagination and scrolling as identical as possible, we chose to apply the progress indicator in both survey designs.

For the subjects to finish the study they had to answer all of the questions. Missing data is common when using scrolling design [13]. By mistake, subjects can scroll past a question. Which is why we decided to disable the submit button until all questions were answered.

When the results were collected, and the survey closed, we sent a message to the students who were invited to participate. With the message, we explained our study and what we were investigating. This was to let them know they were participating in a study, and to give the subjects a chance to delete their data before we interpreted our results.

4.4 Development process

The construction of the tool used was done in the following steps:

The back-end managed the results and makes sure that the right version occurs. Cloud functions were set up and used with the main purpose of enforcing the right amount of both survey types were started. This was ensured by sending every other new user an indicator. It also sent them an ID and recorded their start time.

The front-end handled the page navigation, design and questions. For this, we used Vue.js [24].

4.5 Pilot study

A pilot study was conducted with seven test subjects. The aim of this was a more qualitative approach with two goals:

- Test the reliability of the survey over different devices
- Sanity check questions and general layout

These users had varying knowledge about the subject of this study before they answered it. After they had completed our survey using our tool, they answered a short questionnaire to record their opinions. The questions were mainly about layout and whether they encountered any issues. Data recorded by the tool was also used. This mainly helped in finding and fixing bugs that could have impacted the survey results.

A summation from the feedback can be found in appendix 1 [Appendix 1].

Their results are not counted among the responses from the main study as they felt a stronger compulsion to complete it.

4.6 Content updates

The core of the survey remained intact after the pilot study, but there were some user experience changes, such as improving legibility of the progress bar, and a roughly 20% increase to the number of questions from 40 to 48.

A minor number of bugs were also discovered and taken care of, both general and screen width specific.

³ In free versions

⁴ Two unix timestamps are created, in which the user initiates the survey with a button press, and the other that's being updated at every question answered.

⁵ Only 13 of them were above the age of 30

Question 1

How would you rate your HTML skills before the course started?

None Professional

SKIP 1 2 3 4 5 6 7 8 9 10

Please answer all questions before submitting

Figure 1. Example of the pagination version after the pilot study.

Question 1

How would you rate your HTML skills before the course started?

None Professional

SKIP 1 2 3 4 5 6 7 8 9 10

Question 2

How would you rate your CSS skills before the course started?

None Professional

SKIP 1 2 3 4 5 6 7 8 9 10

Question 3

Figure 2. Example of the scrolling version after the pilot study.

4.7 Questions & Task Design

48 questions were selected, all single answer questions with answers on a Likert scale from 1-10. The scale represented either a rating of their own ability or agreement with a given statement. These questions covered part of a course the students were taking and sent out by the course admin⁶ through official communications.

Because the nature of the study regarded usage of surveys, the survey takers were not informed about its scientific purpose. This was an attempt to eliminate bias as a factor, because this could have reflected how they would answer the survey. This will be further discussed along with the ethics of not informing them in a later section.

5. RESULT

From 163 invited students only 24 of them actually opened the survey. This represents a response rate of 15%. 24 subjects opened the survey at least once while 19 of them completed the survey, which represents a completion rate of 79%. Of the opened surveys, there were only 5 subjects who did not complete it, as can be seen in figure 3. 4 of these 5 subjects left the survey before answering

the first question. Because of this, we exclude their results when comparing scrolling with pagination.

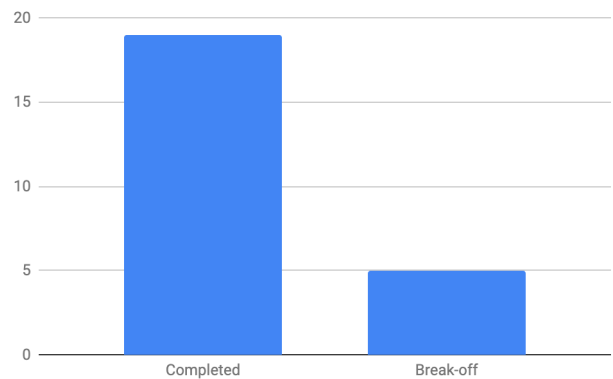


Figure 3. The total number of completed surveys and break-offs.

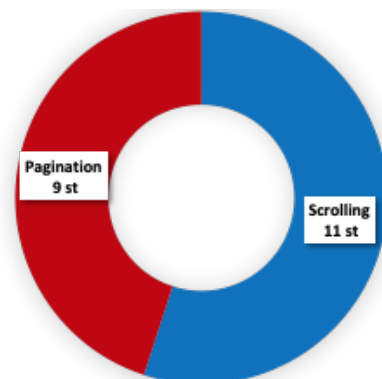


Figure 4. Distribution of versions after excluding 4 respondents

5.1 Scrolling

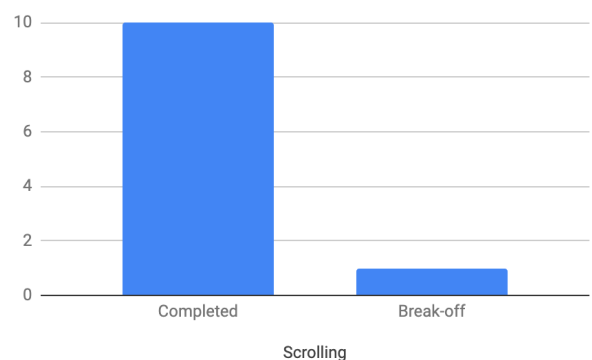
Of the 20 opened surveys the scrolling version represented 11 of them. The distribution is shown in figure 4.

The completion rate for this version was 90%, despite the fact that one subject did exit the survey after just 45 seconds.

Apart from this subject, who we will refer to as break-off, another could be singled out. While other subjects had a completion time of approximately 4,5 minutes, this subject had a completion time of 11 minutes.

The average time for completion using the scroll version was 4 minutes and 26 seconds.

The median survey completion time was 3 minutes and 51 seconds.



⁶ Viktor Ceder Co-Author of this paper

Figure 5. The number of completed surveys and break-offs for scrolling version.

5.2 Pagination

As we can see in figure 4, the pagination version represented 45%, 9/20, of the total amount of opened surveys.

The completion rate for this version was 100%.

Similar to the scrolling version, there was also one subject who completed the pagination version who stood out. The subjects completion time was, surprisingly, also 11 minutes.

The average time for completion while using pagination was 4 minutes 46 seconds. Which is 20 seconds longer than the scrolling time.

The median survey completion time was 3 minutes and 50 seconds, only one second shorter than the scrolling version.

5.4 Excluding extremes

Both types had an outlier each that took about more than double the average times the time to complete the survey, which raised average times up a bit.

With the outlying max number removed there is still a clear gap between the two survey types average completion time, with the scrolling version clocking in at 3 minutes and 42 seconds, while pagination lands on 3 minutes and 58 seconds.

5.5 Statistical significance

To gauge if our results are statistically significant, we have performed an independent T-Test. With a p-value of ~0.38, which represents a 60% chance of our results not being random, we can see that there is no significant difference between the two groups both on time and break-offs.

| | | |
|---------------------------------------------|---------------|-------------------|
| t-Test: Two-Sample Assuming Equal Variances | | |
| | | |
| | <i>Scroll</i> | <i>Pagination</i> |
| Mean | 4,431548333 | 4,760272222 |
| Variance | 5,729740686 | 5,954276867 |
| Observations | 10 | 9 |
| Pooled Variance | 5,835404771 | |
| Hypothesized Mean Difference | 0 | |
| df | 17 | |
| t Stat | -0,2961694285 | |
| P(T<=t) one-tail | 0,3853441074 | |
| t Critical one-tail | 1,739606668 | |
| P(T<=t) two-tail | 0,7706882149 | |
| t Critical two-tail | 2,109815559 | |

6. DISCUSSION

With a target group of 163 subjects, one could expect higher participation than what we experienced, which was only 15%⁷. Our expectations were that the uncompleted rates would be higher than completed for both pagination and scrolling, due to the size of the survey. 17%, that is 4/24, of the subjects who opened the survey did not complete it. This begs the question, what exactly made them leave the survey without answering one question? Did they not perceive the welcome page as motivating as the rest of the

subjects? Did they open it at an inconvenient time and then forgot about it? Would they have completed the survey if we had had follow-up contact with the whole target group?

Follow-up contact could also have increased our response rates overall. Due to our time frame, we decided not to include follow-up contact with the subjects. One problem with the anonymous responses is that there is no way to keep track of the non-respondents. If we had used personalised invitations, the non-response tracking could have been done and eased a follow-up contact.

The decision to include a progress indicator in both versions could be a crucial factor. In previous research, a progress indicator has only been recommended for the pagination version. This is to give the respondent an opportunity to estimate the completion time. On the other hand, this is not necessary for the scrolling version, because respondents can scroll through the survey with ease.

Another decision that could have affected our results is the answer format. Radio buttons make it easier for the respondents to answer a question quickly. If we would have had mixed answer formats, for example, multiple choice and text, our results could have been different. When time is of the essence, multiple choice questions and text answer takes more time to complete than single answer questions. This could have resulted in a lower completion rate than we received.

Our results could have depended on the respondents' engagement and motivations, such as the fact that only students who like to express their thoughts about course content actually participated in our survey. If we would have used a different topic that would have engaged more students, there is a possibility for a higher completion rate as well as response rate.

6.1 Methodology Critique

A completion rate of 90% for scrolling and 100% for pagination does not agree with previous studies. Completion rates have been shown to be much lower in earlier experiments [1, 11, 14].

There are a few numbers that could explain this. Initially, we had a low response rate which supports our earlier claim that only more "dedicated students" that had something they wanted to express actually answered the survey which will, of course, skew the numbers.

Another possibility is that the amount of questions/time it took to finish the survey was too low, despite the fact that we based the number of questions on the feedback we received during the pilot study.

The fact that we used a progress indicator on both versions could have made an impact on our results. With the limited scope of this study, investigating navigation, a progress indicator may affect the respondents decision to complete the survey.

A final possibility would be that the implementation was "too good" and led to an increased completion rate, however, we should not flatter ourselves with such ideas and are only bringing it up for posterity's sake.

6.2 Uninformed survey participation

Due to the nature of monitoring survey behaviour, we felt that it would be necessary to run the study without informing the participants beforehand. This could have been done in a better way, allowing them to consent to a fake study, rather than informing them of the study's existence only after the data had been collected.

6.3 Invitation method

The canvas platform does not have read receipts on course announcements, and it is also possible for students to turn off most forms of notifications they would get by default. This has caused

⁷ The last two years about 30% have answered the official course survey.

other issues in the course that was used for this study, which may have impacted the initial low response rate.

6.4 Future Work

With the preconceived design decisions in mind, this chapter will propose future development and research.

The usage of follow-up contact could be one way to better control variables regarding response rates, which could be one way to improve this study.

One interesting development for this kind of study could be to measure the time under different circumstances. For example, one could measure how long it would take for subjects to complete a survey with a fixed amount of follow-up contacts.

6.5 Divergent and outlying responses

Most respondents had a realistic looking response pattern with a mix of different ratings. One, however, diverges from this pattern and after having answered 15 questions answers the remaining 33 questions with the same answer. This could be argued as a break-off but we have chosen to count it as a completed survey nonetheless.

7. CONCLUSION

Our results cannot confirm nor deny previous studies. This means that we can discard our alternative hypothesis H1: There is a significant difference between pagination and scrolling. This means that our null hypothesis H0, that there is no significant difference between pagination and scrolling, aligns with our results. Our completion rates were much higher than in previous experiments, which could be caused by several factors.

The low response rates are comparable with previous studies, which could prove that it is hard to motivate people without a substitute for their time spent.

With the size and limited scope of our study taken into account, we found that there is no statistically significant difference in the survey completion or time rates. This means that H0 is the outcome.

Some researchers have claimed that using a legitimate authority would increase response rates, and that people would be more likely to respond if the request came from a respected source with a high status [13, 19]. As we can see from our results, this is not necessarily the case. According to this study [19], this could be explained by the fact that students did not recognise the sender as an authority. Because of how the course and student life at KTH is established, in general, there are more often than not informal meetings and even leisure meetings between students and teacher assistants, thus at times removing some implied authority from them.

It has been stated in several studies that pagination is to prefer in longer surveys, and that scrolling would be optimal when a survey only consists of a few questions [12, 13, 14]. This did not apply to our study. With a rather large questionnaire, 48 questions, we cannot confirm these strategies.

The average times suggests that scrolling surveys are quicker to complete, but it did have the only break-off. But in the end, we do not have enough to confirm it with any statistical significance.

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APPENDIX

1 Pilot study

The units used during the pilot study were 29% on an iPhone, 29% on an Android and 43% on a computer. When using a computer the subjects used Chrome.

71% could complete the survey without any problem while 29% encountered some kind of problem.

One encountered problem was that they could not complete the survey without answering all questions. One subject could not submit their survey and get stuck on the last question. The subject could not regress and change their answer.

The majority of the subjects thought the survey had too many questions. That the questions were “straightforward” and easy to understand.

Some commented on the progress indicator, that numbers would ease the estimation of duration. Regarding the design, they perceived the layout as easy and clean with good colour choice. Some of the subjects experienced issues with the “next” button on the pagination version. The button did not fit their screen size which made the button appear below the question. Not beside it.

2 Invitation

Good morning everyone,

We’re always trying to make the courses here at KTH better and therefore I’ve set up a survey to gather some information about how you feel about the course and its various moments.

It will cover the general course, labs + seminars as the project is still ongoing but rest assured, you will get the possibility to provide feedback on it too.

Note, this is not the official course evaluation but an independent project by me to learn more.

The survey can be found here <https://ceder.dev>

3 Survey questions

How would you rate your HTML skills before the course started?

How would you rate your CSS skills before the course started?

How would you rate your JavaScript skills before the course started?

How would you rate your GIT skills before the course started?

Communication from the course TAs felt clear

I felt that I could trust what the course TAs said

I was treated fairly by the course TAs

Did you feel well prepared at the start of Lab X?

The instructions for Lab X was easy to understand

I get the help I needed with Lab X from the course TAs

I was challenged by Lab X

The timetable for Lab X was good

The subjects covered in Seminar X felt relevant

The seminar leader for Seminar X felt knowledgeable and well prepared

I got good feedback on my code for Seminar X

Time was well paced during Seminar X

