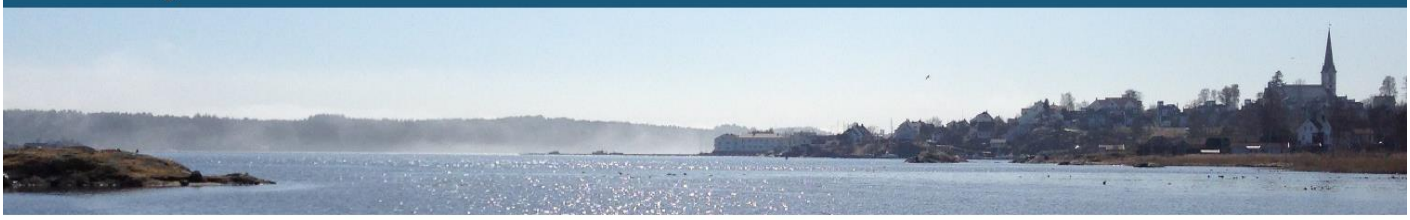
TINGTUN



Tingtun Accessibility Checker

Bachelor applied computer technologies

Oslo and Akershus university college

2013/2014

Group 1

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2014 - 1

AVAILABILITY
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MAIN PROJECT

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PROJECT PARTICIPANTS **Thomas Martin Axelsson - s180352** **William Samuelsen - s177841** **Kim-Andre Kristiansen – s180362**	COUNSELOR **Boning Feng**

EMPLOYER	CONTACT
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SUMMARY

Refactoring of a user interface for an application which checks PDF documents for barriers has been the main goal of this project. The implementation has been developed in Django to prepare a better user interface application which is easier to maintain. The project has also built a module to deal with user management.

Product web site:
http://tt5.s.tingtun.no:7842/pdfchecker/

3 STIKKORD
Accessibility checker
Django
Webapplication

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1.0 Introduction to main project

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Before we start of presenting our project, let us quickly mention that this document is written in English as requested by our employer. The main reason for this is that the company we have been working with employ people from around the world, and to make this project as useful to them as possible, it was desired that we made some additional effort on the documentation process.

Secondly the document is written in a manner that require a certain technical knowledge to properly understand when reading. Apart from the section “5.0 User manual”, the document is intended for sensors of the course, and for the developers of the application we have been working with.

1.1 Group and counselor

For this project we decided to proceed with the members from previous projects, as we know each other well and function rather efficient as a team. Other projects have yielded fair results or better, and considering we all have somewhat high ambitions for what we hope to achieve, it was a rather easy decision. Within the group it has always been room for everyone to express their opinion or come with ideas or suggestions. We also have a history of minimal conflict, and whenever we have disagreed on something we have always been able to discuss matters in a sophisticated and democratic way.

(Subjects we have been working together on previously are Prototyping, Practical information technology, Human-machine interaction, Information technology services and Information architecture. In IT services, which was the most comprehensive of these, we were exploring a

system applied by libraries across the country, and made extensive charts mapping all of its functionality, collected user data through interviews and observations, and finally made suggestions on how the system could have been improved based on what we had learned. In Information architecture we had to browse through databases of scientific papers published by authors worldwide, in order to solve the given problem.)

The project started with a group consisting of four members total, but after approximately two months into the project one of our members temporarily resigned his studies for medical reasons, and we finished the project with only three members.

Boning Feng has been our councilor for this project. He is one of the teachers at this course and hold a degree within electronics and computer security. He has been of assistance to us throughout the project, and has provided valuable input on different topics, and has given feedback in regard to the documentation standard set by the course leaders. He has also involved himself in giving feedback on the final report, and supervised the project in general.

1.2 Course and assignment

The course: “Applied computer technologies” is mainly focused on the principles behind universal design for computer systems and web services. Here we learn how to plan for, shape, develop and evaluate these kind of systems for people without and with certain disabilities and for older people, to ensure these services are accessible to as many as possible. Even if there is a lot of theory involved when learning about these concepts, the course is driven by project work, both individually and in groups.

Furthermore the course includes both basic and optionally more advanced work with multiple relevant programming languages like Java, PHP, HTML, SQL and a few more. There is also quite a bit general teaching about different programming languages, even if we don’t learn each and every one of them. Sometimes only some sample code is shown to give the general idea of a language to understand how it differ from other, how it evolved into what it is and what it is used for.

This project gives us an opportunity to use everything we have learned the past five semesters, and extend our ability to expand our knowledge on our own. At the same time we would get great experience with how we might end up working after ended studies.

The task given was simple enough: Contact different companies that work with some type of IT service or development, and ask if they have a project available for students. Optionally the course leaders provided some projects to choose from, but ideally each group would take matters into their own hands. There is a multitude of companies of different sizes who launch similar projects every semester, as it allows them to get in direct touch with students who are applying for jobs as soon as they are done with their studies.

1.2.1 Deadlines

The schedule for the project was as follows:

1: Status report (25.10.2013)
The first milestone was to form a group, and to begin the process of applying to projects.

2: Project draft (06.12.2013)
At this point it was required to specify any idea or problem that would define the project. The course leaders would then evaluate whether or not this was suited for a main project. If approved, the group would be assigned a counselor based on what kind of assistance the group would need.

3: Pre-project report (24.01.2014)
Here a more detailed description of the system and employer was to be handed in. Any relevant problem was to be listed as well as how we intended to solve this. The pre-project report also included a schedule for how far we expected to be with the project along the spring semester.

4: Main project report (27.05.2014)
Eventually the documentation describing the execution of the entire project from beginning to end was to be turned in. The course have set a documentation standard for this report, and this standard was the base for the structure of this document.

5: Presentation (10.06.2014)
At the end of the project each group was to present their project for their fellow students and teachers.

In addition to this, each group was to make a project web site where all the documents, meeting notes, models, project log and any other relevant written work is available online.

1.3 Employer

For our main project we have been working with Tingtun AS, a Norwegian company located in Lillesand. It was founded in 1996, and deliver technical consultancy services in the area of eGovernment[1] and training. Currently they cooperate with a total of six people worldwide. The services are based on an open policy, to promote participation and to deploy Open Source Software, and open standards to develop universally designed and transparent eGovernment services. Since 2004 Tingtun has provided research based advisory services on to Norwegian government agencies as well as to the European Commission, and the United Nations.

Our main contact person in Tingtun has been Mikael Snaprud, who have been monitoring our progress and provided direct or indirect feedback. We have had contact as frequent as almost every week during the project. We have also had regular contact with one of the developers named Anand Pillai, who work with Tingtun from India. He have provided more technical support when this has been needed. The project was initiated with a face to face meeting with the group and Mikael.

1.3.1 System

The system we have been working with in this project is the web-based accessibility checker Tingtun provides. The application is designed to check either a document found on a URL or an uploaded PDF file for barriers in regard to WCAG[2]. The purpose of this is to provide a tool to control whether or not PDF documents are accessible to as many as possible, and to see if they are within the boundaries of required universal design set by their nations laws. The application

1 Digital interaction between a government and citizens
2 Guidlines for web content accessibility

will list all detected barriers and explain them, allowing the users to more easily improve their services in regard to universal design.

1.4 Requirement specification

This project have revolved around rebuilding the front-end of this system. Tingtun is generally confident about the user interface of their web service, but there are several underlying issues with the current solution. Firstly the process of implementing new functionality is currently rather complicated, and one of the more important focuses for us have been to solve this. Currently the front-end is written in PHP, and the employer have requested that the new solution should be written in Django[3]. Furthermore there has been a requirement to improve the way any information provided by the application is represented to the user. Currently the output is quite technical, and Tingtun want to improve readability for users with lower technical competence so they can more easily improve their services based on the feedback.

The requirement specification is a summary of all the objectives we have developed in collaboration with our employer. These requirements was the foundation of the work we did, and testing the final result towards these requirements determined the success of the entire project.

All the specific requirements are listed in the section 4.0 Test report, along with a breakdown of each as well as detailed information on how these were tested, but here are a short introduction to what we hoped to achieve in regard to our employers requests:

First and foremost we were to rebuild the user interface with Django, to make the front-end easier to maintain and at the same time allow implementation of new functionality to require a lot less effort. Also the code was to be written as efficient and performance-optimized as possible, and should work equally fast or faster than the current solution. At the same time, the application should not have any dependencies for specific platforms or browsers, and should work regardless of client details. The system should also secure itself by controlling whether or not a file contain malicious code, and reject any that might be harmful.

Another important requirement was the added functionality. Tingtun requested that we implemented support for the user to check multiple PDF files or URL links at the same time by

3 Python.based development framework

simply adding all the relevant inputs in a list before starting the check process. At the same time the system should verify that the same file or link is inserted multiple times, to prevent unnecessary traffic towards the server.

It was also requested that the system support different user logins. Regular users should not be required to sign in to use the application, but you would need to sign on to a registered user in order to access statistics

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The following section is a detailed description of how the project was executed from the beginning to end. It is expected that the reader have read the section: “1.0 Introduction to main project” before proceeding, as it contain important information about the group and the employer as well as background and goal for the project.

2.1 Preparation for the project

In this section we will cover anything concerning how we prepared for this project, and how we worked as a group in terms of communication, capacity building, tools and technologies.

2.1.1 Working conditions

Once the question whether to keep our former group or not was settled, we started having regular meetings. We knew we had a big task ahead of us, and even if progress was a little slow in the early stages we figured it would be easier to keep up with the deadlines set by the course leaders the more we prepared.

We tried to meet at school at least once a week in the months prior to the finale of the autumn semester. Essentially it was what we did in earlier projects, and it seemed like a good idea to proceed with what we were familiar to and had positive experiences with. At school we had anything we needed close at hand: A place for all members to sit together with power supply for our laptops as well as a reliable internet connection, group rooms with whiteboard where we could brainstorm, and the possibility to arrange meetings on rather short notice before, between and after classes. In this period, most of the work we did was whenever the whole group was gathered. That way everyone had all the information they needed to start the thought and work process, and could prepare any questions they had for our first meetings with our councilor.

We have had some considerable setbacks in terms of illness within the group. The most significant was when one of our group members had to take a break from his studies because of medical reasons. This is further discussed in 2.1.6 Risk Analysis.

2.1.2 Communication

Communication within the group have not been problematic at any point. Whenever we have started a new project, we have created a new Facebook group where we can easily arrange meetings or distribute the work to be done. Also we have been using this page to inform the rest of the group of anything unexpected like illness. This medium have proven to be very useful as all of us check their Facebook on a regular basis, and get a notification whenever there is an update on this particular project page.

Furthermore we have from time to time used the program Skype for digital conversations and instant messages. This have been especially useful whenever we have days where no meeting have been planned, but something came up resulting in the need of a discussion, or if somebody have a question when working alone and are unable to progress without input from other members. At this point, the instant message function in Skype have been more useful than waiting for a reply on our group Facebook page.

On those few occasions where a member have been unavailable on both Facebook and Skype, we have used regular cellular phones to reach each other.

When it comes to communication with our group councilor it has mostly been by email, but on several occasions we have talked on the phone as well.

Communication with our employer have been rather frequent. Mikael have desired to involve himself to quite some extent, and we have had meetings with him close to every week, or each second week when there have been busy times for either party, during holidays or if there have been little progress to report since last meeting. These meetings have been very useful to the group as well as the employer, as it have been easy to discuss progress and challenges. These meetings have mostly been by phone, but as it have required a speaker for everyone in the group to participate at once, we started using Skype on our end at some point during the project. Skype allows you to call cell phones for a small fee, which is still cheaper than a regular phone call. This have also improved the quality of the conversation.

Anand have also been frequently involved, even if it have been mostly by mail. Throughout the project we have been using Tingtuns' own web-based platform for internal communication, called Tingtun Box. Essentially it works as a file sharing medium similar to Dropbox, where

registered users gain access to certain folders and functionality. Example of this is the possibility of starting a discussion, similar to a regular online forum. When we have had questions to Anand in regard to coding or other technical matters, starting a discussion in the Box have been the favored way to do this as it allows access to the topic for all relevant people, and anyone can leave comments. Also it have been easy to come back later if a similar topic arise.

Prior to each meeting the group have set up an agenda for topics to discuss, so each party can prepare answers or gather information. This method have been extremely useful, and have kept each meeting as short and relevant as possible. The agendas have consisted of anything that might have turned up since last meeting, as well as a paragraph called “closing of actions”. After each meeting, the group have made a note summarising any topic that was brought up. This note is divided into sections for better overview. The first section have always been “actions”, which will cover anything the group and employer agree to set as a goal to achieve until the next meeting.

2.1.3 Documentation

Our documentation is a result of a process that have been ongoing throughout the project. Even if the majority of the current content have been written within the last month of the project, we have made sure to take notes along the way so the process could be described as accurately as possible at the end of the project.

The first thing the group did was to take a look at the documentation standard that was set by the course leaders. The idea was to get an impression of what was to be handed in, and start the thought process among the members on how to best reach this goal. A helpful tool here were the older projects published by former students on the HiOA main project web site. This gave a good impression of documentation length, structure, use of models and of the general content. At this point the group developed an initial draft of the report. This draft did not contain any written material at the early stages, but rather served as an overview of all the sections and topics mentioned in the older reports. Even if it at the time was unclear whether or not a certain topic would be relevant for the final report, it was very easy to determine at a later point when we had more information.

The most important tool we have applied for documentation is Google Documents. It is a web-based document service that provide all the essential office functionality similar to that of Microsoft Word, Excel, Powerpoint etc, and lets you download a certain file in any format and file type you could want. What makes this service extremely useful for a project like this is the possibility for multiple users to edit the same document simultaneously, with all changes automatically saved and updated live for anyone who have the document open. Also it allows for "Read only" privileges to anyone who receive a direct link to the document by one of the users. This have been useful for sharing the document with our employer whenever we have requested feedback on certain topics, and generally providing access so they can monitor our progress.

Throughout the project we have kept a project log where we make a short note of anything that have been done each time one or more group members have achieved anything that can be defined as progress for the project as a whole. When a project stretches over a longer period it is easy to forget details, or the order of which work is done. The purpose of this log was to have a way to keep track of our progress which we could fall back on when we eventually committed to the writing process, so less of the early work was forgotten.

Another helpful routine we have established have been to write meeting summary notes after each meeting with our employer. Essentially what we did was to edit the agenda for the meeting, from what we planned to discuss to what we actually discussed. The meeting notes have been made in Markdown on the Tingtun Box. Markdown (.md) is a plain text formatting syntax designed so that it can optionally be converted to HTML with a simple tool, and lets the user create structured documents online with the use of a few symbols (# = heading, ## = sub-heading with underline etc). This have made it exceptionally easy to create and share these notes with our employer, and when we have made agendas prior to a meeting, sharing it with our employer have been as easy as sending a link to the box. He have then been able to edit the file in any manner he have deemed necessary, whether it was to add further topics for discussion or simply urge us to elaborate further so he can better prepare for the meeting. This way the meeting notes have always been available to anyone at all times, and it have been another way for us to keep track of what happened when, and the order and manner of which things have been done.

2.1.4 Backup

We have taken measures to ensure that none of the work done throughout the project would get lost. We created a Dropbox-folder at the beginning of the project, and all our work have been stored here. Dropbox is a cloud-service that allow registered users to open a folder in their local files, and all content of a particular Dropbox-folder will be synchronized with any other user who have access to the same folder. The content is also available on the web on the Dropbox website, once the user log in. This means that all members have access to all files as long as they have been on a computer with internet available. The group have also occasionally taken other backup independent of the Dropbox version.

The documentation have also always been available online through Google Documents. This service automatically saves any changes made to a document, and store them on the cloud. Also here have the group consistently taken backup locally and with Dropbox for good measure.

2.1.5 Qualification building

As agreed with the employer, the new solution would be built in the Python framework Django. The group had no experience with either Python or Django before the project started, but as we accepted the task, we were determined that the whole group had to learn and study both these tools in depth.
To give us a head start, the developer working for the employer recommended that we started off by reading and working with the official tutorial for both Python and Django. The whole group do have experience with other programming and scripting languages such as PHP, C and Bash, so diving into a new programming language seemed manageable at first. But as the project progressed, we soon discovered Python is a lot bigger than we imagined. Considering this, the group had to agree to only learn the basics of Python, to be able to use Django efficiently. We both used video tutorials and the official Python tutorial to learn the basic.
The official Django tutorial provided us with a basic understanding of the complicated Django spiderweb, but as we progressed, this was not nearly enough to start designing the solution. This meant that we had to use unofficial tutorials to learn what was needed. One of the biggest sources of information that we throughout this project is Stack Overflow[4], which is a question

4 Question and answer site for professional and enthusiast programmers

and ask site, containing loads of relevant information about both Django and Python. We used this actively to find relevant questions to our project, and their answers. And also asked questions ourselves.

2.1.6 Risk analysis

At an early stage in the project the group discussed the possibility that something might go wrong throughout the semester, how different events would affect the progress, how they could be avoided or how they would be dealt with if they arose.

At this point of time we were not aware of how much we would actually use the risk analysis to solve problems which arise. After some time, one of the group members had to resign from the group due to health issues. We were aware that he had some problems related to his health, but never imagined that it would lead to him leaving the group. As the group got reduced from four to three members, the amount of the project still seemed manageable, and the remaining group were still motivated to continue. But after a short while another member unfortunately also experienced health issues which made it hard for him to contribute to the project in such a way that was expected on beforehand. The effect of this lasted for several months. While this were happening, the remaining two members experienced reduced motivation, and the project goals seemed hard to reach. All these problems were brought up with the employer, and the group reorganized the workload to provide more effective results.

The risk related to “Electronic crash” turned out to be relevant, as one of our group members experienced his laptop charger gradually failing and eventually stopped working altogether. This was a problem since the laptop itself was an older model, and the plug for the charger was a non-standardised size and could not be replaced with a universal charger. As a result he needed a new computer, which took about a week to fix. In the meantime he used the computers available at school and his stationary computer at home. There was also need to download all the relevant tools on the new laptop. Despite this, thanks to good routines for backing up all files on Dropbox no work was lost as a result of these technical problems.

Risk	Probability	Consequence	Strategi
Late attendance	High	Manageable	Take responsibility and read the meeting notes.
Communication difficulties	Moderate	Manageable	Contact the members who are not attending. Try to find an understanding between members in the group. In general: take responsibility and use common sense.
Division of labour	Moderate	Serious	Responsibilty for own learning. Let the members know if there are to many tasks at hand. Try to work together and communicate with each other.
Poor efforts	Moderate	Serious	More engagement and responsibilty to the project. Receive feedback from members. What can be done to improve the work? The member must let the others know if the task is too difficult.
Unmotivated behaviour	Moderate	Serious	Take Initiative, and contribute to the project. Engagement to the project. Do not let other things occupy your mind (for instance facebook etc). Take breaks when you need too boost your motivation.
Conflicts	Low	Serious	Try to solve the conflict as soon as possible. Try to find a good solution for both parties. Contact higher authorities if the conflict remains unsolved.
Illness/Sickness	Moderate	Acceptable	Take responsibilty for your own health. The group members will reorganize tasks.
Electronic crash	Modrate	Serious	Replace the faulty device/s as soon as possible (buy or borrow). Backup your computer and your project.
Members quit	Low	Acceptable	Reorganize tasks and spreadsheet.

Figure -1 Risk Analysis

2.2 Beginning of the project

The project have been driven by working towards the milestones set by the course leaders, so each group have a perspective of how far they are on their way to the final deadline. For this purpose this section is divided into paragraphs describing the first phase of the project and each of the initial stages in the same order we have handed in material throughout this period.

2.2.1 Status report

Our first hand-in was to be delivered October the 25th, 2013. Essentially it was a presentation of the group for the course leaders, which also was to include information about our effort and progress towards finding a project. At this point we had been in touch with multiple potential employers without any yield, and we were urged to define exactly what kind of project would interest us in case we would need assistance in our search.

For this project we did not want to limit ourselves in regard to what kind of knowledge we already had. Even if we prefered to work within the boundaries of what we had most experience with like system analysis and user interaction, we were prepared to make the necessary effort to complete a project that would require knowledge of more heavy programming.

We had already decided to continue with our former group, and all our focus was set to finding a suited project. Note that at this point in the project the group still consisted of four members.

2.2.2 Project draft

The next deadline to meet was December the 6th, 2013. At this point it was required to have settled on a project to work with, and this hand-in focused on describing the given problem as accurately as possible. Here we described our employer and the service they provide, as well as the current plan for what they hoped to get out of such a project. Prior to this deadline we had been in touch with Mikael in Tingtun AS, and he was very enthusiastic about the idea of a project like this. He had held a similar project some time back, which turned out to be rather useful.

Once contact with Tingtun was established, it did not take long before we had taken a more detailed look at what the project would require, and the group mutually decided that we would

accept the given task. It was within the boundaries of what knowledge we had or what we expected to be able to learn ourselves, and the overall topic was very appealing to us.

We were all eager to get a head start towards the approaching deadlines, so as soon as we had settled with the project, we sat down and started the thought processes on how to solve it. The main focus at this stage was to establish a proper requirement specification. Initially we had a somewhat superficial perspective of what the project would require, so a priority was to arrange a proper meeting with Mikael. He also was happy to start as soon as possible, and at 19th December, which was the first opportunity we had, we met with Mikael here in Oslo at HiOA. The objective of the meeting was to properly meet and introduce ourselves to each other, share more information about the project and the system, discuss different ideas for the project execution as well as starting the work on establishing a more precise requirement specification.

2.2.3 Pre-project report

Once the spring semester begun the project continued and we were already focused on our next hand-in, which was due the 24th of January, 2014. This time around we were required to hand in a more detailed description of the project, and present the requirement specification we had developed with our employer. The pre-project report ended up looking much like the “1.0 Introduction to main project” in this report, although somewhat shorter.

2.2.4 Requirement specification

The three first hand-ins all resulted in a defined requirement specification, which would ensure that the group were on the the same page as the employer in regard to what would be the goal of the project, and what the final product would look like. Testing towards these requirements have determined the success of the project, as discussed in the section “2.5 Requirement specification and its role” and “4.4 Testing towards requirement specification”.

The requirements we have been working towards are:

<u>User functionality</u>

R.1: The end user should be able to upload PDF-documents or link to documents online

R.2: The application shall list the detected barriers found in the PDF documents

R.3: The application GUI[5] Should follow WCAG guidelines

R.4: The application shall refer to the WCAG guidelines when presenting the detected barriers

R.5: The user should be given a structured list of the detected barriers

R.6: The user interface of the PDF-checker should be easy to use for end users, and should not require any training prior to interaction with the application

R.7: Administrators should be able to access statistics collected by the PDF-checker

System functionality

R.8: The system code should be written efficient and performance optimized, and the application should be as fast or faster than the existing solution

R.9: The PDF-checker should be developed according to selected coding standards and easy to maintain for administrators

R.10: The system should provide an authentication and access control mechanism to match logins to specific users roles. This should include a regular user, a reporter role who can access statistics, and an admin role, or superuser with all privileges

System properties

R.11: The system should not have any browser or platform specific dependencies, and should work the same way regardless of client details

R.12: The system should be secure against malicious PDF files uploaded by the user, and should reject these if they contain exploits or any code that can harm the system

New functionality

R.13: The user should be able to upload multiple PDF files and check these simultaneously, where a single test run will return test results for each selected file

R.14: The system should prevent the user from uploading the same document multiple times during the same check to prevent unnecessary traffic to the server

R.15: The user should be able to insert multiple URLs and check these simultaneously

R.16: The user interface should support multiple languages

R.17: The application should support accessibility tools such as screen readers

5 Interface where user interact with electronic devices through graphical icons and visual indicators

R.18: The application should provide suggestions on how to remove any detected barriers

Additional

R.19: Continuous use of the application should trigger a mechanism where the system informs the user about how they can contribute to further development through donations or payed services

2.3 Planning

Once the pre-project report was delivered, the next phase of the project commenced. This phase was crucial in regard to how efficient we were able to progress once development and documentation started.

The main issue with our planning was, as mentioned in “2.1.1 Working conditions” (last paragraph), the loss of one group member. The whole planning phase revolved around the fact that we had the resources of four people, similar to all our former projects. We were well aware that our last member had some notable health issues, and even if we did take this into consideration, we made plans as if the group would continue as a whole. When he eventually announced that he would be unable to complete the project with us, we proceeded with the original plan.

2.3.1 Activity and work plan

To plan the process properly, the group made a activity and a work plan. The activity plan described all the different tasks the group planned to in detail, and also which members of the group who were in charge of these. This made it possible for us to set realistic goals and progress with work each week. We also visualized the activities in a work plan spreadsheet (Figure 2-1.) which contains all the different phases of the project, and their connected activities. By showing the deadlines of the activities and also how many weeks we had to finish each one of them, it made it easy for us to plan ahead and keep to the schedule.

After two months into the project, we still kept our pace aligned with the work plan. But when one of the group members left, we had to reassign and reorganize all the tasks. At first it seemed manageable to keep going with the original work plan, but four months into the project we were two weeks behind schedule. We still kept going though, and did hope that we could

catch up with the plan, but after a couple of more weeks we understood that we fell quite a length behind the original plan. In collaboration with the employer we decided that measures had to be taken, and agreed to cut several requirements. As originally planned we would finish all documentation at the 20th of May, which would give us a couple of more days to reassure the report were complete. But in the start of May we were told the report had to be delivered the 21th to be able to print it properly. This meant that we had to pick up the pace again.

	Project overview 2013/2014																															
		Deadline	January					February				March					April				May				June					July			
	Week no.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Phase 1	Policy documents																															
	Status report	25.10.2013																														
	Project outline	06.12.2013																														
	Complete the project website	21.01.2014																														
	Pre-project report	24.01.2014																														
	Task schedule	31.01.2014																														
	Progress schedule	31.01.2014																														
	Requirement specification	07.02.2014																														
	Project log																															
Phase 2	Program development																															
	Django installasjon and basic understanding of architecture	16.02.2014																														
	Choose a tool to build graphics in Django	18.02.2014																														
	Learn the basics of Python	18.02.2014																														
	Low-fidelity prototype	28.02.2014																														
	API	01.03.2014																														
	High-fidelity prototype	01.04.2014																														
	Implementation	01.05.2014																														
Phase 3	Testing																															
	Test planning	07.04.2014																														
	Testing	15.04.2014																														
	Comparison testing	15.04.2014																														
	WCAG conformance	21.04.2014																														
	User testing	21.04.2014																														
Phase 4	Project report																															
	Process report 1	07.03.2014																														
	Process report 2	04.04.2014																														
	Process report 3	20.05.2014																														
	Product documentation	20.05.2014																														
	Implementation documentation	20.05.2014																														
	Test documentation	20.05.2014																														
	User manual	20.05.2014																														
Phase 5	Presentation																															
	Prepare presentation	03.06.2014																														
	Present the project	10.06.2014-13.06.2014																														

Figure -1. *Spreadsheet based on the work activity plan.*

2.3.2 System description (current solution)

Our first objective was to analyse and properly describe the system. The goal here was to develop a low-fidelity prototype to easier illustrate what we intended to change, and to get there we needed an overview of the design and the relevant functionality. As mentioned earlier Tingtun wanted the current design to remain more or less intact as they are happy with the way things appear now, so what we did was to break the user interface down to the individual components. Here is a screenshot of the PDF checker before any tests start:

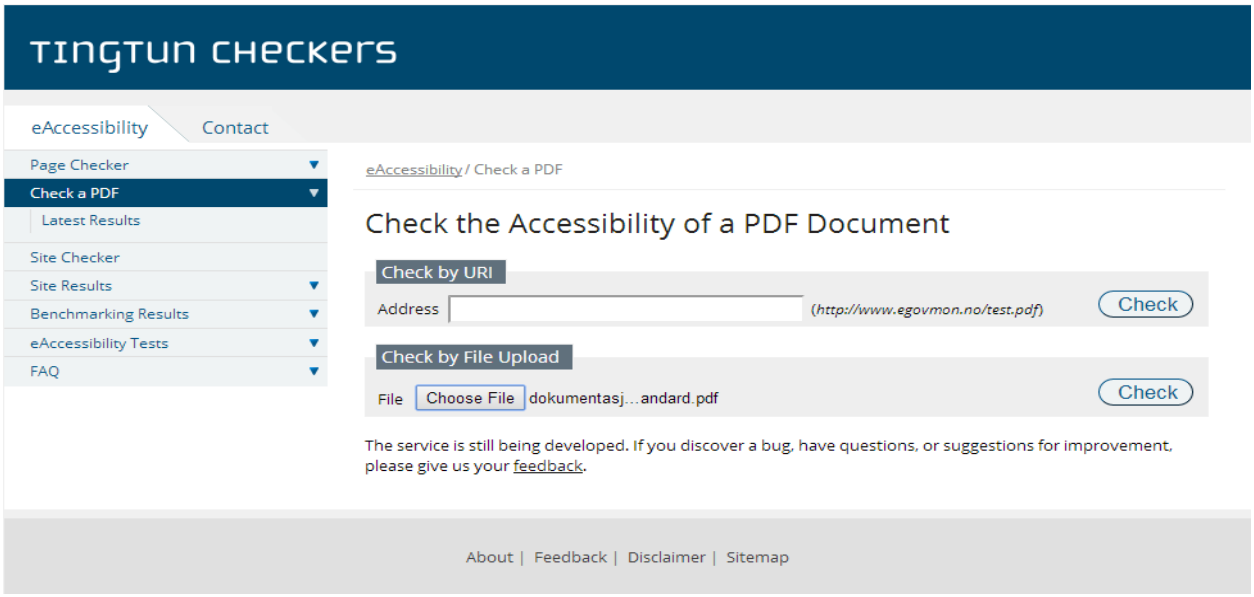

Figure 2-2. *A screenshot of the current PDF-checker solution.*

This is the first step of the process of checking a PDF file. It provides the option to either upload a PDF from your local files, or link to a file that exists online. The page checker appear just like this one, except there is only one input field for a URL. The menu on the left side of the screen is fixed, meaning it is displayed regardless of where in the checking process the user is. This means that it is very easy to switch between the different types of tests, as well as running consecutive tests after the first. The “Check” button will start the process of checking the PDF or URL, depending on selected test.

Next is a screenshot showing the result of a PDF check in the old version:

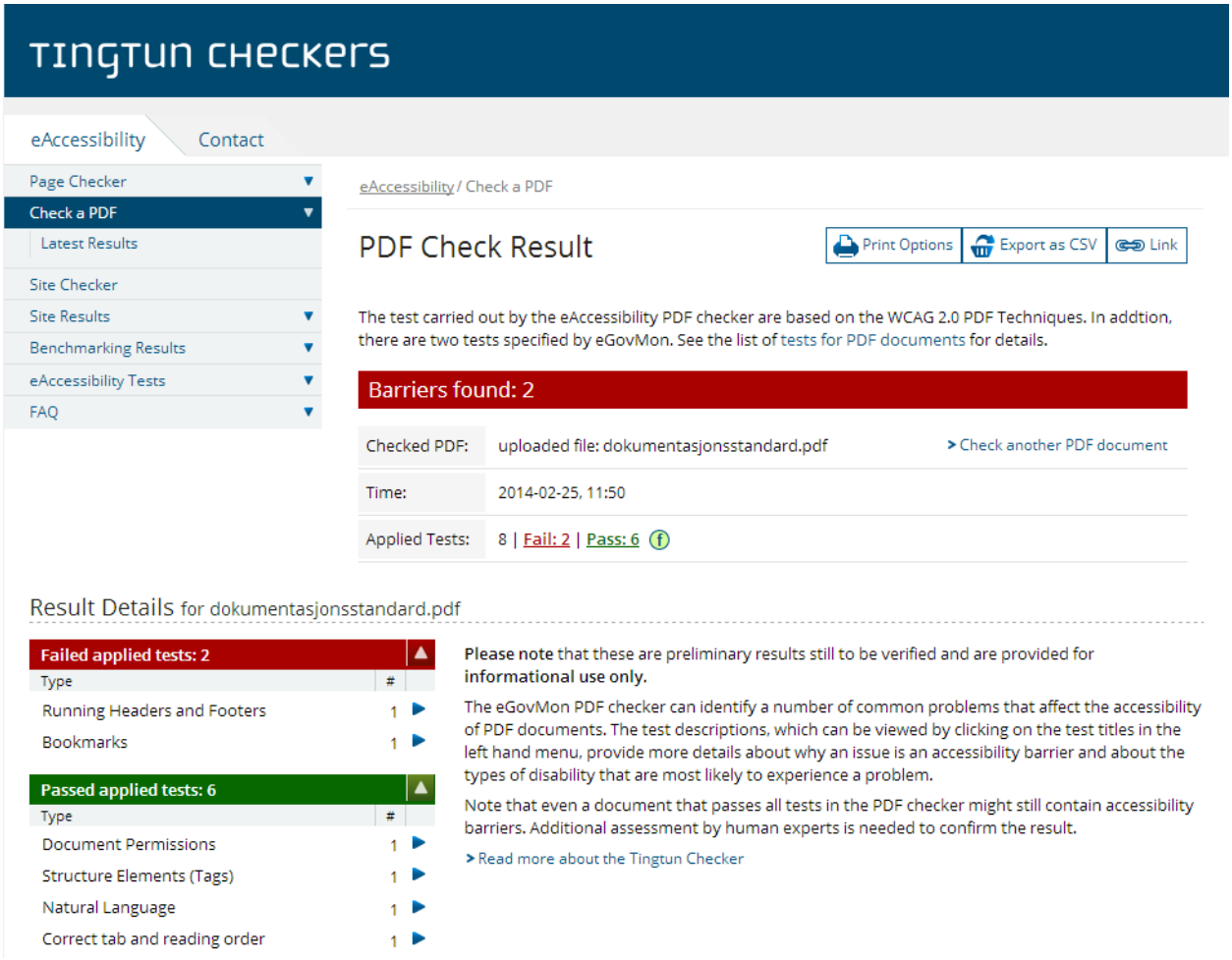

Figure 2-3. *Screenshot of the PDF-checker result page*

The top half of the result page consist the same menu as the previous step, and a summary of which tests were conducted, the ratio of which they failed or passed and a total number of detected barriers. Here are also three buttons that leave the user with options for either printing the result, export the result as CSV which will produce a file with comma separated values, or linking to this specific test result with a generated URL.

To more accurately describe the actual process behind this, we made a sequence diagram to show exactly what happens where, without being too technical. This diagram show how the system handle a PDF file a user upload from their local files:

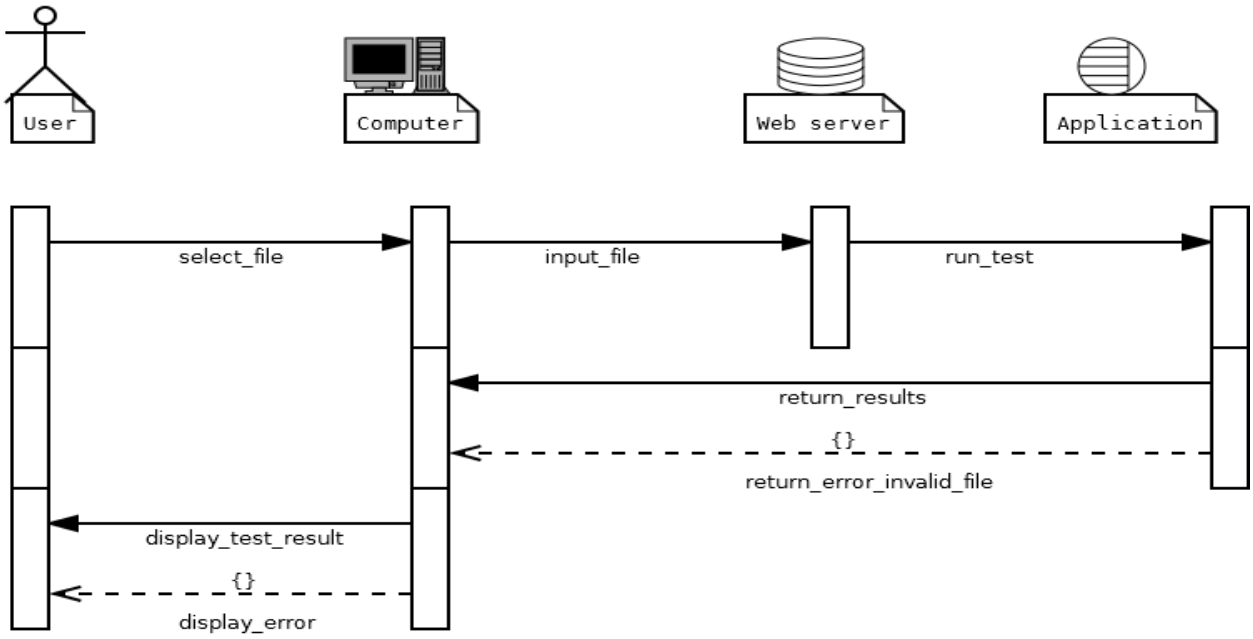

Figure 2-4. *Sequence diagram of the PDF-checker*

2.3.2 System description (new solution)

As soon as we considered our understanding of the existing solution to be adequate, we started discussing how we would improve it in regard to the current design and functionality as well as the requirement specification we developed in collaboration with our employer.

First of all we started looking at the requirement where we were supposed to add the support of checking multiple PDF files or URLs simultaneously. Since Tingtun desired to keep the existing design as much as possible, we needed to find a discrete solution to add this feature. After a session with brainstorming we settled on a solution we felt would meet the criterias. To illustrate how we intended to approach this we developed a series of wireframes. This type of model would act as the low-fidelity prototype we needed to progress. The model itself would not cover design features such as colors, fonts etc, but rather represent the functionality the user is presented with, and how buttons, input fields and other functions the user can use to interact with the application. The model would also give an impression of how they are positioned relative to each other. This wireframe is based on the PDF checker:

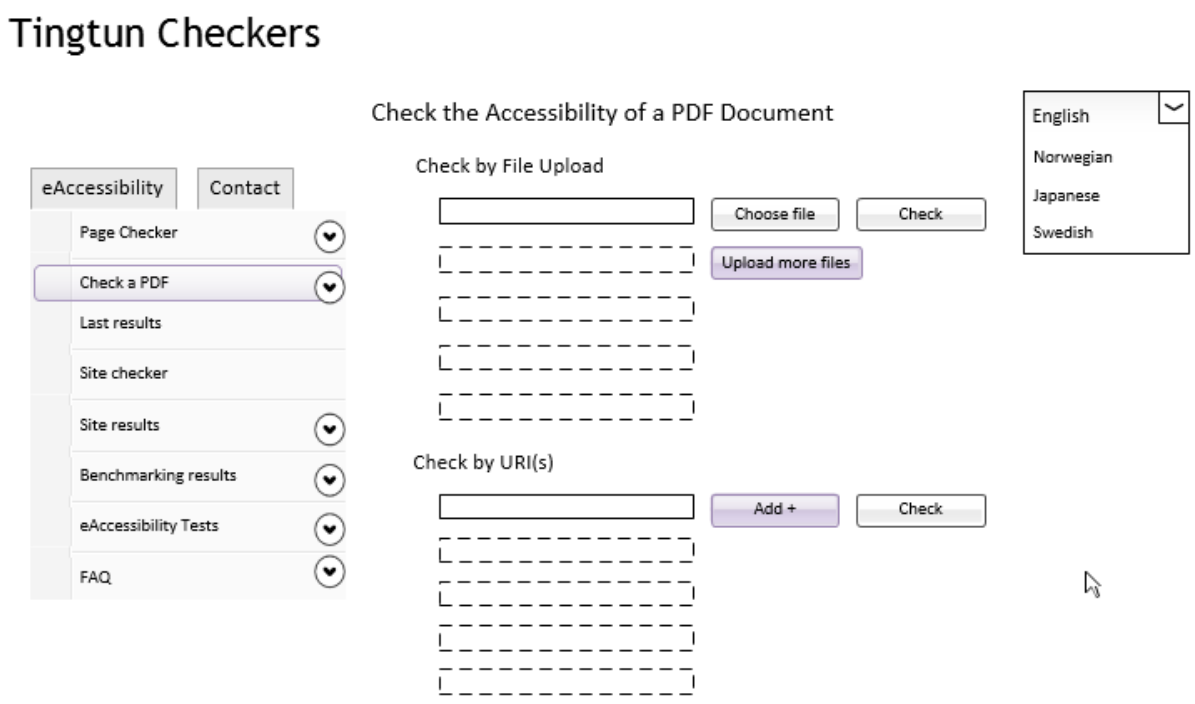

Figure 2-5. *Wireframe based on the PDF-checker*

The basic idea was that the user is presented with an interface very similar to the current solution as shown in figure 2-2, with only a single input field each for upload or URI. Then when the user have inserted the first link or file, a button will appear with the functionality to add more input fields or add more files to the list. Originally we set the maximum input fields to be 5, as it would be most design friendly, and at the same time not make too much of an impact on the server traffic. To be clear: The boxes with stapled lines in the model as well as the gray buttons ("Upload more files" and "Add +") are not displayed to the user by default. They only appear when certain requirements are met. The reason for this is first and foremost that this will keep the user interface as clean and user friendly as possible, while at the same time preserving the design of the current solution so users who are familiar with the application will encounter minimal changes.

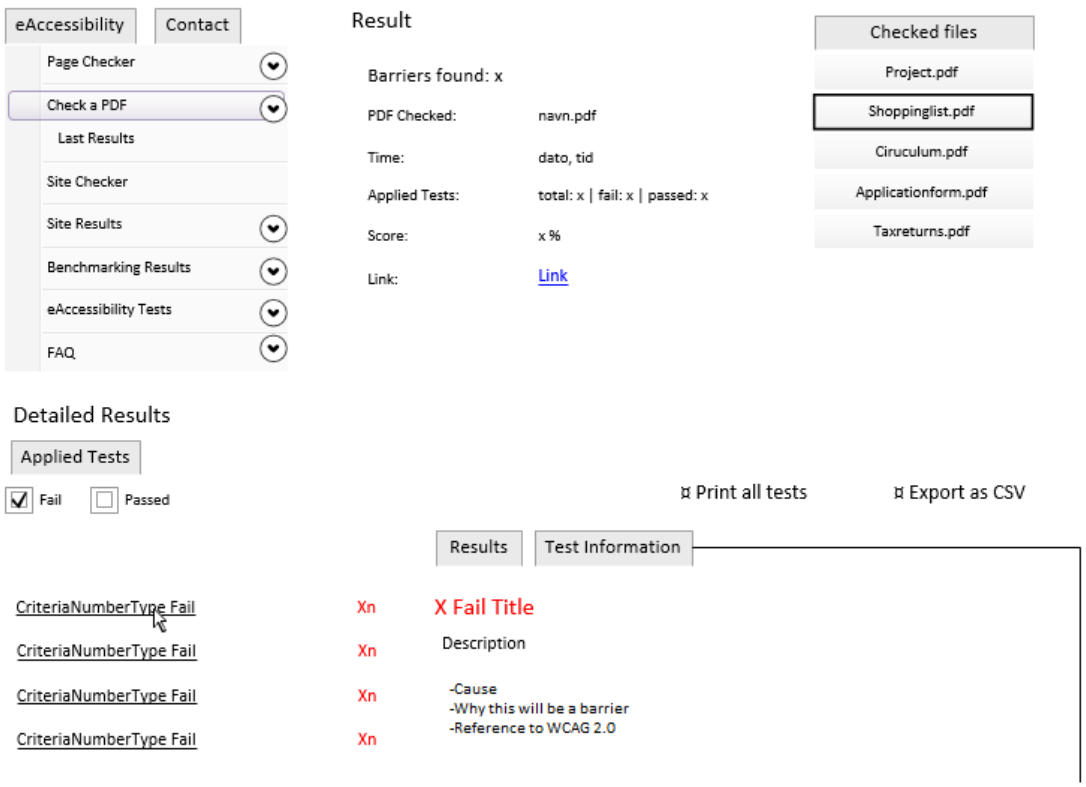

Figure 2-6. *Wireframe representing the result page of the PDF-checker*

The next wireframe represent how we intended to handle the result when the user check multiple PDF files or URIs at the same time. Essentially the model is based on figure 2-3, which describe the result of a single checked file. The main difference is that the user is presented with a list of all files checked, shown in the upper right corner of the screen. The user can then easily toggle between the different results by selecting files from this list.

2.4 Development process

Once the planning process came to an end we started looking at the code for the existing solution, to get a better understanding of what we could use and what we needed to develop.

The first objective was to get a basic structure similar to the existing solution. Since Tingtun was satisfied with the current design, we were able to extract most of the former HTML and CSS and reuse it in the new solution. The first step was to implement the static structure in a HTML file. Then we had to figure out how to display the fields which would take the input containing either a URL to a PDF-file or uploading it locally.

After some time, we were able to display both the required fields, and also found a solution to handling input from more than one field at a time. As this section of the development progressed, we decided to focus on how we should make it possible for the user to add more fields at will. When discussing this in the group and researching for a solution to the problem, we agreed that the easiest way to do this was by using Javascript code because there already existed solutions for this, that we could redefine to fit in with our forms.
As the group have limited experience with Javascript, we did not want to use anymore time on this than needed. This solution were based on a Javascript jQuery function which clones the fields by clicking on a button. When presenting this to employer, he seemed happy with the solution and suggested making some minor changes to the HTML and CSS code in such a way that the cloned fields had a structure which is satisfactory to universal design. This part of the project were one of the most time consuming problems we faced, and in the end we ended up not using this at all because we would rather prioritize the main functionality. But even though, it is still possible to use this in the future to make the current solution even better.

When we decided that the process of displaying the fields were adequately, we continued on to figure out how to handle the files that were uploaded through the file upload field. The first issue to this problem, were where the files should be stored. We did not care for the problem regarding sending the files to the backend to retrieve the results just yet, but rather saving it to a predefined folder. We discovered that the best option for this was the built-in function Django provides. When this was accomplished, we continued on with handling the file and URL input extracted from the fields. To ensure that both of these fields only contain valid data, we used a Django function which covers this. At this point we did not know how we should proceed by connecting to the backend and sending the input from the fields, so as agreed we asked the developer working for the employer about this, and he promised to be back with us shortly.
As we waited for the guide to this, we started working with the user registration and login site. Now that we were already comfortable working with fields, it was quite easy for us to set up a registration site containing predefined fields, such as username and password. These were also added as models to ensure that all the data would be saved to the database properly. When handling this data, we first assured that the code checked in the data input in the fields were valid and then saved it. At the same time the password gets hashed properly to ensure that the security is satisfying.

The login function was straightforward, and was easy to produce. Basically it justs checks the input password and username, and if the login is successful, saves the user information in a session so this can be used later on in any applications inside the project.
Simultaneously as we got an introduction on how to connect to the server backend and send a URL to the uploaded file, and retrieve the tests made to the document, we started working on a cookie function which would provide regular users with information regarding a donation request to the company. By using the included Django cookie functions, we were able to create a function with a cookie which counts each visits to the site.. And then, after a defined number of visits, shows donate information or some other message.

When receiving the guide containing information about how to connect to the server and retrieve results from singular tests, we started the work with sorting all the tests out.

2.4.1 Development tools

Several tools have been used to develop the application and interact with the servers. In this chapter we describe them briefly .

To interact with the server set up by the employer, we have both used Putty and WinSCP. As Putty is a command tool with a way to easy connect to servers, we used this to issue a various set of commands related to Python and Django. While WinSCP were used to visualize the file-tree and also give us an easy way to edit files.

When programming, the members of the group have used different text editors after own preferences. Everyone made sure the different text editors provided proper spacing and soft tabbing, and also gave response to certain syntax error. Considering how sensitive Python is, this was important to prevent errors in the code.

VirtualEnv is a virtual environment package, designed for Django. This makes it possible to work on several Django projects without worrying about affecting other projects. Even though there

was only one project throughout this project, for future work around this application, VirtualEnv can be an important tool.

In addition to the implemented debug tool Django provides, which is described in the 4.1.2 section in the test report, we have also used a Python debugging tool called ‘pdb’. This tool was used in the cmd windows to test seperate files, and proved very helpful when creating the server.py file which is described in detail in the 3.7 section of the product report .

2.5 Requirement specification and its role

The success of the project have been determined by looking at the requirement specification to see which objectives are completed and which remains after the final deadline. As described earlier the project encountered several setbacks along the way, and the consequences of this is clearly indicated here. Note that even if a requirement was not met, there was put a lot of effort into trying to meet it, and much of this work is done in a way to enable future development.

#	**Description**	**Completed**	**Comment**
R.1	*The end user should be able to upload PDF-documents or link to documents online*	Yes	The application is able to receive, temporarily store and then send a PDF file to the server
R.2	*The application shall list the detected barriers found in the PDF documents*	Partially	We were able to list some of the detected barriers found in the PDF documents. The problem was to collect the test results of all the applied tests. The application did receive some information so there were some level of success here, but eventually we ran out of time and were unable to complete this section in time before the report were sent in for printing. To be able to complete this requirement later on, it is mostly copy pasting code we have already made to display all detected barriers, and at the point that this report is read the application may be completed
R.3	*The user interface of the*	Yes	The user interface of the application

	application should follow WCAG guidelines		meets the WCAG guidlines
R.4	*The application shall refer to the WCAG guidelines when presenting the detected barriers*	Partially	There was some difficulties in listing the server output from a test, even if the application received the information from some of the tests. But in the end we were able to refer to one of the WCAG guidelines. As stated in ***R.2***, this may be finished by the time this report is read as the code surrounding this problem is mostly done
R.5	*The user should be given a structured list of the detected barriers*	Partially	This requirement is also related to R.2, and at this point there is only one barrier listed. But as stated earlier this may also be finished when this report is read
R.6	*The user interface of the PDF-checker should be easy to use for end users, and should not require any training prior to interaction with the application*	Yes	As we have followed mostly the same design found in the current solution, the user interface should be easy to use
R.7	*Administrators should be able to access statistics collected by the PDF-checker*	No	Discussed in further development
R.8	*The system code should be written efficient and performance optimized, and the application should be as fast or faster than the existing solution.*	Yes	See test documentation for more information
R.9	*The PDF-checker should be developed according to selected coding standards and easy to maintain for administrators*	Yes	The code contains comments and follow both Python and Django guidelines
R.10	*The system should provide an authentication and access control mechanism to match logins to specific users roles. This should include a regular user, a reporter role who can access statistics, and an admin role, or superuser with all privileges*	Yes	Except for statistics discussed in **R.7**
R.11	*The system should not have any browser or platform specific dependencies, and should work the same way regardless of*	Yes	See test documentation for more information

	client details		
R.12	*The system should be secure against malicious PDF files uploaded by the user, and should reject these if they contain exploits or any code that can harm the system*	No	Requirement have been left out in collaboration with the employer, as we did not have time to focus on this
R.13	*The user should be able to upload multiple PDF files and check these simultaneously, where a single test run will return test results for each selected file*	No	As time became an issue this was one of the requirements we had to leave out. Even if we had planned a solution for design, how to handle the information and started coding it, we realized how much it would require to complete this, and decided along with our employer that our time was better spent elsewhere. We still used a lot of time on this requirement, and the outcome of this have been discussed in further development in the product documentation
R.14	*The system should prevent the user from uploading the same document multiple times during the same check to prevent unnecessary traffic to the server.*	No	As R.13 was left out, this automatically followed as it was no longer relevant
R.15	*The user should be able to insert multiple URLs and check these simultaneously*	No	This requirement was also left out for the same reason as R.13.
R.16	*The user interface should support multiple languages*	No	One of the requirements we only were to focus on if we had any leftover time
R.17	*The application should support accessibility tools such as screen readers*	Yes	Reached as far as we came with the applications
R.18	*The application should provide suggestions on how to remove any detected barriers*	No	Another one of the requirements we only were to focus on if we had any leftover time
R.19	*Continuous use of the application should trigger a mechanism where the system informs the user about how they can contribute to further development through donations or payed services*	Yes	Function explained properly in product documentation

In retrospect it is clear that the group and the employer had too high ambitions for what they hoped to achieve with this project, and in result there are multiple requirements that could not be met as there was not enough time to complete them all. Even if some of the requirements only are considered “nice-to-have”-features, the group did spend a lot of time and effort in trying to complete them. What could have been done differently would have been settle with fewer requirements, but also to dismiss unrealistic requirements at an even earlier stage of the project. The group also underestimated the time required to fulfill some of these, which led to some notable delay in regard to the original work plan.

2.6 Conclusion

As the project came to an end and most of the work was done, it was time to look back at the semester and evaluate the execution of the project. There were a multitude of things that went wrong or could have been done differently, but overall we were happy with our own performance all things in consideration. The loss of a group member and health issues in the group were the greatest challenge to overcome, as our overall work capacity got reduced. The project we had accepted was already of considerable size, even for four members.

Tingtun was also satisfied with the project outcome. Even if there were several unmet requirements, much of the foundational work have been done to complete these. It was a matter of making the best out of a situation that made the project considerably harder to complete.

Throughout the project the group and the employer have been in close contact, and Tingtun have provided valuable input along the way and have gladly shared their knowledge and experience, to help the group in the right direction when they have struggled.

2.6.1 Product and future development

We have managed to develop a user interface to present checks of PDF-files, but do not display all the results in regard to passed and failed tests found in the PDF-files. Even though, we have come so far that it is quite easy to finish this, and the group will try to have it done at the end of the project so the employer may benefit from this. We do wish we have finished this in time for the deadline, so we could have displayed a fully working application.

We have also managed to make a user interface with registers users based on input information, and provide a login function which can be used in further development. Users can also be managed in the Django admin interface.

The application we developed met many of the requirements we set for it, even if time got a little short at the end of the project. At the same most of the requirements that remain have been met in some degree, and in regard to future development it will require a lot less effort to complete these. We have also made sure that the code is commented and easy to maintain for administrators.

2.6.2 Time estimation

When estimating the time for the different activities, the group did not leave a lot of room for mistakes. The result of this, was that the group fell behind on all of the activities when certain mishappens occurred. To try to catch up, the tasks were reorganized and the work plan was revised. Looking back on how the project phases were planned, the work regarding learning Python and Django should have been started earlier. Both the framework and programming language did require a lot more work than we estimated early on, considering we had no experience with either before the project started. The requirements should also have been revised earlier, when our group capacity fell considerably.

2.6.3 Learning outcome

The learning outcome of the project were considerable for all members of the group. Learning new technologies like Python and Django will surely be useful in the future, and gave us more experience towards solving difficult problems by using a series of different tools.

By encountering challenges which had an impact on the process, trying to solve this by reorganizing tasks, gave us more experience towards analysing situations and discussing solutions which would have a positive impact on the project.

The group has, as mentioned, worked on several projects earlier, but not on a scale like this one. By introducing more elements, the teamwork improved regarding analysing and problem solving.

The fact that it was requested to write the project report in English was not a problem for the group, as we consider our knowledge of the language to be average or better. It have taken some extra time to write the report, but overall we are confident in the general language. We have also learned a lot along the way in regard to vocabulary, both general and more technical terminology.

The group have also discovered the value of our frequent creation of meeting notes as well as the project diary, which have helped us a lot to keep track of everything that have been done, when and in what order. Without these the main report would most likely contain less details of the early stages of the project.

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3.1 Preface

This part of the report describes the product in detail. What it does, how it works and how it can be maintained by future developers.

To be able to understand this document, a basic understanding of IT is required. As Python and Django are both advanced programming tools, the reader should also have experience with coding, so that it is possible to understand each section of this document in depth. The second section describes Django in detail, and is aimed at readers who have little or no experience with this framework at all. Even though some technical knowledge is required, we have still aimed to make this document as easy to understand as possible.

3.2 Tools, technologies and framework

Several languages and tools have been used to develop this application. In the next sections all tools used will be described, to give the reader an idea of how they work and interact with each other.

3.2.1 Python

The high-level programming language Python have been used, in collaboration with Django, to handle the database, presenting different templates, presenting fields in templates and connecting to the server to retrieve results. This language let us express concepts in fewer lines than most other programming languages, which makes for an easy to understand application and also one which is easy to maintain. At this point both Python 2.7.6 and Python 3.4 are both eligible versions, but we have chosen to work with Python 2.7.6, considering Python 3.4 still lack some functionality and is not as stable as Python 2.7.6.

3.2.2 Django

Django is a high level Python web framework. This framework offers several built-in functions which makes for rapid web development and a nice and clean set up. When the developers interact with Python and Django, commands are called in cmd, powershell (Windows) or terminal (Linux). These commands create Django projects, and applications inside the projects. Commands are also used for instructing Django to initiate its lightweight development server. Doing this makes it possible to visualize the application and debug it with Djangos built-in debug function (figur1).

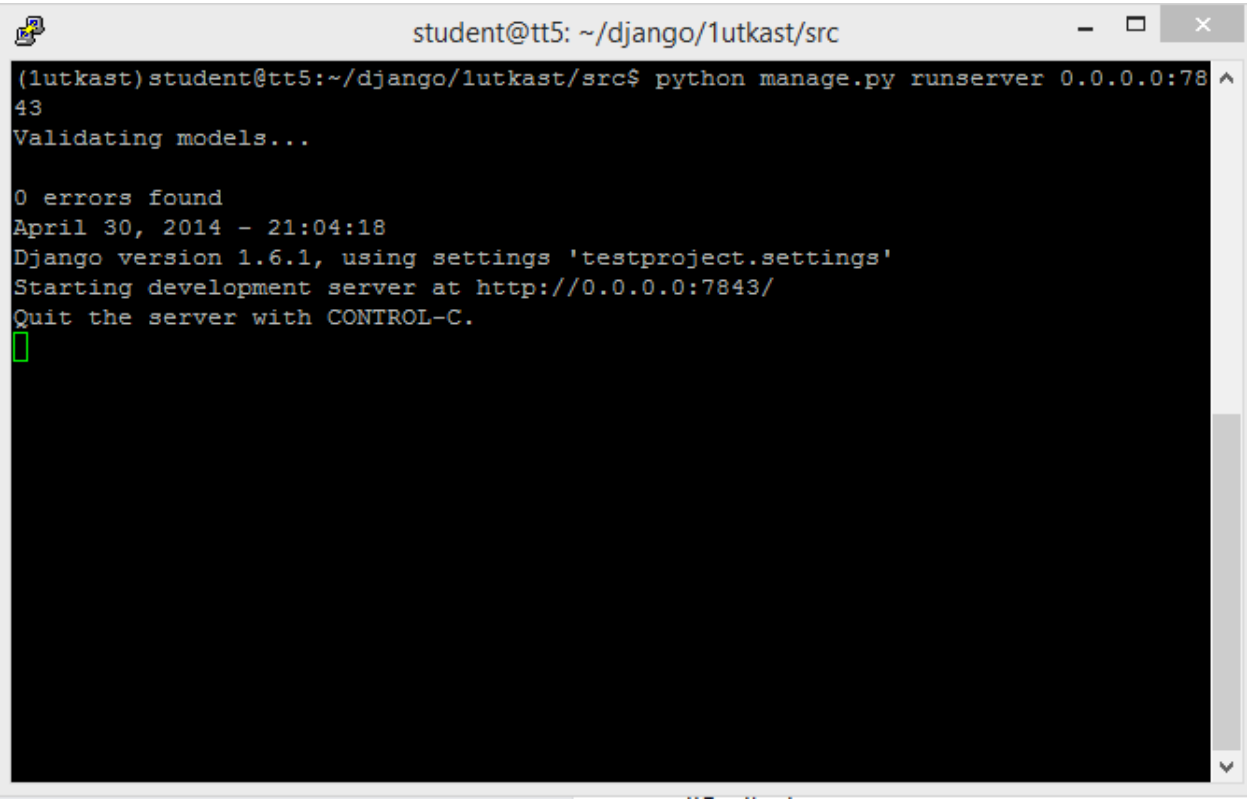

Figure -1. *Command line example of running the Django server*

When creating a Django project and an application, several python files are generated. Some of these have a preset range of functionality **(figur2)**.

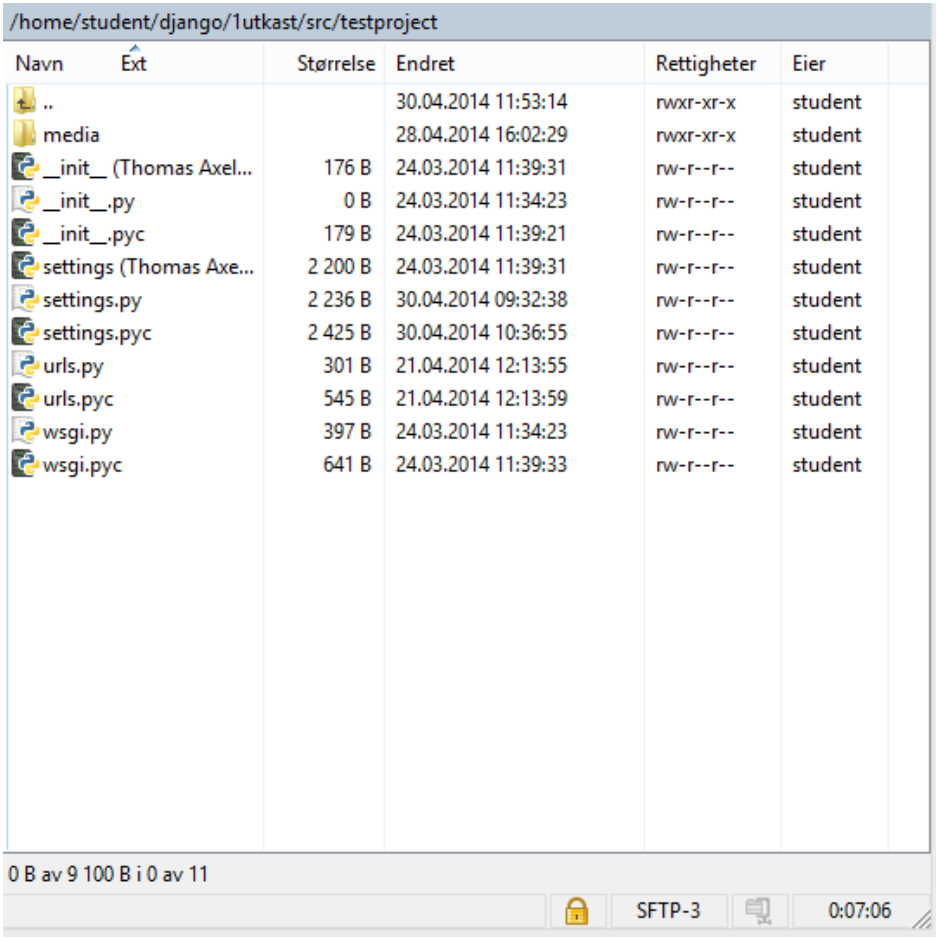

Figure 3-2. *An example of the files generated in a Django project.*

The settings.py file is one of the most important files in a Django project. It is global for the project and all added applications. This file contains information about host/domain names, path to storage of files, included applications, and middleware. The administrator can edit this file in accordance to the Django documentation. The documentation describes the usage of each section in detail. The ORM (Object-relational mapping) and the Admin interface are popular and effective tools provided by Django. The ORM offers powerful database management, and also supports several databases as MySQL, PostgreSQL, Oracle and SQLite. The Admin interface provides the user with database management.

At this point of time, Django version 1.7 is in a development phase, and the group have therefore chosen to work with Django version 1.6.1. If the administrator at a later point wishes to

transfer over to Django version 1.7 when this is deployed, keep in mind to read the changelog thoroughly to avoid errors in the application.

A simplified example of a Django request made by a user is shown in figure 3-3.

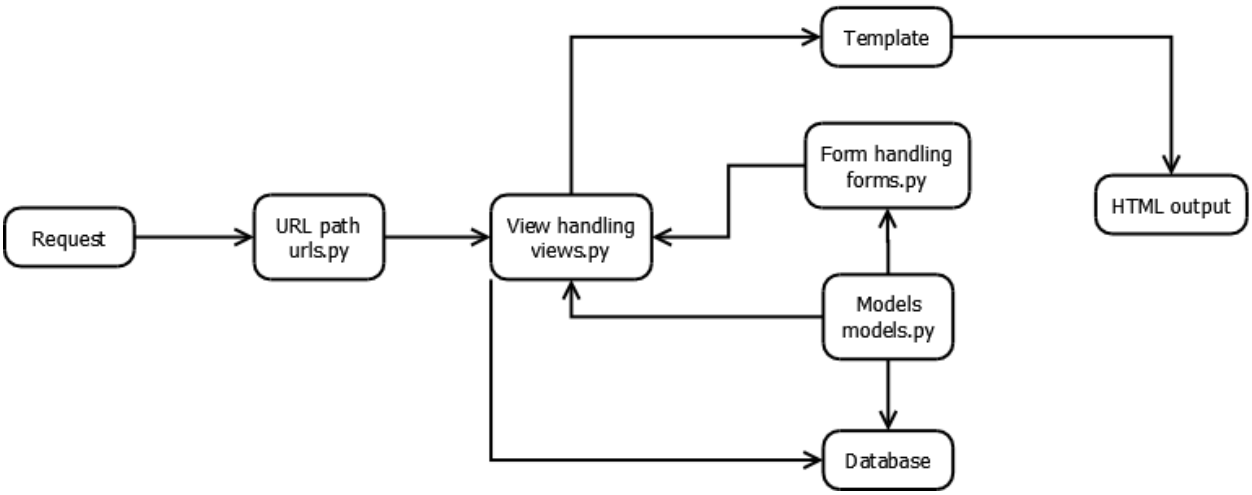

Figure 3-3. *An example of a Django request*

The most central files of an application is shown, and also their relations to each other.

Throughout this documentation, we will explain all files and their content in detail. If the structure of files is confusing, please feel free to backtrack to the figures showing the mapping of the files.

3.3 Architecture

In the Django project consists of two applications, “pdfchecker” and “authentication”. The “pdfchecker” naturally consists of the interface handling the registration of the PDF-files through a URL and a fileupload field, and “authentication” consists of registering personal information to the database and login interfaces for the users.

3.4 Database

The group has in accordance with the employer chosen SQLite as the database in this development process. As SQLite already is the default choice in Django, there was no point

choosing a different type. SQLite is also already included in Python, so there was no need to install this manually. If there is a need for changing the current database to something else, this is possible through changing the “Database” section in the settings.py file. It is also possible to include multiple databases if needed. If these databases are external, the username and password for these must be included, and also migrate them through the command line using cmd or terminal. More info about this can be found in the “Multiple Databases”-section in the Django documentation[6]. The models.py file is used for creating database tables and fields in Django through user requests. Each class represents a table, and the content inside these represents the fields. It is also possible to add tables manually and fields manually, either through the CMD/Terminal windows, or through the admin interface. After making changes to the database by deleting or adding new tables, the ‘python manage.py syncdb’ command needs to be run to update the database properly. There is one major drawback regarding databases in Django. After creating a table with fields, it is not possible to add more fields to the table without deleting the table and then adding it again. To solve this issue, it is possible to use several tools not included in Django, such as south but we have not explored this any further in this project.

Regarding requirement **R.14**, which asks for a function that supports multiple file upload, and also a list displaying the field names, storing the field names in a database was required. To solve this problem, a class was made in the models.py file containing a field which stores the path of the file. When either saving images or files through Django, the ‘MEDIA_ROOT’ and ‘MEDIA_URL’ in the settings file determines where to store them. And this is also defined in this Django project, as shown in figure 3-4.

```
85  MEDIA_ROOT = os.path.join(BASE_DIR, 'media')
86
87  MEDIA_URL = 'http://tt5.s.tingtun.no:7842/pdfchecker/media/'
```

***Figure 3-4.** ‘MEDIA_ROOT’ and ‘MEDIA_URL’ which defines the location of stored files*

But to be able to use the path of the file names in other sections of the application, these need to be stored in the database, and therefore a table with this field had to be created.

6 https://docs.djangoproject.com/en/dev/topics/db/multi-db/

```
1  from django.db import models
2
3  class handle_UploadPdf(models.Model):
4      docfile = models.FileField(upload_to='.')
5
```

Figure 3-5. *The models.py file in the application 'pdfchecker'*

The table that is created by the class, is called 'handle_UploadPdf' and only contain one field to store the path of the saved PDF file. In line 4, an attribute which determines an additional path to where the file should be stored. The path defined will not overwrite the path in the 'MEDIA_ROOT' but be an addition to this. As of now, the additional path is not defined, but the thought behind it, is that the administrator can use this to define unique paths based on the time and date they were uploaded. This way it could be easier to maintain an archive of the stored files. Unfortunately, as we were never able to complete **R.14**, this file is not included in our current function which handles the uploaded files. But we still decided to keep the content, for further development.

To be able to satisfy requirement number **R.10,** which asks for a set of user roles, we decided to create a separate application to deal with these. This application, called "authentication" is split into two views, "registration" and "login". Both of these interact with the database in different ways.

First of all, the user must be able to register to the application with sufficient personal info. The administrator of the application will then have an overview over who is currently using the interface. Django provides a User object which consists of several attributes. The default attributes are the following:

- username
- password
- email
- first_name
- last_name

These attributes will be accurate considering user information, and have therefore been implemented in both the models.py and forms.py file.

```python
from django.db import models
from django.contrib.auth.models import User

class User_Information(models.Model):
    # Links UserProfile to a User model instance
    user = models.OneToOneField(User)
```

Figure 3-6. *The models.py file in the application 'authentication-*

The figure above displays the main content of the models.py file. First, the User object is imported from the implemented Django authentication models. Then, a class is made containing a user model which is linked in a one to one relationship to the User object. A one to one relationship will ensure that minor problems will occur when various applications are used in the future.

3.5 Front-end/Back-end

The back-end in the Tingtun PDF Checker is running a SOAP service on a Tingtun server. The communication between the back-end and the front-end is done with "SOAPpy", a Python package that provides tools for building SOAP servers and clients. In the front-end a SOAPpy call with the url of the pdf file is sent to the server. If the url is valid, the server returns results in a string which is a representation of a Python dictionary. The task for the front-end will then be to parse and present the results. The current solution is using PHP/Apache, and the new solution is using Django/Python to perform this task.

3.5.1 The SOAPpy call (server.py)

A typical interaction of a SOAPpy call is displayed in figure 3-7.

```python
import SOAPpy
server = SOAPpy.SOAPProxy('Tingtun.server',namespace='')
url = 'www.foo.com/bar.pdf'
result = server.checkacc(url, 'url-tingtun', 'client-ip', '', 'Forwarded-for')
```

Figure 3-7. *A typical interaction of a SOAPpy call*

The SOAPpy call begins with SOAPpy being imported, and the server defined with the Tingtun server as first parameter. The result variable includes the url of the pdf document, the url of tingtun and the client ip.

```
# Convert SOAP result into Python dict
res = result._asdict()
res.keys()
['header', 'validok', 'downloadok', 'result']
```

Figure 3-8. *Converting the SOAP result into a Python dictionary*

The next step is to convert the SOAP result into a Python dictionary. This is done with “result._asdict()”. ‘header’, ‘validok’, ‘downloadok’, ‘result’ are the main keys in the dictionary. The keys ‘validok’ and ‘downloadok’ indicates if the pdf document is validated and downloaded successfully. No error will be returned if the value of these keys are 1 (True). The value 0 (False), on the other hand will return an error. The actual result is located in the key ‘result’, and will be the key used to present the result.

```
res = result['result']._asdict()
res.keys()
['EGOVMON.CRE.1.2', 'EGOVMON.PDF.03', 'EGOVMON.PDF.05', 'WCAG.PDF.14', 'EGOVMON.TITLE.1.2',
 'EGOVMON.VER.1.2', 'WCAG.PDF.17', 'EGOVMON.AUTR.1.2', 'WCAG.PDF.16', 'EGOVMON.PDF.08',
 'EGOVMON.PROD.1.2', 'WCAG.PDF.03', 'EGOVMON.MTIME.1.2', 'EGOVMON.CTIME.1.2', 'WCAG.PDF.18','WCAG.PDF.02']

filterkeys=[k for k,v in res.items() if k.startswith(('EGOVMON.PDF', 'WCAG.PDF'))]
```

Figure 3-9. *Creating another dictionary containing applied tests.*

The line on 11 in figure 3-9, creates another dictionary with the main key ‘result’. The keys of the “res” dictionary are tests applieded by the PDF checker.It contains the actual test results as well as a mix of meta data. The keys that start with EGOVMON.PDF and WCAG.PDF are the test ids that are important, they containt the result. The “filterkeys” loops through the dictionary and filters out the keys that start with these strings.

```
res['EGOVMON.PDF.05']
[<SOAPpy.Types.structType item at 139948434367264>:
{'column': 1, 'line': 0, 'type': 'assertion', 'mode': 'automatic', 'result': 0.0}]
```

Figure 3-10. *The structure of each test is displayed in this figure.*

The structure of each test is displayed in figure 3-10. It returns a SOAPpy array that contains a dictionary with the result. The key to notice is the ‘result’ on line 21. If the value is 0 the test is a PASS. If the value is 1 the test represents a FAIL.

```
23    #Number of tests that have failed and passed
24    failed = 0
25    passed = 0
26
27    for k in filterkeys:
28            x =  len(res[k])
29            i = 0
30            while i < x:
31                    if res[k][i]['result'] == 1:
32                            failed = failed + 1
33                    if res[k][i]['result'] == 0:
34                            passed = passed + 1
35
36                    i = i + 1
```

Figure 3-11. *A loop that adds variables failed and passed to the values of res[k][i][‘result].*

To receive all the tests that have failed and passed, a loop is defined. The variables failed and passed will then be added accordingly to the values of res[k][i][‘result]’. Because the tests can have more than one position (for instance, a test can have res[k][0][‘result], and res[k][1][‘result’]), a while loop needs to be implemented. The while loop loops through all of the positions existing in a test.

```
38    #Applied tests
39    AppliedTests = passed + failed
40
```

Figure 3-12. *Total applied tests.*

The total applied tests. Just a simple addition of passed and failed.

```
38  #Creates two dictionary containers
39  dictionary_failed = []
40  dictionary_passed = []
41
42  #Loop through WCAG.PDF.01
43  if 'WCAG.PDF.01' in filterkeys:
44          #Creates a dictionary container for WCAG.PDF.01
45          dictionary01 = {}
46          x = len(res['WCAG.PDF.01'])
47          i = 0
48          failed_WCAG01 = 0
49          passed_WCAG01 = 0
50          while i < x:
51                  if res['WCAG.PDF.01'][i]['result'] == 1:
52                          failed_WCAG01 = failed_WCAG01 + 1
53                  if res['WCAG.PDF.01'][i]['result'] == 0:
54                          passed_WCAG01 = passed_WCAG01 + 1
55                  dictionary01.update({'description':'Alternativ Text for images',
56                                       'id':'page1', 'failed':failed_WCAG01,
57                                       'passed':passed_WCAG01})
58                  i = i + 1
59
60          #If the number of failed tests are greater than 0,
61          #copy dictonary01 to the list dictionary_failed
62          if failed_WCAG01 > 0:
63                  dictionary_failed.append(dictionary01.copy())
64          #Else, copy the dictionary to dictionary_passed
65          else:
66                  dictionary_passed.append(dictionary01.copy())
67
68
```

Figure 3-13. *An if statement which is created for each test.*

In order to represent each test with the current result, an if statement is created for each test. Because a test can have both failed and passed tests, two dictionary containers are defined on line 39 and 40 (these will be used later). On line 45 a dictionary for the test WCAG.PDF.01 is created. On line 55 the dictionary is updated with values such as description, id, and number of failed and passed tests. These values will be used in order to display the details of the result. The last segment of the code is to see if there were any failed tests. If there were (failed_WCAG01 is greater than 0), copy the dictionary for the test WCAG.PDF.01 to the list dictionary_failed. If not, copy it to the dictionary_passed.

```
72  if 'result' in res:
73
74          return [[{'applied':AppliedTests,'totalfailed':failed,
75          'totalpassed':passed}],dictionary_failed, dictionary_passed]
76
77  else:
78          passed = 'passed'
79          return passed
80
```

Figure 3-14. *All the data contained are returned in a list to the view in Django.*

Last but not least, if the key ‘result’ exists, and there were tests conducted. All of the variables, dictionaries and dictionary containers are returned in a list to the view in Django. If not, the returned value is a string named ‘passed’.

3.6 Graphical user interface (GUI)

As the employer is already satisfied with the current design on their solution, changes were limited and only implemented in collaboration with the employer.

3.6.1 Templates

In the Django settings.py file, it is required to add the path to the folder containing the templates for each application. In figure 3-15 on line 14, the path used for the template folder is displayed.

```
11  # Build paths inside the project like this: os.path.join(BASE_DIR, ...)
12  import os
13  BASE_DIR = os.path.dirname(os.path.dirname(__file__))
14  TEMPLATE_DIRS = [os.path.join(BASE_DIR, 'templates')]
```

Figure 3-15. *Path to the folder containing the templates.*

The “pdfchecker” application have three templates: base, index and results. The base template consists of the static structure obtained from the current application. The static structure would include the menu, header, footer, and the sub menu (figure 3-16).

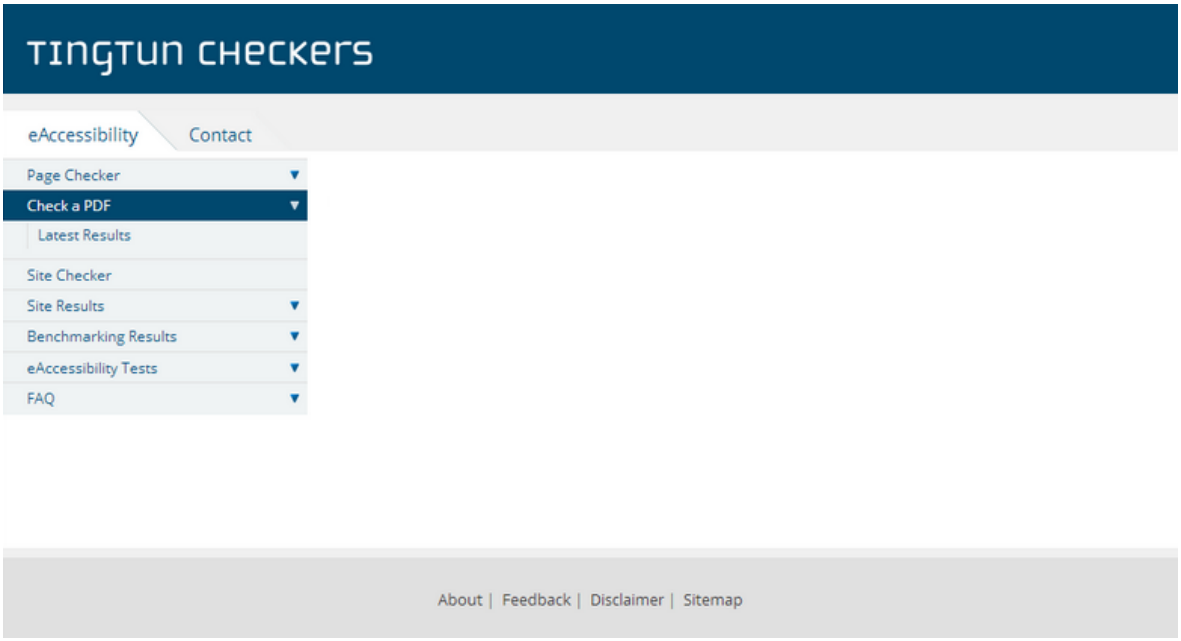

Figure 3-16. *Base template HTML output.*

The base template is created with a content block. Django provides this with “{% block content %} and “{% endblock %}”.

```
<!DOCTYPE html>
{% load staticfiles %}

<html>
<head>

</head>

<body>
<div id=content>
{% block content %}{% endblock %}
</div>
</body>
</html>
```

Figure 3-17. *Base template is created with the content block.*

Child templates can then easily extend the base template, and input the content in the block.

```
{%extends 'base.html' %}

{% block content %}

Content of this template is located here..

{% endblock %}
```

Figure 3-18. *Extending child templates.*

This django function gives administrators an easy method to implement other child templates without having to duplicate code. The “pdfchecker” application features this method by extending the base template, and in a child template presenting the URL and fileupload fields in the content block. To use the base template, the method in Django is created in the child template (figure 3-18). In the “pdfchecker” application the method would be called as such: {%extends 'pdfchecker/base.html' %}, and then again add the “{% block content %} and “{% endblock %}” with the desired code between these commands.

This method is also used in the authentication templates, however the base template is edited, and the submenu removed. This basically means that the only thing displayed in the base template is the header, footer, menu and the content block.

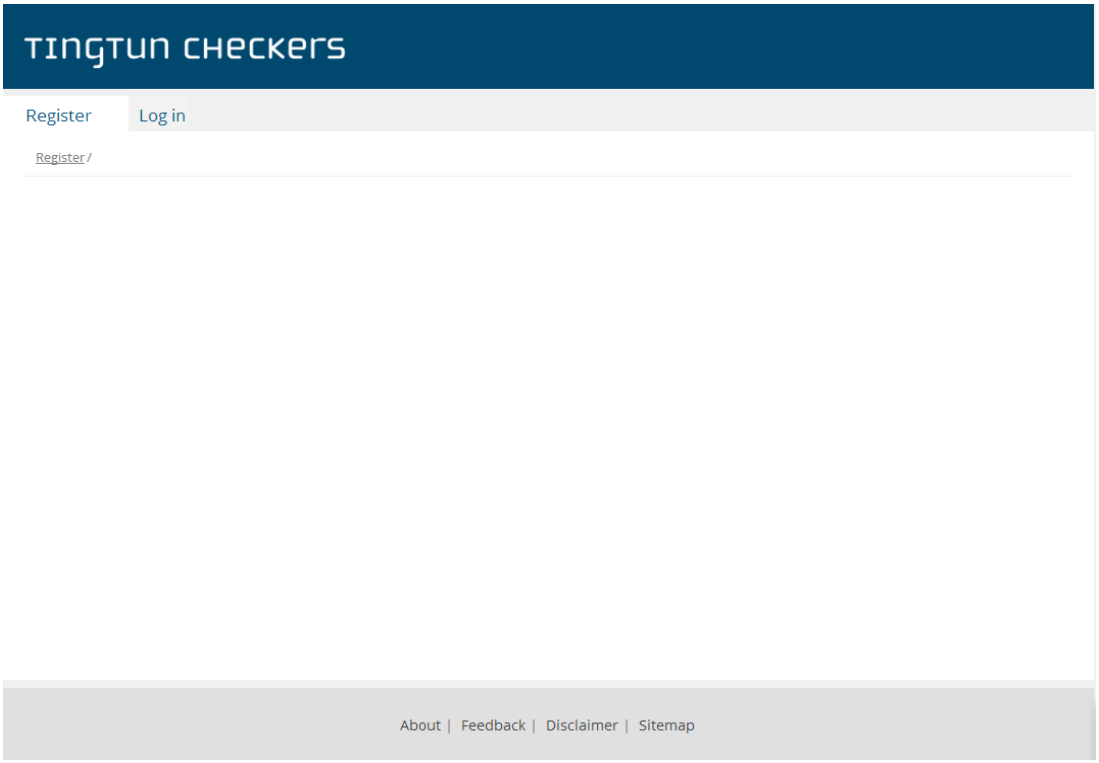

Figure 3-19. *Base template of the application 'authentication'*

3.6.2 Static files

To handle the static files, such as media and CSS files, django offers a path to these, which is configured in the settings.py file. All according images and CSS files in the Django project is located in the "static" folder.

```
88
89    STATIC_URL = '/static/'
90
91    STATICFILES_DIRS =(
92        os.path.join(os.path.dirname(BASE_DIR), "static"),
93    )
94
```

Figure 3-20. *Path to the folder of the static files.*

To be able to call these files in a HTML template, python is needed. First of all, the static files need to be loaded at the top of the base HTML template, as shown in figure 3-20. After this, all the different static files need to be properly called from the right location, this includes all pictures and files. An example is shown in figure 3-21.

```
1  <!DOCTYPE html>
2  {% load staticfiles %}
3
4  <img src="{% static "images/logo.png" %}" alt="Tingtun Checker logo">
5
6
```

Figure 3-21. *Loading the static files in a template.*

3.6.3 Urls

There are several urls.py files, one for each Django project, and one for each application. The urls.py file in the Django project (figure 3-22) displays all URL paths, and their respective connections.

```
1  from django.conf.urls import patterns, include, url
2
3  from django.contrib import admin
4  admin.autodiscover()
5
6  urlpatterns = patterns('',
7      url(r'^pdfchecker/', include('pdfchecker.urls')),
8      url(r'^authentication/', include('authentication.urls')),
9      url(r'^admin/', include(admin.site.urls)),
10 )
11
```

Figure 3-22. *Urls.py file of the project.*

To get an understanding of how the views are connected to the urls, the ‘pdfchecker’ urls.py file will be used as an example (figure 3-22)

```
5  from pdfchecker import views
6
7  urlpatterns = patterns ('',
8      url(r'^$', views.upload, name='pdfchecker'),
9  )
```

Figure 3-23. *Urls.py file of the application ‘pdfchecker’*

The url lines are built up by several attributes. At line 8, the first thing to notice is the “r’^$’”. This

determines the path. If it only contains a '$', it will be the index template for the 'pdfchecker'. The next attribute in the line, is the view function the path is connected to. In this case, it is the function 'upload', which is described later in this section. All paths also have a name attribute. This is used for keeping each defined url unique, to prevent any problems if the same view is used in different urls.
So the path of the shown url is as following:
pdfchecker = /pdfchecker/

3.6.4 Views

A view in Django is a Python function that take a web request and return a web respons. The view is basically the core of the application, and everything connected to handling and displaying forms, templates and messages are handled here. The web respons can be html, image, lists, dictionaries or almost anything.

3.6.5 The PDF Checker

3.6.5.1 Forms

Both requirement **R.1** and **R.14** which states that there should be possible to upload PDF files through URL's and local file locations, naturally requires two fields which makes these operations possible. To be able to display these fields in the 'pdfchecker' template, they need to be determined in the forms.py file located in the 'pdfchecker' application (figure 3-24).

```
1  from django import forms
2
3  class UploadPdf(forms.Form):
4      docfile = forms.FileField(label='Browse')
5
6  class UploadPdfUrl(forms.Form):
7      docurl = forms.URLField()
```

Figure 3-24. *Forms.py file of the application 'pdfchecker'.*

As both of these fields need to be handled separately, two form objects are created. The 'UploadPdf' object, contains a file field set in a variable called 'docfile'. This field has one defined attribute, called label. Which naturally displays the label name to the field in the template. The other object, 'UploadPdfUrl', contains an URL field set in a variable called 'docurl'.

3.6.5.2 View and template

```
1  from django.shortcuts import render, render_to_response
2  from django.template import RequestContext
3  from django.http import HttpResponse, HttpResponseRedirect
4  from django.core.urlresolvers import reverse
5  from django.forms.formsets import formset_factory
6  from django.forms.models import modelformset_factory
7  from django.contrib.auth import authenticate, login
8  from django.contrib import messages
9  from django.utils import timezone
10 from datetime import datetime
11 import datetime
12 from django.conf import settings
13 import urllib, urllib2
14 import SOAPpy
15
16 from pdfchecker.models import handle_UploadPdf
17 from pdfchecker.forms import UploadPdf, UploadPdfUrl
18 from pdfchecker.server import connect
19
```

Figure 3-25. *The first part of the views.py file in the application 'pdfchecker'. The modules and forms are imported here.*

The first thing to do, is to import all corresponding modules, models and forms from their location. A function called 'connect' is imported from a file called server.py.

```
20 # This view consists of a formset containing the FileField for uploading PDF-files
21 # and also a URLField which contains the url to a file
22 def upload(request):
23
24         #Creates a formset of the form and the database handle
25         UploadPdfFormSet = formset_factory(UploadPdf)
26         handleUploadPdfFormSet = modelformset_factory(handle_UploadPdf)
27
28         #If the request is a POST
29         if request.method == 'POST':
30
31                 #Request the data from the URL field, and the files from the upload field
32                 formURL = UploadPdfUrl(request.POST)
33                 formsetFile = UploadPdfFormSet(request.POST, request.FILES)
34                 formsetHandle = handleUploadPdfFormSet(request.POST, request.FILES)
35
```

Figure 3-26. *Continuing on the views.py file, the first part of the function is displayed. The forms are factored into 'formsets' and data and files are requested.*

Inside the function upload(), the first thing that is done, is the creation of FormSet, which makes it possible to handle several forms at once. Both the form 'UploadPdf' and the database model

'handle_UploadPdf' are stored in formsets in line 25 and 26. This is done early on so they can be displayed in the template properly. On line 29, the if-statement activates if a 'POST' is requested, and both data and files are requested from the from the file and URL fields.

```
35
36              #If the URL is valid
37              if formURL.is_valid():
38
39                      #Data localised in formURL.cleaned_data, url_input = data['docurl']
40                      data = formURL.cleaned_data
41                      url_input = data['docurl']
42
43                      #Creating a timestamp with the local timezone
44                      now=timezone.localtime(timezone.now())
45                      time = now.strftime('%Y-%m-%d, %H:%M')
46
47                      #url_input as parameter, sent to the function connect() in server.py
48                      result = connect(url_input)
```

Figure 3-27. *Checks if the URL is valid and creates a timestamp. Data is sent to the server.py file.*

If the URL is valid (data was inputted in the URL field by user). The data is then extracted and saved in a variable called 'url_input'. On line 48 the 'url_input' is sent to a function called connect in the server.py file. The function will either return a string with 'passed' or a list with dictionaries that contain the result.

```
49
50                      #If result returnes 'passed', render context to result_success.html
51                      if result == 'passed':
52
53                              #Context contains timestamp, and formURL
54                              context = {'time':time,'formURL': formURL}
55
56                              #Response contains request, template and context
57                              response = render(request, 'pdfchecker/result_success.html', context)
58
59                              #Return response
60                              return  response
61
```

Figure 3-28. *If the data returned is passed, the rendered template will be 'result_success.html.*

If the returned value is 'passed' the context will not contain result, and the rendered template will be 'result_success.html'.

```
61
62                  #Else, render context to result_failed.html
63                  else:
64                          #Context contains timestamp, result from connect(), and formURL
65                          context = {'time':time,'result': result,'formURL': formURL}
66
67                          #Response contains request, template and context
68                          response = render(request, 'pdfchecker/result_failed.html', context)
69
70                          #Return response
71                          return  response
```

Figure 3-29. *If result is returned, the rendered template will be result_failed.html.*

If the list with dictionaries is returned the context will be timestamp, result from connect(), and formURL, and the rendered template will be result_failed.html.

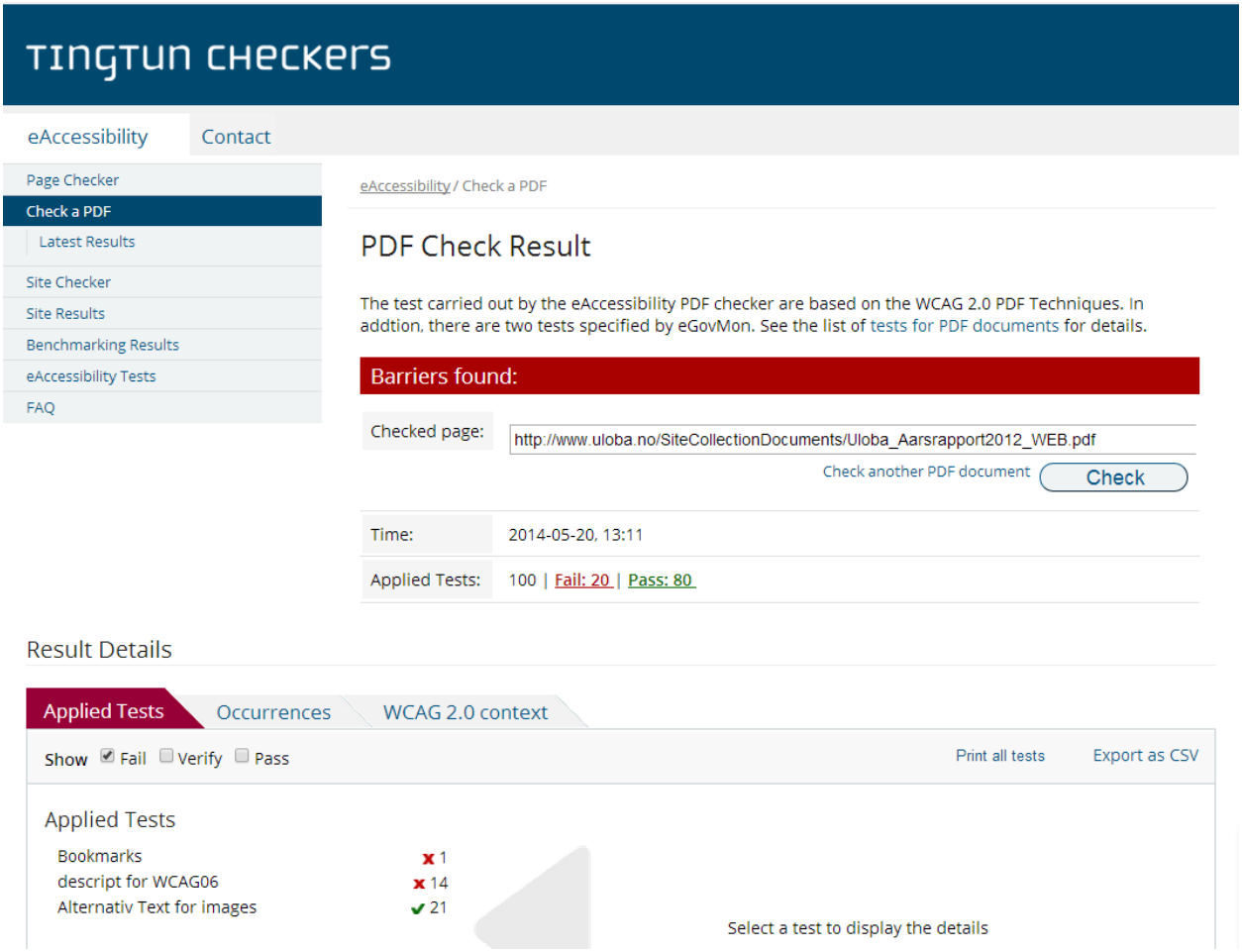

Figure 3-30. *'result_failed.html' template is displayed.*

The result_failed.html template interface is displayed in figure 3-30.

```
39
40  <li class="row feedbackedText">
41      <strong class="r_label f_unify-width posabs" style="width: 6.94em;">Appli
42      <div class="r_content f_unifyReposition_padding-left" style="margin-left:
43
44      {%for element in result%}{{ element.0.applied }}{% endfor %} |
45      <span class="markfailed"><a href="#failedTests" title="Jump to the list c
46      Fail: {%for element in result%} {{ element.0.totalfailed }}{% endfor %}</
47      <span class="markpassed"><a href="#passedTests" title="Jump to the list c
48      Pass: {%for element in result%} {{ element.0.totalpassed }}{% endfor %}</
49      <span class="f_tooltip f_tooltipAllowLink tooltipWrapper feedback">
50      <span id="feedbackRequesttests" class="f_tooltipContent" role="tooltip" a
51      <span class="tooltipContent">
52
```

Figure 3-31. *HTML extracted from the current solution with applied, failed and passed tests.*

The html is extracted from the current solution. This corresponds to the Applied Tests in the result_failed.html template. In order to display the total number of applied, failed and passed tests, a for loop goes through result, and extracts the correct value in the list. In position [0] in the list from the function connect(), a dictionary with these values are defined.

```
72
73              #If the formsetFile is valid
74              if formsetFile.is_valid():
75
76                      #Save the formset in variable handles
77                      formsetHandle.save()
78                      handles = formsetHandle.save()
79
80                      #Loop through the urls in handle.docfile, and save it to pdf_url
81                      pdf_urls = [handle.docfile.url for handle in handles]
82                      pdf_url = pdf_urls[0]
83
84                      #Loop through the names in handle.docfile, and save it to pdf_name
85                      pdf_name = [handle.docfile.name for handle in handles]
86                      pdf_name = pdf_name[0]
87
```

Figure 3-32. *A for loop goes through the URLs in the handles.*

The same principle occurs for the formset file, however, in order to receive the url of the uploaded pdf file a loop must be created and go through the urls of the handle, ‘handle.docfile.url for handle in handles’. The context and response is similar to the formURL, and will therefore not be explained.

To satisfy requirement **R19**, which asks for information regarding donations to the firm, based on a set amount of visits to the site, we have designed a cookie function. This function is implemented in the upload view, and is shown in figure 3-33.

```
68      else:
69          formsetFile = UploadPdfFormSet()
70          formURL = UploadPdfUrl
71
72      response = render(request, 'pdfchecker/index.html', {
73          'formsetFile': formsetFile, 'formURL': formURL,
74          })
75      # Get the number of visits to the site through a cookie called 'page_visits'
76      page_visits = int(request.COOKIES.get('page_visits', '0'))
77
78      # If the cookie 'last_visit' exist
79      if 'last_visit' in request.COOKIES:
80          # Request the data from this cookie
81          last_visit = request.COOKIES['last_visit']
82          # Send the value to a python datetime object
83          last_visit_time = datetime.strptime(last_visit[:-7], "%Y-%m-%d %H:%M:%S")
84          # If it has been more than a day since last visit
85          if (datetime.now() - last_visit_time).days > 0:
86              # Add one to the 'page_visits' cookie
87              response.set_cookie('page_visits', page_visits+1)
88              # Update the 'last_visit' cookie
89              response.set_cookie('last_visit', datetime.now())
90      # If the page_visits cookie is less than 100, display donate message.
91      if page_visits < 100:
92          messages.add_message(request, messages.INFO, 'Donate information')
93      else:
94          # If there is no 'last_visit' cookie, create one.
95          response.set_cookie('last_visit', datetime.now())
96      # Return data to user, updating cookies.
97      return response
```

Figure 3-33. *Cookie function which is in affect after the 'upload' function displays the index template.*

As shown, the function is activated when the user is redirected to the /pdfchecker/ containing the upload forms. First of all, a 'page_visits' cookie is created, which contains an INT, this is set to 0 as default. On to line 79, if the 'last_visit' cookie exists, the data from this cookie is requested, and the value is sent to a python datetime object. On line 85 the 'last_visit_item' variable which contains the datatime object, is compared to the datetime.now. If there has been more than a day since the last visit, we add one to the 'page_visits' cookie, and then update the 'last_visit' cookie.

If the ‘page_visits’ cookie is less than 100, the donate information is displayed through the Django framework messages. Now less than a 100 visits does not really makes sense, but this is just for showing how the function works. The administrator is free to change this to a number which makes more sense, and also add donate information which is suitable.
On to line 93, if there never were a ‘last_visit’ cookie to begin with, this is created. Then the data is returned to the user, updating the cookies properly.

3.6.6 Authentication

3.6.6.1 Forms

To be able to both handle the register and login forms displayed in the Database section of this document, and meet requirement **R.10,** we need a view and forms with according functions. The register fields which is the same as in models.py showed in the database section are defined in the forms.py file, as shown in figure 3-34.

```
1  from django import forms
2  from django.contrib.auth.models import User
3  from django.contrib.auth.forms import UserCreationForm
4
5  class User_Form(UserCreationForm):
6
7      # Define the nested class. The default fields can be edited here, if you wish to exclude something.
8      class Meta:
9          model = User
10         fields = ('username', 'first_name', 'last_name', 'email')
11
```

Figure 3-34. *Forms.py file from the ‘authentication’ application.*

At the top of this file we import django standard forms to be able to define what we want. Then we also import the object User from the already defined models in django.contrib.auth and the ‘UserCreationForm’ form from django.contrib.auth.forms. The User_Information class from models.py is also imported.

At line 5 we define the class which will contain the forms we wish to represent in the registration template. The ‘UserCreationForm’ is given as an argument here to ensure that the passwords fields is displayed as they should, and that the hashing of the passwords, which is done in the view, works properly.

On to line 8, a Meta class is defined. In this class, the model is defined as the User object, and we have included all the usual attributes in the fields. The password fields does not need to be defined as they are part of the 'UserCreationForm'. It is possible to extend the fields with other attributes if needed.

3.6.6.2 View and template

```
8   from authentication.forms import User_Form
9
10  # A view which registers and saves the input from the user
11  def register(request):
12      context = RequestContext(request)
13      # Processing form data.
14      if request.method == 'POST':
15          user_form = User_Form(data=request.POST)
16          # If the form is valid.
17          if user_form.is_valid():
18              # Saves the user's data to the database.
19              user = user_form.save()
20              # Hash the password and updates the user object.
21              user.set_password(user.password)
22              user.save
23              # Tell the template that registration was successful
24              messages.success(request, 'You registered successfully')
25          else:
26              print user_form.errors
27      else:
28          user_form = User_Form()
29
30      return render_to_response(
31          'authentication/register.html',
32          {'user_form': user_form},
33          context)
```

Figure 3-35. *Views.py file from the 'authentication application. This file handles the register forms, and saves the input user data to the databse.*

Over to the view.py file shown in figure 3-35, first of all, we need to import the User_Form class from forms, so we can use this in the view. This is done at line 8.

Then, a function called register is created. In line 12, we request the context and save it in the variable "context".. If the request method is 'POST', the data entered in the fields in the template will be requested and saved in the variable "user_form", as shown on line 15. On line 17 the django function 'is.valid()' checks if the form contains valid data, if it does it uses the .save() function to successfully save the data to the database. Then, on line 21, the password entered by the user is hashed for security reasons. And the object gets updated. Now, after all this is

finished the user receives a success message which outputs that the process is finished and the user registered successfully.

When this function is called all the data are as mentioned save in the database. It is now possible to use this data in other functions. All data are also displayed in the admin interface, which is covered later in this section.
Now if the request method never was ‘POST’ from the start, the user is redirected to the register template which contains the user form. To be able to display this, a variable called “user_form” is created, this contains all the fields specified in the forms.py file. This variable also has to be represented in the template itself.

```
23
24          <h1> Register to Tingtun <h1>
25
26
27  <div class="f_unify">
28
29          <form id="user_form" method="post" action=""enctype="multipart/form-data">
30          <fieldset class="mainfieldset">
31
32          <div class="singlerow">
33          {% csrf_token %}
34
35          {{ user_form.as_p }}
36          </div>
37          </fieldset>
38          <input type="submit" name="submit" value="Register" />
39          </form>
40
41  </div>
42
43  {% endblock %}
```

Figure 3-36. *Register template which displays the register attributes.*

On line 37, the user_form is displayed. The “.as_p” connected to the variable, determines how the form is displayed. In this case the form is displayed as paragraphs in HTML. Another thing that is important to notice in this figure, is the “csrf_token”. This is a middleware provided by django to ensure that cross site forgery does not happen. It is implemented in all the forms we have made so far, and it’s important to ensure that this is also used in any future forms.

As an example to how this data can be used, we have also made a login function which compares the data input and redirects the user to the pdfchecker, as shown in figure 3-37.

```
38  def user_login(request):
39      # Gets the request's context so it can be called in render_to_response
40      context = RequestContext(request)
41      # If it's a HTTP POST, process form data.
42      if request.method =='POST':
43          # Gather the username and password obtained from the login form.
44          username = request.POST['username']
45          password = request.POST['password']
46          # User object returns if information obtained from the login form are correct
47          user = authenticate(username=username, password=password)
48          # If we have a user object.
49          if user:
50              # If the account is active.
51              if user.is_active:
52                  # If the account is valid and active, the user logs in and is in this case redirected back to the pdfchecker.
53                  login(request, user)
54                  return HttpResponseRedirect('/pdfchecker/')
55              else:
56                  # If the user is disabled, the user will be informed of this.
57                  return HttpRepsonseRedirect("Your Tingtun account is disabled. Contact the administrator")
58          else:
59              # If the login information provided are wrong, the user will informed about this.
60              print "Invalid login details: {0}, {1}".format(username, password)
61              return HttpResponse("Invalid login details supplied.")
62      # The request is not a HTTP POST, the login forms then get displayed.
63      else:
64          return render_to_response('authentication/login.html', {}, context)
```

Figure 3-37. *A function also in the views.py file from the application 'authentication'. Input data is compared to database data.*

.On line 40, we request the context into a variable as usual. Then the function checks if the request method is 'POST', if it is, the username and password data are both obtained from the login form. Then a variable is made containing 'TRUE' or 'FALSE' depending on the obtained data is correct. This variable uses the Django middleware 'authenticate' [7]to perform this operation. Then the function checks if we have a user object, and then if this object is active. This is also an implemented Django function. How to activate and deactivate accounts are covered in the admin interface section of this document. Now, if the user is active, the user logs in and is redirected back to the 'pdfchecker' template. If the user is disabled, they will be redirected and a response explaining the problem will be shown. The user will also be made aware of any invalid login details, which then also formats the fields, making them blank. If the

7 https://docs.djangoproject.com/en/dev/topics/auth/

request was never a ‘HTTP POST’ in the first place the user is redirected to the login.html template, displaying the login fields (figure 3-38).

By logging in, the user’s ID gets saved in the session, and from here it is possible to make further use of this session. This is described in the 3.6.2 section.

```
{%extends 'authentication/base.html' %}
{% block breadcrumb %}
            <li class="">
                <a href="../login" title="Log in">Log in</a>/</li>
{% endblock %}

{% block active %}
        <ul>
        <li class="first ">
            <div>
                <a href="../register" title="">Register</a>
                <span class="none">.</span>            </div>
        </li>
        <li class="last active ">
            <div>
                <a href="../login" title="Log in">Log in</a>
            </div>
        </li>
        </ul>
{% endblock %}

{% block content %}
<html>
<head>
    <title>Tingtun</title>
</head>

<body>


        <h1> Login to Tingtun<h1>

        <form id="login_form" method="post" action=""/>

        {% csrf_token %}
        Username: <input type="text" name="username" value="" size="50" />
        <br />
        Password: <input type="password" name="password" value="" size="50" />
        <br />

        <input type="submit" name="submit" value="Login" />
        </form>

</body>
</html>
{% endblock %}
```

Figure 3-38. *The login template from the ‘authentication’ application.*

The major thing to notice here compared to the other templates, is that the fields are just regular HTML fields. This is because we really only want to compare the data put in these fields to the data in the database. Other than that, this is just a regular template with a ‘POST’ form.

3.7 Users

To meet requirement **R.10**, which require several different roles of users. Each with defined set of permissions, Django provides an admin interface which covers all of these. As stated in the requirement, there were also the question about shown statistics. The group has unfortunately not been able to focus on this, but there are plenty of room for developing this further, by using the various options described in this section in combination with Django packages who focus on retrieving statistics.

3.7.1 Handle users through the admin interface

To be able to understand the easiest way to manage users, an introduction to the admin interface is required. First of all, we have activated the admin interface through the several steps described in the django documentation. This includes, marking it as active in the ‘INSTALLED_APPS’ section in the settings.py file, and also including it in the urls.py file for the Django project. The interface is accessible through the path /admin/.
After users have registered through the register portal, the interface provides a wide range of options regarding user management.. First of all, to be able to log in to the admin interface, an active user with a superuser status is required. To create one manually without interacting with the admin interface, it is possible to do so through the CMD/Terminal windows. The following command will start the superuser prompt: ‘python manage.py createsuperuser’.
Logging in with a active superuser account will display the two sections, ‘user’ and groups’. The ‘groups’ sections does not contain any data at this point, but it is possible to create groups manually in the interface and connect different users to these.

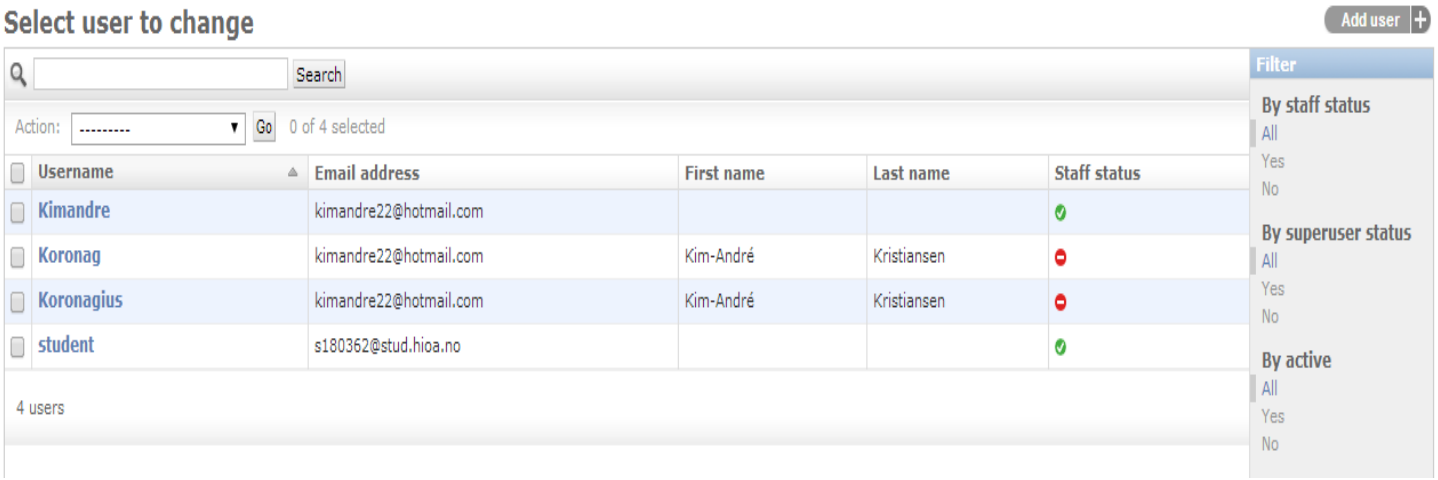

Figure 3-39. *The user section in the Django admin interface.*

An example of the user section is displayed in figure 3-39. There are several functions included here. The admin can do searches, defining part of or the whole of user attributes. It is also possible to filter by user status. If the admin want to add users manually, it is possible to do so by pressing the ‘Add user’ button, here a username and password has to be defined to create the user successfully. The action bar at the top over the ‘Username’ provides a delete function which will delete all the users marked in the checkbox. If any of the usernames are clicked on, a new window appears, with more options, as shown in figure 3-40.

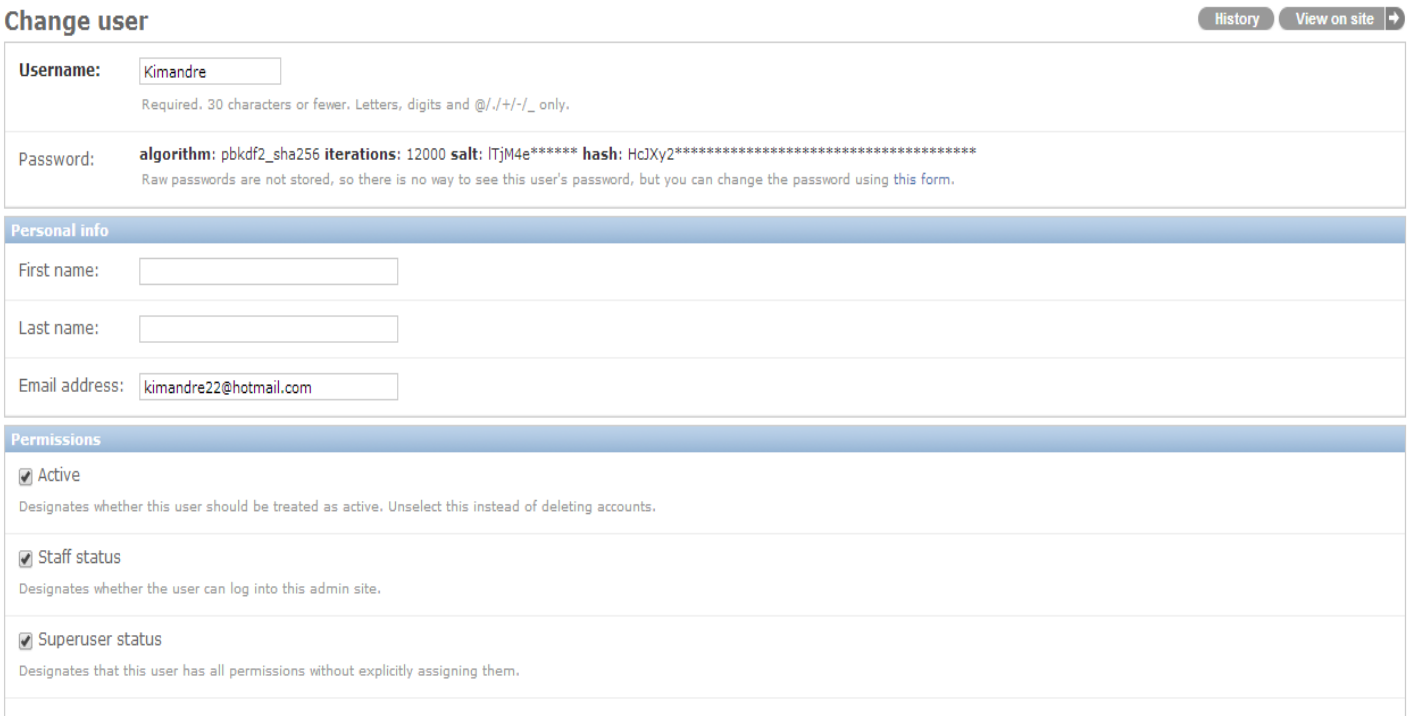

Figure 3-40. *Changing user information in the Django admin interface.*

Here, all personal info about the account is stored. And it is also possible to do various changes to these. The most important section to notice here are ‘Permissions’. By checking or unchecking these boxes, the administrator decides if the user is active or not, or if it has a staff or superuser status. There are also several options not included in figure 3-40, where the administrator can pinpoint the user permissions, such as adding timestamps, sessions and so on.

3.7.2 Further development with users

Backtracking to the login section, there are several uses of the saved session. One example of its uses is shown in figure 3-41.

```
1  def logged_in(request)
2      if not request.user.is_authenticated():
3          return HttpResponse("You have to be logged in to view this site")
4      else:
5          return HttpResponseRedirect('/pdfchecker'/)
6
```

Figure 3-41. *An example on of a function which checks if a user is logged in.*

Here, a logged_in function is made. Let us assume that this example is connected to the /pdfchecker/ path in urls.py. Now, the Django authenticate framework will check if the user session is ‘TRUE’, if it is not a ‘HttpResponse’ message will be shown to the user informing about the required authentication. If the user is already logged in, a redirect to the /pdfchecker/ path will automatically happen. These views can be connected to the urls patterns in the urls.py file as a addition to the already defined views.

Now, this doesn’t mean that it is required to make whole functions to restrict access. It is also possible to restrict access to content in templates, by doing the following showed in figure 3-42.

```
1  {% if user.is_authenticated() %}
2  <p> Show content </p>
3  {% else %}
4  <p> Other content </p>
5
```

Figure 3-42. *An example of how to hide content from users who are not logged in.*

The Django authentication middleware is used as the statement on line 1 in the example.

3.7.3 Further Development with the PDF-checker

To increase the user experience, and the effectiveness of the application, it is possible to allow the users to upload several PDF files in one instance. This can be done by using a javascript jQuery function, which clones the fields by interacting with an OnClick-button. The javascript function itself, would look like something displayed in figure 3-43.

```
function cloneMore(selector, type) {
    var newElement = $(selector).clone(true);
    var total = $('#id_' + type + '-TOTAL_FORMS').val();
    newElement.find(':input').each(function() {
        var name = $(this).attr('name').replace('-' + (total-1) + '-','-' + total + '-');
        var id = 'id_' + name;
        $(this).attr({'name': name, 'id': id}).val('').removeAttr('checked');
    });
    newElement.find('label').each(function() {
        var newFor = $(this).attr('for').replace('-' + (total-1) + '-','-' + total + '-');
        $(this).attr('for', newFor);
    });
    total++;
    $('#id_' + type + '-TOTAL_FORMS').val(total);
    $(selector).after(newElement);
}
```

Figure 3-43. *Javascript function which can be used to duplicate forms.*

When implementing this in the ‘pdfchecker’ index template, the javascript code should look like something presented in figure 3-44.

```
<script>
    $('#add_more').click(function() {
        cloneMore('div.table:last', 'service');
    });
</script>
```

Figure 3-44. *Adding the javascript function in a template.*

The ‘add_more’ should be replaced with the button that activates this function. At the ‘cloneMore’ the ‘div’ name is set for ‘table’, this should be replaced with the div name were the forms are duplicated. An example of how the forms should be displayed in a template is shown in figure 3-45.

```
1  {{ formsetFile.management_form }}
2  {% for form in formsetFile.forms %}
3      <div class='table'>
4      <table class='no_error'>
5          {{ form.as_table }}
6      </table>
7      </div>
```

***Figure 3-45**.An example on how the forms should be displayed when using the javascript function.*

The ‘management_form’ at line 1, is used to keep track of all the additional forms that are created. If this is not included, a validation flag will be raised. By making a for-loop, the forms are displayed properly when cloned. This is also needed to be able to extract the data from the forms properly.

4.0 Test report

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4.1 Preface

Quality assurance, goals of testing

To ensure that every requirement is met, the group will conduct several tests. Each test will consist of checking a predetermined set of requirements. Considering this, the group will mark each requirement with test numbers which are connected to each test.

The test are divided into these phases:

T1 = Regular testing of functionality.
T2 = Comparison testing to the current application.
T3 = Testing the requirements to see if they meet the WCAG requirements.

4.1.2 Requirements and connected tests

User functionality

R.1: The end user should be able to upload PDF-documents or link to documents online **T.1, T.2**
R.2: The application shall list the detected barriers found in the PDF documents **T.1, T.2**
R.3: The application GUI should follow WCAG guidelines **T.3**
R.4: The application shall refer to the WCAG guidelines when presenting the detected barriers **T.1, T.2, T.3**
R.5: The user should be given a structured list of the detected barriers **T.1, T.3, T.4**
R.6: The user interface of the PDF-checker should be easy to use for end users, and should not require any training prior to interaction with the application **T.3**
R.7: Administrators should be able to access statistics collected by the PDF-checker **T.2**

System functionality

R.8: The system code should be written efficient and performance optimized, and the application should be as fast or faster than the existing solution **T.1, T.2**
R.9: The PDF-checker should be developed according to selected coding standards and easy to maintain for administrators **T.1, T.2**
R.10: The system should provide an authentication and access control mechanism to match logins to specific users roles. This should include a regular user, a reporter role who can access statistics, and an admin role, or superuser with all privileges **T.1, T.2**

System properties

R.11: The system should not have any browser or platform specific dependencies, and should work the same way regardless of client details **T.1**
R.12: The system should be secure against malicious PDF files uploaded by the user, and should reject these if they contain exploits or any code that can harm the system **T.1**

New functionality

R.13: The user should be able to upload multiple PDF files and check these simultaneously, where a single test run will return test results for each selected file **T.1, T.2 (Requirement left out)**
R.14: The system should prevent the user from uploading the same document multiple times during the same check to prevent unnecessary traffic to the server **T.1 (Requirement left out)**
R.15: The user should be able to insert multiple URLs and check these simultaneously **T.1, T.3 (Requirement left out)**
R.16: The user interface should support multiple languages **T.1, T.3 (Requirement left out)**
R.17: The application should support accessibility tools such as screen readers **T.1, T.2, T.3**
R.18: The application should provide suggestions on how to remove any detected barriers **T.1, T.3**

Additional
R.19: Continuous use of the application should trigger a mechanism where the system informs the user about how they can contribute to further development through donations or payed services **T.1**

4.1.3 Testing under development

While developing the new solution, we tested the application regularly to ensure that everything worked properly. To discover errors and get feedback on these, the implemented debug function in django were set to 'TRUE'. Django returns information about the found errors, and refers to the file and line where the errors were found. This is an effective way to fix discovered errors. However, the information regarding some of these errors were not as self-explanatory as we hoped. Even though we looked in the Django documentation for an in depth explanation, it did not seem like the problem had any connection to the provided information. When encountering these, we quickly solved the problems by researching for questions asked related to the errors on sites such as stack overflow.

4.2 Test phases

Test one (T1), will cover all the regular functions of both the 'pdfchecker' and 'authentication' application. When checking the PDF-checker, we will ensure that the forms are shown properly, and that the links to the PDF documents are sent properly to the backend. The results retrieved from the backend shall be shown accordingly in the GUI.

Test two (T2) covers comparing the groups solution to the already existing solution. This to ensure that the new solution is as good or better as the existing one, in forms of interacting with the GUI and also the speed of checking the PDF.

Basically, test three (T3), is done just to ensure that all the regular WCAG 2.0 guidelines are met.

4.2.1 Test phase one (T1)

When doing the regular testing of the 'pdfchecker' application, we used a set of different PDF-files to ensure that all the results were presented in the way we wanted them to. One of the PDF-files were set up in such a way that all of the available tests in the backend were done.

To check that everything regarding the 'authentication' application worked properly, we registered several different users and then proceeded to try logging in with them. When performing this testing, we encountered a problem. After registering users, it was not possible to log in with them. When checking the admin interface for clues, it seemed like the users were registered properly.. But when investigating further, the password did not get hashed as it should when registering. After researching the problem in the Django documentation and on the web, a solution to it was found. By not using the password fields implemented in the 'User' object and rather use the built in authentication form 'UserCreationForm', which contains password fields as default, the problem was solved.

Both of the applications have been tested in all the major browsers; Chrome, Firefox, Internet Explorer, Opera and Safari.

To ensure that all related Django and Python code is easy to understand and maintain, comments have been used as a tool to explain how code works.

4.2.2 Test phase two (T2)

In general the current solution compared to the groups, is very similar in ways of design. So when interacting with the GUI the results provided was satisfactory. But as the GUI is not yet entirely finished, the testing of this is limited.

To ensure that the application is as fast or faster than the current application, we tested both application with different PDF-files, and timed the response time. The result showed that the response on the new application were very similar to the current application.

4.2.3 Test phase three (T3)

To be able to determine if the current application meet the WCAG 2.0 guidelines, a series of websites offers a tool where the user input a URL to the site which will be checked. And then outputs the errors found and refer to related WCAG 2.0 guidelines.
In good spirit, we chose the Page Checker provided by the employer. At first we had several errors in both the ‘authentication’ and the ‘pdfchecker’ applications, but these were quickly resolved. In the end, the only error we were left with, were a label error which we believe is an error we cannot do anything with considering it has something to with the Django middleware used to display the fields.

4.3 Conclusion

All of the test phases have provided us with results which we have used to improve both of the application. And have also ensured that requirements like R.3, R.8 and R.11 have been successfully met. A test phase where users would be involved, is something that was planned in minor detail early in the project, but as the project came to an end, there was no time for this. It would surely have been useful in regard to user feedback, leaving information which could have been used to improve the application.

5.0 User manual

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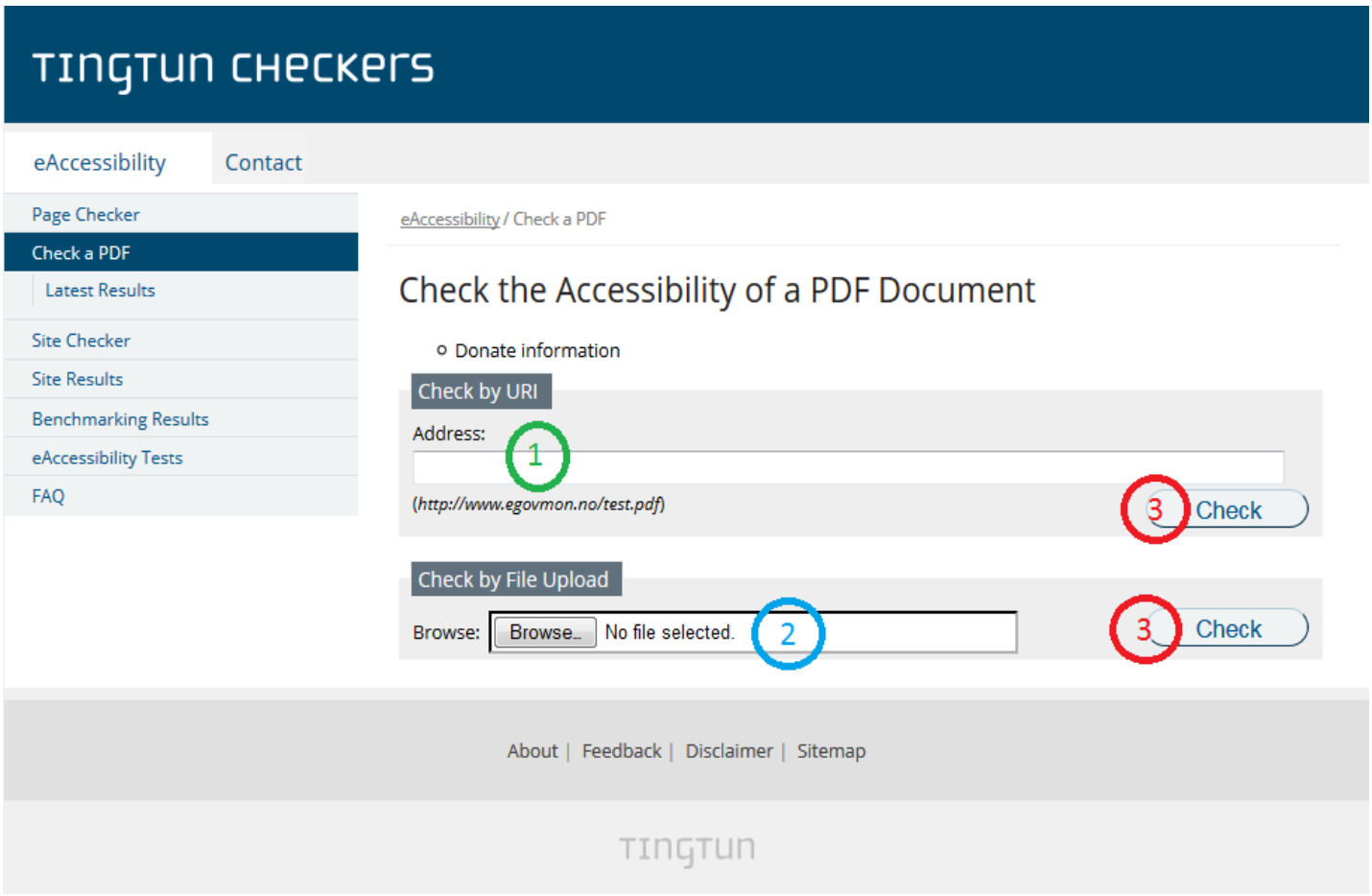
This manual will help users get started with Tingtun Accessibility Checker, and how it can be used to check the accessibility of PDF-documents. We have tried to make it as short and concise as possible.

The first thing seen when opening the PDF checker is a screen that look like this:



Figur 5-1. *The index of the PDF-checker.*

When this screen is displayed, the options of inserting either a URI or uploading a PDF are available.

This field allows you to insert a web address. If the PDF document you wish to check exist somewhere on the internet, you can choose this option to type in or copy the address to that document.

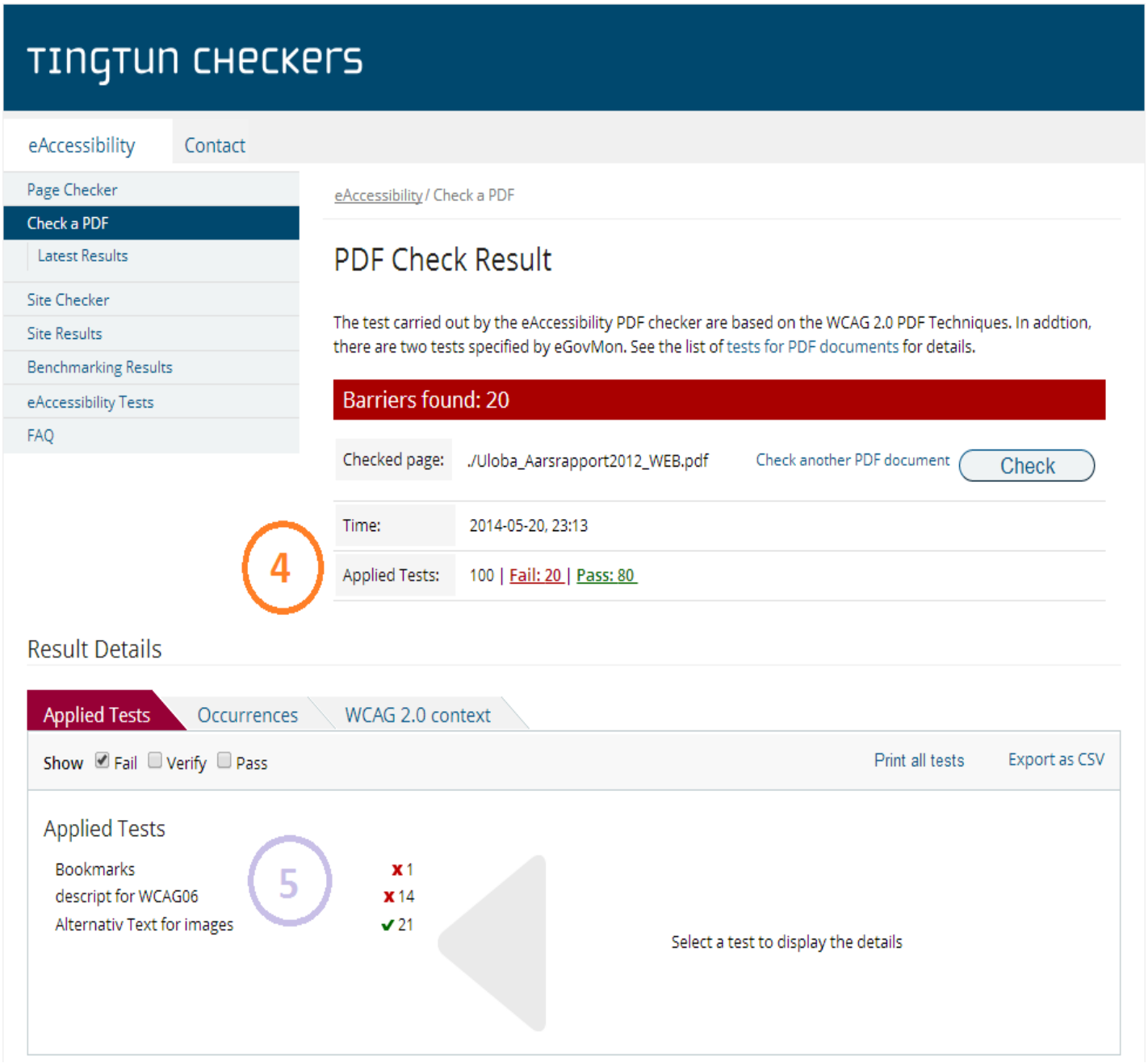
If the user rather want to check a PDF file that is stored on a personal computer, the secondary option here allows the user to choose among the files stored locally on a hard drive. When clicking “Browse” a window will open. From here navigate to the folder where the PDF-file is stored, select it and click “Open” to complete this step.

Finally, when either step 

or 

is completed the test can be run by clicking the “Check” button next to the chosen option.

This will take you to a new page that shows you the result of the tests



Figur 5-2. *Result page of the PDF-checker.*

The result will include information about the number of tests applied to the document selected, and show the ratio between the number of tests that passed and failed.

Here you can find a list of each test that was applied to the document. Each of these can be selected to display information about why this test was passed or failed, and if it was the latter, it is possible to get more information on how to improve the content to solve this.

6.0 Sources

Django tutorial

http://www.tangowithdjango.com/
https://docs.djangoproject.com/en/1.6/ref/contrib/csrf/

Python

https://wiki.python.org/moin/ForLoop
https://docs.python.org/2/tutorial/controlflow.html#the-range-function
http://www.tutorialspoint.com/python/python_while_loop.htm

StackOverflow:

http://stackoverflow.com/questions/10902340/multiple-file-upload-django
http://stackoverflow.com/questions/501719/dynamically-adding-a-form-to-a djangoformsetwith-ajax
http://stackoverflow.com/questions/23722209/djang-admin-interface-invalid-password format-or-unknown-hashing-algorithm
http://stackoverflow.com/questions/22958250/upload-file-through-url-in-django
http://stackoverflow.com/questions/23564252/need-the-uploaded-file-in django?noredirect=1#comment36173977_23564252

Timestamp:

http://www.cyberciti.biz/faq/howto-get-current-date-time-in-python/
https://docs.djangoproject.com/en/dev/topics/i18n/timezones/

Javascript

http://jsfiddle.net/hQ7y5/
http://api.jquery.com/hide/

Tools:

http://www.putty.org/
http://www.tylerbutler.com/2012/05/how-to-install-python-pip-and-virtualenv-on-windows-with-powershell/
https://pypi.python.org/pypi/pip
http://winscp.net/eng/index.php
http://notepad-plus-plus.org/
http://komodoide.com/komodo-edit/

From Wikipedia:

http://en.wikipedia.org/wiki/E-Government
http://en.wikipedia.org/wiki/Markdown
http://en.wikipedia.org/wiki/Graphical_user_interface

Youtube:

https://www.youtube.com/watch?v=3DccH9AMwFQ (part 1-10)
https://www.youtube.com/watch?v=4Mf0h3HphEA&list=PLEA1FEF17E1E5C0DA

Other:

http://www.techrepublic.com/blog/web-designer/effective-design-principles-for-web-designers-repetition/
http://www.w3.org/Provider/Style/URI