CREATING A WEB APP FOR THE PSYCHOLOGY DEPARTMENT OF THE UNIVERSITY OF TRIER

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The psychology department of the University of Trier commissioned a web app to observe user behavior. They provided specific instructions in non-technical language about what they wanted to appear on the screen. Through weekly meetings, the supervisor provided feedback and the application was corrected and refined and became closer to the end goal until the project’s conclusion.

The goal was to produce a web app capable of collecting particular data about each user. This was done with the help of internet documents, forums, and videos. This project relates to the mounting research about how video games are relevant to psychology and vice versa.

The resulting application was seen to be capable enough to motivate the psychology department to launch a study involving the app to examine the resulting data from the study for psychological research.
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1 INTRODUCTION

According to the commissioner of this project, video games are related to psychology. Video games are a human activity and humans' behavior is governed by psychology. Linking the two could lead to interesting results in research.

1.1 Background

The Psychology department of the University of Trier (uni-trier.de) is constantly involved in studying behavior. They always have several tests running and they are branching out to explore related areas in the science. One PhD student is exploring how video games may be a means to study the phenomenon of behavior further. Several members of their team wrote a research paper recently. It is about relating motivation scales with previously established video game related research (Poeller, S., Birk, M. V., Baumanne, N., Mandryk, R. L. 2018). The Psychology department saw the opportunity to explore how video games relate to psychology more concretely by commissioning this thesis project.

The department is interested in doing this sort of project on a larger scale. In the future they would use more programmers and sound designers and artists. For this kind of large scale project you need money. They chose to commission this proof of concept in order to apply for the grant application because it does not cost money. The qualifications of the writer of this thesis that are the basis of their ability to participate in this project include previous projects such as developing simple web apps.

1.2 Objectives and Purpose

The purpose of the project is to build a functional web application that tests the user's memory with thematic pictures. It gathers data in the background with which the psychologists attempt to observe how motivation would influence user behavior. It is just one small part of a larger idea to make a video game-like application. One goal of the project is to make it appear as much as possible
like an entertaining game to the player as opposed to making it look like a psychological exam.

The app is run in the latest version of the Firefox web browser. Some languages used are HTML, CSS, JavaScript, jQuery, PHP, and SQL. Data is stored in a database for later processing by the psychologists.

Upon completion of the project, a study would be done to check for correlations between the data generated and data from other psychological tests. This study is beyond the scope of this thesis. This proof of concept will be used to obtain a research grant which will be used to pay for the production of a higher quality project in the future.

1.3 Framework and Limitations

The goal is not to develop a full featured video game. It is a success if something is created that could be improved upon after completion of the project. This project is not automating or replacing anything and it does not attempt to do so. The limitations include prior experience, and the difficulty of bridging the gap in understanding between the psychologist commissioners and the programmer.

1.4 Justification

This project is a good match for the degree program because both the project and the degree program belong to the field of IT. Numerous skills are gained in the areas of client communication and in practical development. This exact project is the kind of thing that research teams pay IT specialists to do for a living. It is valuable as an advanced stepping stone into working life.

1.5 Motivation

Psychological information about a person can be used to predict long term trends in a person's choices. Much of the information you can glean from the field about yourself is unconscious. These are the kinds of things that a person does not already know about themselves. Most people do not have access to much of the information about themselves that can be uncovered with relatively
little effort from a psychologist. This can lead to a person making life choices that do not line up with what is best for them in the long term. This can lead to frustration and feeling unfulfilled and stressed. In this way, the project aims to increase the net happiness of the world. This is presumed because it aims to provide a way to observe the results of providing people more data about themselves.

Observing motivated behavior is important because it helps link an observed action with a reason for the action. In this way it helps answer ‘why did this person do this?’. The goal of this project is to provide a way to glimpse aspects of behavior, to gather more data, in a way that is more cost effective and has a lower dropout rate than previous psychological exercises. Several people in the psychology department testify that a significant bottleneck in psychology research is a low amount of high quality and organized data. The tool, if successful, could be useful in a variety of applications in psychology.

Every day, video games become more relevant as we hand over more and more work to robots, freeing up more time for everyone to relax and have fun. More time than ever will be spent in virtual reality than ever, and it is important to stay up to date about how these activities relate to psychology and the brain.

1.6 Research Questions and Methodology

What factors influence a video game player’s likelihood of continuing to play the game versus stopping the game? How is a psychological test gamified? How are common web development tools and languages used to produce a video game? These are some questions that will be addressed in this thesis aided by research.

Player retention is important. The amount of people who participate in online psychological tests often dwarfs the number who complete the exercise. If the exercise is gamified there might be gains in this area. This means that a larger fraction of the people who begin the test would stay until the end because video games are entertaining and much more interesting. There has been increasing amounts of research done on player retention. This is because the gaming
industry has exploded in recent years and it has become many people’s livelihoods to keep people glued to their screens.

Gamification is an area that is growing rapidly. It is useful to make a necessary task interesting to people who are needed to perform the task. Gamifying this task will help increase the amount of data available for psychological study if it works.

HTML was designed for the purpose of creating web pages where information can be displayed to a user in a static way. Web development languages will be used to produce a videogame-like app.

Regarding the User Interface design decisions, the team of psychologists who commissioned this project have total control. They are interested in very particular psychological aspects of user behavior. The researchers have methods in mind to promote expression of these. As the writer of this thesis does not study psychology, they are unable to comment on the majority of the graphical design choices that influence the planning and developing of this project.

1.7 Thesis Structure

There will be a discussion of the questions outlined in the previous sub chapter. Then there will be one chapter dedicated to the code that makes up the app, including some noteworthy mistakes and what is learned from them. Finally the application documentation is included.
2 DOCUMENTATION

In this chapter, first there will be a more general user friendly guide. Following this will be a more technical approach. This application was designed to be used in a study by the psychology department of the University of Trier, Germany. The images that are shown in this chapter are screenshots of the app running, which was created by the writer of this Thesis. Any content that appears in the screenshots including text and images was supplied by the team of psychologists who commissioned the app for their research.

2.1 Overview

The app puts the user into a character on the screen. This is done by using a cover story that is displayed for the user to read. It talks about how their character is going to a new job place (Image 1). The character is called Stefan or Stefanie depending on what gender the user entered in the form at the beginning of the app.

Bitte versetzen Sie sich in die Rolle von Stefanie.

Stefanie arbeitet seit fünf Jahren in einem Familienbetrieb in einem kleinen Dorf im Münsterland. Im ersten halben Jahr war sie dort sehr glücklich - alles war neu und aufregend. Im Laufe der Zeit wurde sie jedoch immer unzufriedener. An ihrem Arbeitsplatz fühlt sie sich nicht wohl und auch ihre Freizeit erfüllt sie nicht. Ihr langjähriger Freund hat sie gerade verlassen. Sie hat zwar eine Hand voll Bekannte mit denen sie selten mal etwas trinken geht, die meisten Abende guckt sie jedoch alleine Serien.

Nach längerer Überlegung hat sie beschlossen, etwas zu verändern. Sie hat ihren derzeitigen Job gekündigt und sich in einer größeren Stadt für einen neuen Job beworben, der hoffentlich mehr zu ihr passt. Im Zuge der Bewerbung nimmt sie an einem Eignungstest teil.

Stellen Sie sich vor, Sie sind Stefanie, die jetzt den Eignungstest durchläuft.

Image 1. Cover Story

As the application was designed to be used by natives of the German language, you will not find any English. There are translations of each Image in Appendix 1. In the App, when you click through the cover story, your character is sitting at their desk at their office (Image 2).
The user’s screen zooms into the computer and a memory test begins. This entire app is centered around this test that the user then completes. The test is divided into sections. First there is the learning phase. Before each phase there is a page explaining what will happen and what keys the user should press. This is where twenty images are displayed along with texts (Image 3). Each image is accompanied by audio of a person talking for ten seconds. The audio is meant to encourage the memory link between the image and the text.
There are five test phases. During each of these, each of the images from the learning phase are displayed twice. Once with the correct text and once with an incorrect text. The incorrect text for one image is simply a different image's correct text. For each of the 40 images in a test phase, the user must press a key that corresponds with whether they think it is the correct text for that image or not. The time it takes the user to press a key and their accuracy are recorded.

After each of the first four phases, the screen zooms back out from the character’s computer screen to show the same scene from the start of the app. A thought bubble appears over the character’s head. There is an image in the thought bubble and it enlarges to fill the user’s browser window. Some text appears over the image describing a memory from the character’s life. A clip of music is also played. Then the image shrinks back into the thought bubble and fades away. Then the character’s computer screen enlarges to fill the user’s browser window and the user continues on with the next phase. After the fifth phase, there is a questionnaire that asks the user what they thought about the whole experience (Image 4).
2.2 How to set up and run the application

There exists both a folder containing the code that makes up the app, as well as a .sql database file. It is not possible to get passed the first page without a proper database connection and PHP server. Download Xampp from www.apachefriends.org and install it. Give yourself ownership of the /htdocs folder within your personal Xampp installation and delete the index file inside it. Copy and paste the app code into htdocs. Start your new mysql server and Apache with Xampp. Open localhost/phpmyadmin in a web browser. Create a database called ‘implicitness’ and import the .sql file. Modify the db.php file in the root folder. Change "db_server='localhost';", "$db_user='root';," and "$db_password='';" to match your database credentials.

Open the application in an internet browser, preferably the latest version of Firefox, and you are presented with a login screen. Use the username “stage1” and the password “password”. You will be directed to the apps pre-start page (Image 5). This consists of six buttons arranged vertically on the screen with the bottom one being the color green. If the bottom button is not green or something looks wrong, then press the refresh button until it looks good.
At this point it is suggested to put the browser window into full screen mode, as the app was designed with this in mind. This can be done by first clicking somewhere inside the browser window, for instance in the white space to the right of the vertical array of buttons, and then pressing f11 on the keyboard. Press the green “STUDY” button to proceed to the form (Image 6).

Image 6. Form
Before the study participants come into the room you should place some sort of marker on the ‘Y’ key to indicate ‘No’ and one on the ‘M’ key to indicate ‘Yes’. This is because the onscreen instructions will reference these. The user will fill out the form and then follow on screen instructions until the conclusion of the app. When they have left, you may refresh the browser window by holding down the control key and simultaneously pressing the “R” key on the keyboard. This will return you to the pre-start page. It is suggested that you back up the data from the participants as frequently as possible. Backing up the data is done by pressing on the “DATA BUTTON” on the pre-start page and copying the contents and pasting it to a text file saved offline in a location that you have access to. Navigating to the pre-start page after backing up data is as simple as refreshing the browser window.

The content that is meant to be copied can be found in the block of text at the bottom of the page. At the top of the page there exists a table with the data in an easy to read format. Below that is a block of text with only the headings of the various columns. Further below that is a block of text that includes first the user information and then immediately following that is the study data. It is likely that both the user information and the study data are needed (Image 7). Remember to scroll all the way to the bottom of the page and make sure to copy all the data.
2.3 Debugging

The pre-start page buttons are equipped with functionality that may be helpful in debugging. Much of it has to do with skipping parts of the app so that testers and coders can view the app’s behavior in a particular section without needing to go through the process of clicking through all of the elements in the app every single time. The following paragraphs will explain this functionality.

The “VOLUME TEST” button is helpful in calibrating the volume level of the computer. To make sure the user can hear the multiple auditory aspects of the app, the volume level of the computer should be adjusted to make sure all sounds are clearly audible. Pressing this button will quickly rotate through samples of the audio that will be used in the app.

The “FAST LEARN: Makes learning phase go by really fast, Caution: turn off volume.” button is pretty self explanatory. The learning phase of the app is quite long and is tedious to go through every time you want to test functionality that lies beyond the learning phase. Failure to disable volume while using this option will result in dozens of incompatible audio files containing human speech being played simultaneously as the learning phase is rapidly cycled through.
The “SKIPS: Gives you options to jump to various places in the game” button provides skipping functionality. It also generates some text of instruction about how to use this functionality. This text will have a yellow background and it will be found in the upper left corner of the form page (Image 8). Pressing the green “STUDY” button will bring you to the form page. The instructions read: “9: near the end of the learning phase. 2-5: near the end of that number phase. Clicking these instructions will skip this form”.

Image 8. Form with skips enabled

When you are on the form page, and you have already pressed the “SKIPS” button so that these yellow instructions are in the corner, you have the following options. Pressing 9 will teleport you to one of the last few images of the learning phase. This is useful when you want to see the transition between the learning phase and the next part. Pressing the numbers 2, 3, 4, or 5 will teleport you to one of the last few images of phase 2, 3, 4, or 5 respectively. This is helpful when you want to see the transition after the end of a particular phase. Clicking the highlighted yellow area of the instructions themselves on the form page will teleport you to the page following the form the form page so that you do not have to fill out every single element of the form a dozen times in a row while testing functionality that lies immediately after the form.
The “TEST LAST PAGE QUESTIONNAIRE: After you fill out the beginning form (So you are assigned an ID), the cover story page will pause for 10 seconds, and then you can test the last page questionnaire” button allows you to test the questionnaire that lies at the end of the app (Image 4). After pressing this button, fill out the form as normal and press the “Weiter” (continue) button. Then press the “Start” button, and then press the “Weiter” button. Then wait for 10 seconds and you will be teleported to the questionnaire.

2.4 Key Files Functions and Variables

Important files for this project are found in the /home/apps/stage1 directory. The /home/apps/stage1/index.php file is where the HTML for every part of the app is kept. The progression of the app's functionalities is dictated by JavaScript which is kept in /home/apps/stage1/js/js.js. The JavaScript variables and functions are not organized comprehensively. There will be an overview of the most important ones but a full documentation would be extremely complex and lengthy.

Every time something needs to be stored in the database, JavaScript sends a string including the data to /home/apps/stage1/middleman.php. This is done via the todb JavaScript function which can be found in the bottom of the JavaScript file. The app is in large part a long string of JavaScript functions, all in that same JavaScript file. In general, each function calls the next function, or clicking a button that was revealed by the last function queues the next function. One exception is that the element hiding and revealing functionality has been grouped into functions at the bottom of the document because these need to be called more than once. For instance, “openstartscreen” and “closestartscreen” reveals and hides elements of the form page at the beginning of the app.

In the beginning of the JavaScript file there are lists of all of the variables used, for easy adjusting. The first list includes variables that are set to equal HTML elements. After this are some key variables that deserve some explanation. The “answers” variable is an array that contains the strings that coorrespond to the texts that will be shown to the user during the memory test. The “orderoflearningphasedisplay” variable is an array that contains the order that the learning phase will be displayed in. The “order_photos1” and “text1” through
“order_photos5” and “text5” variables are arrays that contain the order that each phase will show the correct and incorrect image/text pairs. After this list of variables, there is another list of variables that are miscellaneous values and placeholders that will be used throughout the app. The less intuitive of these feature explanatory comments in the code.
3 PLAYER RETENTION

Player retention in video games is the measure of various metrics of user engagement (Viljanen, Airola, Majanoja, Heikkonen and Pahikkala 2017). In this thesis retention will be defined as as the ability for the app to retain the user for the full duration of the app. The goal is to get as many people as possible to go through the entire app. This is because a complete data set has more data than a partial one. And the more data, the more accurate the conclusions can be based on it.

3.1 Theory

As Mr. Brown iterates in his speech at the UX summit, emotion is more important than logic in the mind of the player that you are trying to increase the player retention of. The idea here is to put the player in a situation in which they experience the sensation of being part of the game, and that way they could start relating to it and become more interested and invested. This motivates aspects of the final version of the project. He also states that simplicity is paramount. (Brown 2017) You do not want the user to become overwhelmed. Simplicity is key in implementing the user controls and feedback.

The goal is to try to observe motivated behavior. Psychological tests are only successful if the user does not understand all the mechanics of the test. As Brown explains, people want to do things even though they do not know why (Brown 2017). This is a key factor in the process of the project. To hold the user to their seat, they need to be guided by the reassurance that this is merely a game, and not actually a program taking notes on their every move.

Patterns in the user interface are essential. Even Brown makes note of this. Patterns are the only way to keep a player from using too much energy on learning useless things that will deflect from game-play. How to play and what to click should be immediately intuitive. For this purpose, misleading extra features were not added. The elements that are clickable are standard and obvious. This is key also for first impressions, which are crucial. If the user cannot understand what to do when they enter a game, they will depart the experience just as quick as they came in. (Brown 2017)
3.2 Practice

One problem is how to tell the user if their guess is correct or not during the test phases. This is complicated because giving the user all the information about the details of their brief and numerous successes or failures would be too much. The user might guess that the image is paired with the wrong text, when in fact it is the correct match. Implementing a visual feedback system for the correctness of the pair as well as for the correctness of the user’s guess would be too visually distracting. This is potentially confusing when they may appear to contradict each other. Finally, a short and simple audio feedback is implemented only when the user makes an incorrect guess in a test phase.

The character is shown at their desk in front of their computer. The decision was made to animate the transition between this screen and the learning phase where the user is participating in the memory game. This is done by blowing up the character’s computer screen to the size of the browser window. A more simple alternative would be to instantly jump into the screen and begin the memory test. However, this has the potential to make the user loose sight of the story we are trying to tell, where the user is this character using their computer in the game. The user is kept inside the fiction we are spinning, that helps hold their attention more effectively. The user has the opportunity to form a stronger attachment with the app if they identify as the character on the screen. This is reaching toward the greater goal of player retention.
4 GAMIFICATION OF A WEB APP USING TRADITIONAL WEB LANGUAGES

The defining elements of gamification are “a goal, rules, a feedback system and voluntary participation”. Intrinsic motivation is when you want to do something for yourself, and extrinsic motivation is when you want to do something for something or someone else. (Wiklund & Wakerius 2016. 12) The commissioner says that they have a very difficult time acquiring participants for psychological studies, and when they are successful, it ends up being mostly bachelor’s student's studying psychology which isn't a very diverse crowd relative to the population of humans on earth. Commonly the participants are extrinsically motivated by the urge to help the study and advance human research and understanding. It is important also to have intrinsic motivation.

As we know from high school, if you only do homework for the reason of wanting to appease your parents and teachers, you will not get very far. If you actually enjoy learning, you have a better chance at getting good grades. The idea here is to make the exercise enjoyable in its own right. To add some variety and novelty that will make the user actually want to continue.

Game designers often go right for the extrinsic motivators like points and achievements. However, these may distract from the intrinsic motivations felt by the player in the first place that they feel from simply playing the game. (Wiklund & Wakerius 2016. 12) A point system is not used in the app exactly for this purpose. It is possible to fill the edges of the screen with statistics and bubble letters reading “Good job!!”. But simplicity is chosen to be a higher priority. The idea is to get the player to feel as if they are inside the game.

The internet used to be chiefly for document sharing. It has become a complex interwoven web of programming languages that layer functionality on top of each other in a dance stricken with compatibility issues. The dance hopes to achieve data storage on servers, formatting documents and providing interactivity. This is not ideal for programming a video game, when much better platforms exist. (Appalachia 2016, 1)
If a more versatile programmer were to come across this project to create a video game, they may have chosen a more specialized platform. As the project goals are described, web design languages appear immediately to have the functionality needed. Web design jumps out to the writer of this thesis as the method to pursue. This is because at the start of the project there is no system besides web programming that the writer of this thesis has any degree of specialty in. However, despite not using the perfect tool for the task, a great deal of useful expertise is acquired through troubleshooting with web design languages.
5 DATABASE

The app is expected to generate two tables of data (Tables 1 & 2). The app records data in a database with two tables in it, respectively (Image 9).

Table 1. User Data Table

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Gender</th>
<th>Semester</th>
<th>Age</th>
<th>Subject</th>
<th>VPN</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bob</td>
<td>Male</td>
<td>1</td>
<td>22</td>
<td>Psychology</td>
<td>RR30 73 14</td>
<td>Q1:1_Q2:2...</td>
</tr>
</tbody>
</table>

The User Data table (Table 1) shows information about each user including their name and age. The VPN is the student identifier used by the client in the greater University of Trier. It is a combination of some answers given in the form at the beginning of the app such as the day of the user’s mother’s birth and the first letter of the user’s father’s first name. The questions relate to the answers given by the user in the end-of-app questionnaire.

Table 2. Phase Data Table

<table>
<thead>
<tr>
<th>ID</th>
<th>Phase</th>
<th>Pair</th>
<th>Truthfulness</th>
<th>Time</th>
<th>Guess Accuracy</th>
<th>Key Pressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>335</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The Phase Data Table (Table 2) shows information about each of the 40 images encountered in each of the five phases. The ID in the Phase Data Table for a particular user is the same as the ID in the User Data Table (Table 1) for that user. The Phase Data Table includes the number of the phase (1-5), the number of the particular image-text pair (1-40), the truthfulness of the image-text combination (0=false, 1=true), the time that it took to answer in milliseconds, the accuracy (0=incorrect, 1=correct), and the key pressed (0=Thinks the image-text pair is correct (“M”), 1=Thinks the image-text pair is incorrect (“Y”)). Each row is matched to the relevant image-text pair by the Pair number. The order of the pairs in each phase does not change from user to user. The order is defined in several arrays in the JavaScript file. The order was randomized once and then set to be the same afterward for each run of the app. All this data is extracted from the database (Image 11).
The id in the stage1 table is a foreign key that points to the id in the stage1data table. The stage1 table has so many primary keys because there are so many similar rows added with the same id added over the course of someone using the app, that it is the only way to be sure that the primary key is unique. This would have also been solved by creating a table specific id, but that was not thought of when creating the database.

The database was designed with simplicity in mind. Only the information requested by the commissioner is stored. There was not much planning required. During development of the app, it was possible to add a new column to a table here and there as new functionality was discovered to be needed. This happened as functionality was explained, developed, presented, and miscommunications were discovered and discussed.
6 CODING

The bulk of the project is consumed by the piecing together of bits of code. As such this is an important topic for this thesis’ scrutiny.

6.1 Process of Development

Weekly meetings were held during which progress was discussed with the client and results were presented. This allowed the commissioner to detect misunderstandings early and redirect programming effort to guide the project in the most efficient direction.

The database is small and the test data could be inserted with relative ease compared to much larger projects. This allowed quick table reconfiguration and eliminated the need for extensive planning. Database edits on the fly were simple and making them often was not costly.

In the case where the requirements for the week were completed ahead of schedule, there were always other things to work on. For instance creating a live version of the site online and improving aesthetics could always be improved.

The details of the development of the user experience and user interface was dictated by the particular psychological buttons the researchers wanted to press. The team had specific goals for this and communication was paramount to getting it right. They required an intuitive navigation system which was accomplished via clearly labeled buttons and regular patterns in button functionality. It is important to have a single tone played in the event that the user made a particular mistake in the app. More precisely, this was done when the user guessed that a text image pair is correct incorrectly, but not when they guess that an incorrect pair is incorrect, correctly.

A Linux based text editor called Geany is where code was written. To quickly test the code a local PHP server and database was created using Xampp. The database was manipulated initially using PHPMyadmin and some functions such as user creation and data deletion were able to be made into functions that were executed from within the app. The Firefox developer tools were used
frequently in JavaScript and CSS debugging. W3schools.com was used as a reference for all programming languages used. Stackexchange.com was used frequently in debugging JavaScript and PHP, as well as the other languages however less frequently. Functionality testing and usability evaluation was done by running the code in Firefox and interrogating each function individually. Then by checking the outlook against the instructions given by the client and against the writer of this thesis’ personal reaction to the aesthetics. Firefox was the main browser that would be used when the app was used in the study by the department of psychology in the University of Trier.

6.2 Learning

Many things were learned during the process of coding. Among these learned things exists how to write clean code, how not to animate elements, and how not to hide elements from view when you don’t need them on the screen.

6.2.1 JavaScript and CSS

Sometimes referencing an element in JavaScript was necessary. For instance when it was desirable to change a particular CSS property of an element on the fly. In the early stages of the project, the long-form `document.getElementById("my_id");` was used. PHP was used predominantly for much functionality and it was decided that this should be converted to JavaScript. This lead to a large volume of JavaScript. It was discovered that it was possible to make a JavaScript variable point to an HTML element. Creating a list of such variables in the beginning of the document proved to reduce code volume and visual noise substantially. Koller states in his master's thesis that clean code is code that avoids repeating code. His research also points to clean code increasing code quality and maintainability (Koller 2016. 65).

The JavaScript files were organized by the type of code. Functions were grouped together at the start of the document before all the event reactions. This turned out to be a bad idea because when there was a fix that needed to be implemented, it took a long time to locate the relevant code that dictated the behavior of the app at the relevant stage in the order of operations. Therefore, the organization was changed to be the order of operations. Where the code
that effected the first action resided at the top of the file, and subsequent functionality falling sequentially below. Koller also states that clean code should be understandable (Koller 2016. 6).

Animations were added to move some images around on the screen. JQuery was used in the following way:

\[
\text{\$\left(\#\text{elementId}\right).animate\{ css\text{-}property: "value\text{-}unit" \}};
\]

This is not the most efficient way to execute an animation in terms of computer processing. The computer will work less if you use CSS transforms to animate an element, for example creating a class with transition:transform time, style; (Lewis, P., Irish, P. 2013). When you use JavaScript to apply this class to an element, it will animate any change in the transform property. It is important to remember that changing CSS transforms is not an additive action like changing a CSS property through jQuery animations. You need to set the transform to the value that you want to end up with, starting from its original potion, not starting from the position you transformed it to previously.

6.2.2 How to hide elements

The z-index CSS property was used to hide elements that would be used later in the app behind a white background div. Through a misunderstanding of how to efficiently use CSS, full viewport sized divs that needed to be swapped out when different functionality was needed were stacked on top of each other creating a long stack of content stretching far below the viewport. To bring these up to the viewport, large numbers were needed to adjust their distance from the top of the viewport and a different solution was badly needed. An exasperated decision was made to offload not only the PHP functionality to JavaScript but also the HTML. Each element was created and destroyed as needed with JavaScript. This presented many issues, including those regarding proper referencing these elements in CSS, leading to forced CSS property definition in every instance of the creation of an element in the JavaScript, which leads to an explosion of JavaScript code volume.
The CSS property display:none; to manage display is arguably better than the previous solution. Each time an element must be displayed, its display property is changed in JavaScript. CSS transitions on an element are canceled if the display property is changed at the same time. This is not good because it is important to start an animation on an element at the moment that it appears on the screen. The code was changed so that each element that should be hidden had the CSS property of height set to 0. This works for everything except elements containing text, which take up space even when their height is set to 0. This issue was resolved by also deleting the text, and for buttons, simply setting the display property to none, because buttons were not animated.

Something called a “White-space only text” node appeared in particular areas where the browser thinks there ought to be a blank space. For instance between images and throughout tables. This is fixed using a function that deletes them in JavaScript that was posted online by one James Edwards (Edwards, 2012). The images do not pre-load and take time to load when their height is increased above 0. This is unacceptable because instant image switching is important for the appearance of the app. This was fixed by first loading every photo as the largest size it needs to be throughout its career in the app, and then upon everything loading changing their sizes back to the starting positions with 0 height. This loads everything for immediate access later regardless of internet speed.
7 CONCLUSION

The outcome is acceptable to the writer of this thesis. A working proof of concept has been created that has the power to demonstrate feasibility of this idea depending on the outcome of the study results.

The lessons that were learned allow for a much greater degree of intimacy with web app programming. This is extremely useful for future projects and/or employment. It seems that IT is in demand in every field, even Psychology. Everyone needs web apps, and it is important to have capable people who can produce quality products to satisfy this demand.

There were many ideas that were explored during the course of the cooperation for this project. Some of these came close to fruition, as can be seen from the other files contained in the project files. These will easily be made into similar projects. There has been time spent carefully adding comments to all of the files to assist the future collaborator if they are different from the writer of this thesis. They are all in the same theme exploring user behavior through this Stefan or Stefanie character, and when enough of these small projects have been fleshed out, they can easily be put together, as per the commissioner’s plan from the beginning of the project. There is a rich future ahead of this project.
BIBLIOGRAPHY


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APPENDICES

Appendix 1. Translations of text in Images from Chapter 2.
Appendix 1.
Translations of text in Images from Chapter 2.

Image 1 translation:

Please put yourself in the role of Stefanie. Stefanie has been working for five years in a family business in a small village in the Münsterland. In the first six months she was very happy there - everything was new and exciting. Over time, however, she became increasingly unhappy. She does not feel well at work and does not fulfill her spare time. Her longtime friend has just left her. Although she has a handful of acquaintances with whom she rarely ever gets a drink, most evenings she watches alone series. After much consideration, she has decided to change something. She has quit her current job and applied for a new job in a larger city, which hopefully will suit her more. In the course of the application, she takes part in an aptitude test. Imagine that you are Stefanie, who is now undergoing the aptitude test.

Image 2 translation:

In the following you will see 20 couples, each with a picture and a text, and hear a few sentences over the headphones, which should clarify the topic even further. Try to remember which picture-text pairs belong together.

Image 3 translation:

To rise in activity

Image 4 translation:

Please answer spontaneously how much the following statements apply to you. strongly disagree, hits something, Is largely the case or meets perfectly.

1. I enjoy communicating with other people.
2. When I have solved a difficult task, I would like to search for the next challenge.
3. Often, I usually look for an argument with others.
4. It is important to me to find a personal meaning in everything I do.
5. I feel in my element when I can chat with other people.
6. If it's a tough task to tackle, I often volunteer.
7. Others often like to say where they are going.
8. I can only be motivated if I am able to work in a single task.
9. Human closeness is more important to me in my life than achievement.
10. If I can work on a difficult thing for hours, I am completely happy.
11. In my daydreams, I often play the heroic role.
12. The most important thing in life is that you can not be diverted from your own path.
13. I like talking to nice people about everything.
14. Often I am spontaneously looking for an occupation in which I can test my abilities.
15. If I know what I want, I want to get others excited about it too.
16. I want everything I do to bring me further in my development.
17. I value independence.
18. I prefer to decide for myself rather than seek advice from others.
19. I was able to identify well with the person
20. I have solved the task in a concentrated way
21. What do you think about what the investigation was about?

Image 6 translation:

Age, Gender, Male, Female, Other, Field of study, Semester, First letter of the mother’s first name, First letter of the first name of the father, Own birthday Year of birth of the mother, Birthday of the mother, Continue.