

Responsive Web Design Process

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Abstract

This paper gives a short overview over modern web design processes in respect to responsive design. The introductory part of this document gives an overview over what to keep in mind when starting a project. In chapter 2 work flow ideas are presented and compared to the traditional waterfall approach. Then three methods for the actual visual design are described and compared. In the final chapter some testing and documentation libraries and tools are demonstrated using short examples.

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Chapter 1

Introduction

It's not necessary hard to design a homepage. Therefore you can use the "Frontpage Wizzard" or a free "Content Management System (CMS)" with some available standard themes. You can do it within 60 minutes. It doesn't mean that this is a bad idea for a private homepage, but it has nothing to do with the real sense of web design you need for business. The responsive web design process becomes the new Meta for web design. It's a totally new thinking of the needs and a re-arranging of the traditional web design process of the 2000er years. Therefore it needs an open communication, skills, knowledge and time. And the understanding, that web design is so much more than just filling a "Frontpage Wizzard" or a CMS" with plain text and some nice graphics.

1.1 Get in Contact

"Das Bewußtsein ist ein Wissen um unsere Vorstellungen."

Immanuel Kant

Every skilled webdesigner has his own ideas and point of view, as Immanuel Kant mentioned in another case. But it's a good idea to keep in mind, that you're not designing different webpages and webservices for yourself. You're designing it for your client and the potential users.

To start the responsive web design process in a smart way it's a good idea to get in contact with your client and keep different things in mind:

- Who is your client?
It depends if you are designing and working for a big company, small or medium sized enterprises or a single person company.
- What does your client think he needs?
In some cases, your client will have a clear point of view, what he needs. He has a detailed concept of the layout, the whole design and the content. He also thinks he knows what his users want and he just needs somebody to transform his ideas into reality by technical assistance.
- What does your client really need?
In most of these cases, when your client thinks he knows what he needs, he's wrong. Of course it's not easy to tell your client, that he's on the wrong way with his desires and thoughts. But the gap between "what does your client think he needs" and "what your client really needs" can become really huge, if your client is guided by his impressions that are not based on facts.
- Talk about the price
Webdesign takes a lot of time and needs skilled persons. For that reason creating a webpage can't be for free. In times like these, where even the public authority in Graz (Styria) offers webpages for free for

small and medium sized enterprises, it's not easy to make that point clear. At the very beginning of the planning phase, take the time to talk with your client about the price. It's also a good idea to keep an eye on the additional costs like maintaining and updating the website.

1.2 Fundamental Facts

At the beginning, there are some fundamental facts that need to be clear before starting. These facts are the very beginning of the responsive web design process. Based on the answers to these facts, you are able to start your work in the best of all possible ways.

The fundamental facts are:

- **How much traffic will be generated**
Especially for large web projects, the amount of generated traffic is an important point. Most of the users may have high speed internet access, but to have an eye on the server load it is not a good idea, to waste kilobytes useless.
- **Will there be expansions/changes soon**
If there are changes and expansions concerning the company incoming, it's a good idea to be prepared for that. It makes no sense, to design a webpage for a company that will have changed when the design process is finished.
- **Who will maintain and update the website?**
What is the plan for maintaining and updating the website? Is there an own IT consultant or is it the work of a secretary? This is one basic decision for designing the backend of the webpage.
- **What's the main aspect of the website?**
Is the main aspect to inform or to make business? Keep the main target in your eyes and focus on the main aspect.

1.3 About The User

The next step is to get familiar with the potential user of the webpage you are working on. The main aspect is: What's the main device of user's choice?

1.3.1 Possible devices

- **PC / Laptop**
The traditional way to access the internet through a personal computer or a laptop. Therefore you can use high resolutions.
- **Mobile Phone**
The modern way to access the internet through your mobile phone. If the majority of your potential users visit the homepage through a mobile phone, it's a good idea to keep this in mind and focus the whole page to small resolutions. There are different possibilities that will be explained later (see: breakpoints, bottom-up design)
- **Tablet**
Tablets like iPad become more and more interesting.
- **Television**
Modern TV offers the possibility to access the internet.

- Info-Screen
For example in train stations or in a bus.
- Other device
Also be aware of new technologies that are coming. For example: Google 3D glasses,

The internet access through mobile devices becomes more important. Global internet usage through mobile devices, not including tablets, has almost doubled to 8.5% in January 2012 from 4.3% last year according to free web analytics company StatCounter. The firm's research arm StatCounter Global Stats highlights the increasing use of mobile devices to access the internet with market share doubling year by year since 2009 Counter, 2012

All in all there will be more internet access through mobile devices within the next years. A research of Electronic Inc and BI Intelligence shows, how many different devices have been sold and will be sold within the next years. Szygiel, 2012

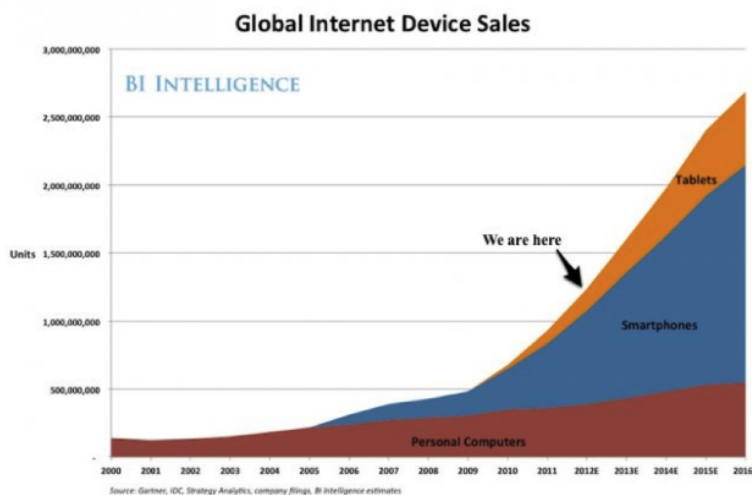


Figure 1.1: Mobile Usage Chart

1.3.2 Details about the user

It is a good idea to know something about the user when you are starting the design process.

- Age
How old are the potential users? The whole design should be orientated on the age of the potential main users. If you are designing a webpage for a company, that produces something for children or teenagers, it would be a good idea to know that and focus on that.
- Education
It is a good idea to know something about the education of your potential users.
- Preferred style
Knowing something about the personal style favorites of your potential users will help you in the whole responsible design process.
- Duration spent on webpage
What is the duration potential users will spend on the website?

1.4 Overview: traditional vs responsive web design

The traditional web design process is not able to fulfill the necessary points that are needed nowadays. The traditional web design process consists of the following points:

- layout and page elements are set to a specific size (pixel-based)
- little room for flexibility
- navigation menus may become unusable
- forms may become inaccessible
- interface may be rendered inadequate

The responsive web design:

- page elements are designed for different views
- pages are not atomic units
- layouts are fluid
- different possibilities for user input (touchscreen)
- important: keep lines of communication open!

Hogan et al., 2012

Chapter 2

Responsive Web Design Process

“All pages of our new web application should be designed to fit to different screen sizes.”

Hubert Steiner at the kick-off meeting of the naida development project in 2009.

"First results in the ongoing web development project have shown, that there is a 1024px or more optimized version available so far, the design team should keep moving towards the right "responsible" direction." The term “responsive web design” describes a website-building process that uses the same set of code to display the page properly on different device classes like desktop, tablets and smartphones. The standard of some years ago to build different web sites in parallel for desktop and mobile versions is gone. The goal now is to provide a very flexible website that handles all environments. The traditional “waterfall” process would be to start with strategy, continue with the design phase, do all the front and back end development. After the page is set up a testing process step should be carried out and finally the web page will be deployed.

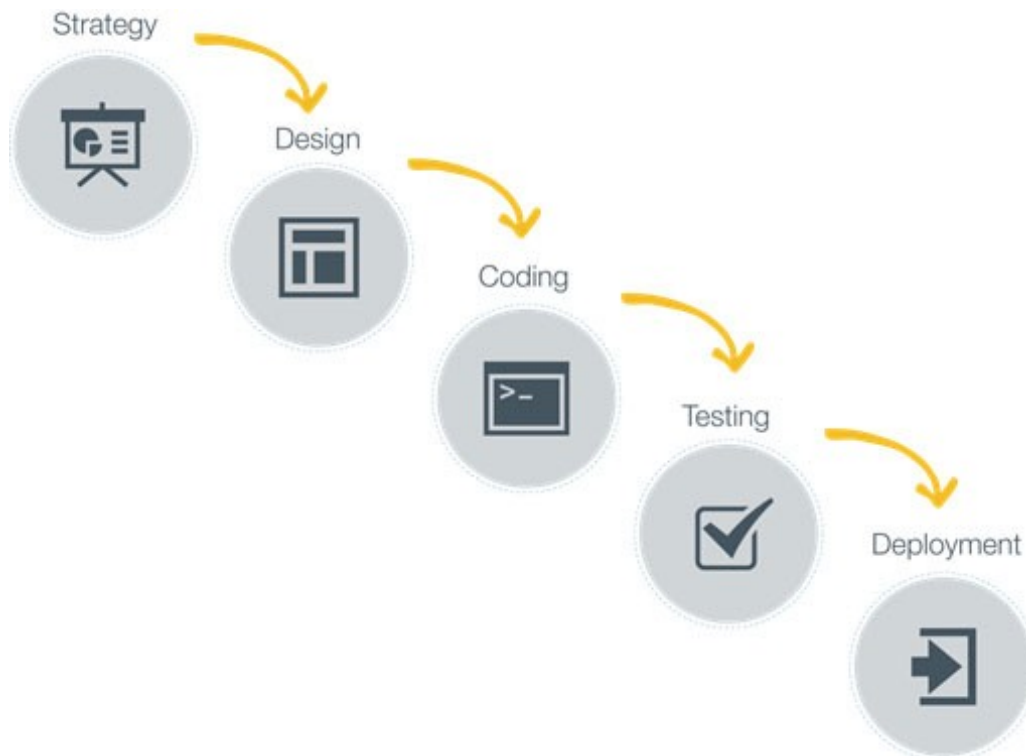


Figure 2.1: Waterfall Design Process Sheppard, 2012

One of the biggest disadvantages of the waterfall process is that the design phase is mainly aimed to develop a pixel-perfect version for large screens. If the design is carried out by an external designer, very often the in-

terface between design and web page development are Photoshop images of the web design. An agile approach with responsive design considers these problems from the beginning. To overcome a pixel-perfect design, a couple of wireframe concepts are used to develop different views of the page for different device classes. If the wireframe-designs are implemented properly, the site will display perfect on mobile devices, tablets and very large screens of desktops. Horizontal scrolling is reduced to a minimum, a little vertical scrolling is no problem at all and the users are accustomed to it. In image 2 the modern “responsive” web design approach is laid out, instead of two different design / coding process steps room is given for a combined iterative design and development process step, where design- and web developer teams work closely together, the continued results of the steps within the process lead to improved versions of the website in different resolutions.

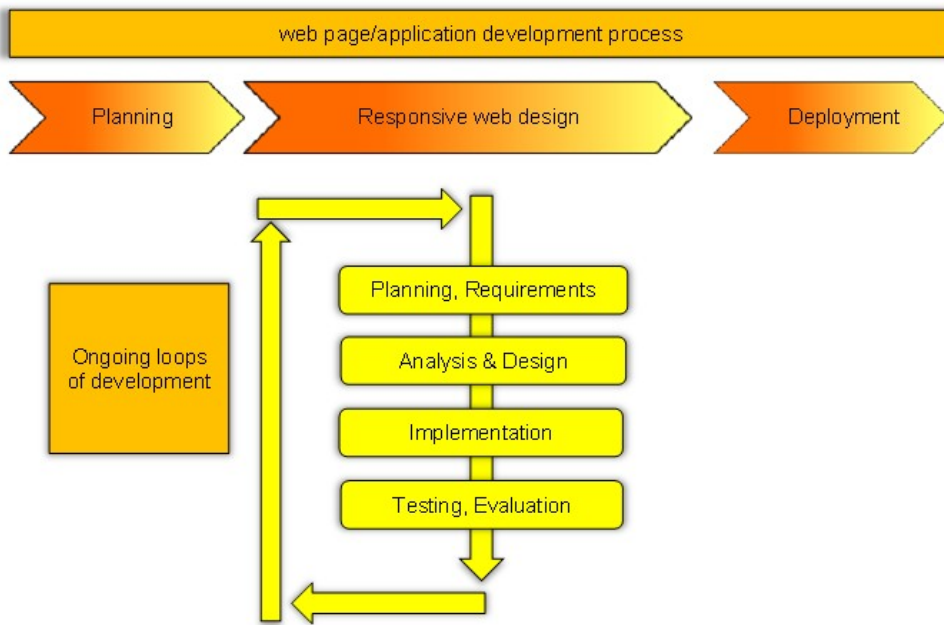


Figure 2.2: Responsive web Design Process

A main task is to find a good solution for the minefield graphic designer + web designer + client. Possible ways to improve the relation of these groups with seemingly different goals is to establish a communication on a regular basis – e.g. every two weeks or so. It is very important to formalize true feedback to the page and design work and to keep personal feelings of single persons out. The client must be involved in a form of structured feedback, as he is the payer for the whole product you are developing. Some clients need to provide their input in order to feel accepted and to put their personal mark on the results. However, if you choose a different path, have a good structure and be able to explain your design and decisions behind it. Both the graphical designer and the web designer should have a look into the world of the other’s profession. Graphical designers should learn basics on how to use HTML/CSS/JS to have a feeling what is possible, web designers should understand why proportions or colours are the way they are in the present design. The total outcome will be even better if these to groups stay in close communication about what they think and what they aim at for the present design. The whole design of the web page (not only graphic or functional design) should be a product of a good interaction design (no strict interface between Photoshop designer and page designing). This matter is especially demanding, if different companies work on the two tasks, as it leads to slightly increased costs when you do another round like image two suggests. It is important to make the client aware of this fact and explain the extreme advantages.

2.0.1 Ten steps for a responsive web design workflow

Hay, 2012

The following recipe is an approach how to develop a process or a structured workflow for a responsive web design company:

1. Create a content inventory

This is a list of all content that could/should appear anywhere on the new web design. Parts of this inventory should be the main site navigation, the logo used, social media links, registration/status link if needed, the date and location, introduction text, speakers, countdown, sponsors, . . . This doesn't mean that everything will be on the final page – but you need to have an idea and a structured approach to have everything needed within reach.

2. Content reference wireframes

These were called wireframes some time before, they allow to draw a couple of sketches how the page layout could look like – also for different device classes. They can be discussed and changed easily. An example for the frames on a web page could be:

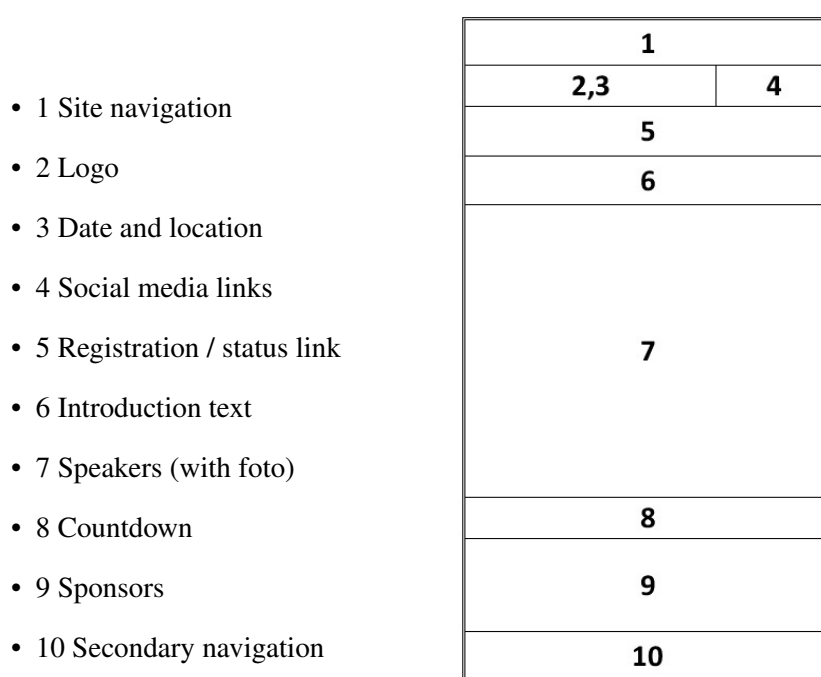


Figure 2.3: Content Reference Wireframe

3. Designing in text (“plain text”)

The first task in this process step is to design the content in plain text only. The client should not see all deflecting html tags. Little clickable things can be part of that – in order that they can be discussed with the textual context. Then the plain text should be converted to HTML in order to have the possibility to display in every browser (which works on all device classes!). The result of this step in creating basic textual content should be text that can be displayed in every browser, especially on small displays of mobile devices.

4. Zero interface (don't add anything)

The concept of a zero interface is to let out anything that is not absolutely necessary, as it could change the whole thing and ruin everything. Avoid too many features. Start with the design from the HTML content out and add a little design, play around, improve good looking things and decide for the best available.

5. Breakpoint graph The breakpoint diagram or breakpoint graph is a visual possibility to make you think about width. First the responsive designer should think in terms of device classes, not devices. The

breakpoints help to establish the moment when a major change in the design's layout (see ?? content reference wireframes) is necessary to fit to a different device class.

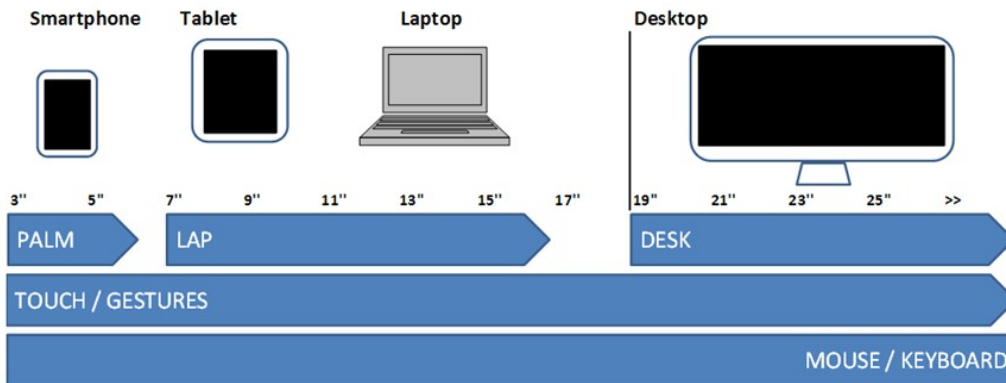


Figure 2.4: Break Point Diagram

6. Design for various breakpoints

In the design phase a lot of sketches should be developed before fully jumping into HTML and coding. Don't use Photoshop, use CSS and HTML instead of static pixel images. Use the opportunity to publish instantly, feed it to the browser and see what it looks like.

7. HTML/CSS/JS prototype instead of Photoshop

No design in static pictures means that the design team should better set up the layouts in HTML/CSS/JS instead of pixelly perfect images. Use the wireframes as a source, and work on to a prototype of the web page without typography, colour and texture. Main reasons for resulting problems in the past were the straight interfaces between Photoshop-Designers and web page developers. All involved persons should work together and communicate which should result in a much better outcome. The project leader needs to take care that there is not too much informal feedback which is usually not documented like phone calls, SMS or instant messages.

8. First presentation of prototype: use screenshots

The first presentation of the new web page should not be a clickable fully functional version of the web design. It is important to present the first results to have a discussion and get feedback from your client. Don't tell the client that there is a working page in place already.

9. Present prototype after revision

Show the operational prototype of the web page after the first revision. Include all your customer's inputs into the page, or explain clearly why you did not include some bits and pieces. The graphic design should be almost perfect already.

10. Document for production

The designers should document and visualize components at the same time for the web page developers. There are a couple of tools available which are mentioned in a later part of this document (like dexy or pattern primer).

Adopting an agile responsive approach will help you to emerge from the main constraints of the traditional "waterfall" process. The outcoming designs and development will be better looking and more productive and efficient on all possible platforms and screens. The real challenge is to break out of the "traditional way" and become responsive in your organization. The ideas and steps above should provide a good base for discussions.

Chapter 3

Design

Olsson, 2012 Buckler, 2009 Heilmann, 2012

3.1 Overview over Responsive Design Approaches

Graceful Degradation	Progressive Enhancement	Parallel design
Top-down approach	Bottom-up approach	Design in parallel
Handlers are added for less capable devices	Enhancements are added for more capable devices	At each design step the design is made for all the different design classes
+ indirect focus on the “greatest” device	+ indirect focus on the “smallest” device	+ every design for every device class at the “same” time

3.2 Graceful Degradation

Graceful degradation in general means that a system is able to continue properly even if faults have appeared. The synonym would be fault tolerance. According to web design this means that the work of designing a web site starts at the top. The top in this context means that the designer takes advantage of the latest and greatest features, which are provided for example by the newest browsers. By using a browser with fewer features the design decreases gracefully, which means that built in handlers manage the functionality for those browsers. This is quite similar for different devices. The principle is to build for the latest and greatest and build handlers for less capable devices. The latest and greatest could be a huge television screen and on the opposite the small touch screen of a smartphone. If this top-down approach is well applied, nearly every design can be viewed in an appropriate manner, that the user can enjoy the content on the device he or she is using.

3.3 Progressive Enhancement

Progressive enhancement is a pretty similar approach to graceful degradation but in the reverse direction. The principle is to design from the bottom, which means for the small devices to the top, where the bigger devices like desktop screens and televisions can be found. The technique is to start with a basic version of the design for small screen devices and after that enhancements are added to increase the user experience for the “greater” devices which can handle the additional features. Progressive enhancement is a quite newer approach than graceful degradation. It is probably easier to create a small screen device design using this technique, because the first step on the ladder is the small design and this (hopefully) implies a simpler way to make changes for those devices.

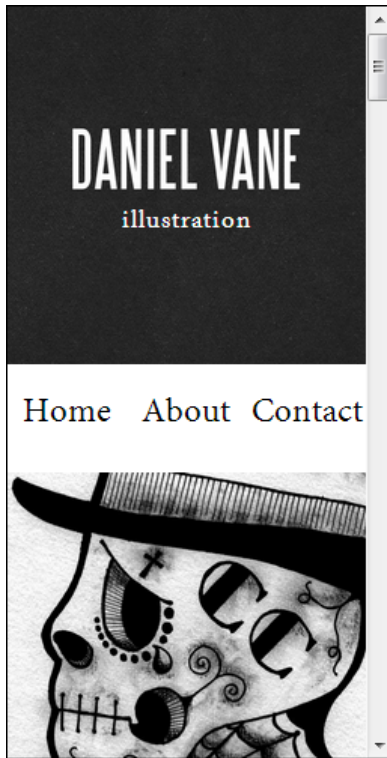


Figure 3.1: DanielVane.com at 240px screen width

3.4 Parallel design

The technique behind parallel design is to build the design for every device class at each step of the design phase. The great advantage is that the issues for every device class can be recognized very early and the possibility of avoiding a redesign is very high. A good choice for the number of device classes may be three. One class for smartphones, one for tablets and the last one for desktop screens could be a wise decision but it is obvious that this depends on the purpose.

3.5 Design Approach Conclusions

Every principle mentioned above supports the designer to create a responsive design. Graceful degradation is probably the better choice if the majority of your users have access to the content via a greater device such as a desktop system. Progressive enhancement seems to be a good way for the future because of the growth of mobile web usage. Parallel design looks also very well on the different device classes but this implies probably a bit more of extra effort.

3.6 Example for good Responsive Design

A very good example for good responsive design is the site <http://danielvane.com/>. The site was tested with a responsive online tester, which is reachable over the url: <http://mattkersley.com/responsive/>. In our opinion the results are very good. A small subset of the result for a better understanding of responsive design and its meaning:



Figure 3.2: DanielVane.com at 768px screen width



Figure 3.3: DanielVane.com at 1024px screen width

Chapter 4

Testing

Testing is a crucial part of creating a website. The following chapter will not only discuss testing responsive designs, but testing websites in more general. Additionally possible problems when testing responsive design will be shown.

4.1 Usability Testing

The same testing principles as for standard interfaces also apply to responsive design interfaces. When conducting usability tests one has to take into account, that the interface will have to be tested on multiple devices. There is software that will simulate different screensizes on the PC but can not simulate the feel of using a mobile phone or a tablet. This fact increases test costs because the tester needs a constantly updated repository of different devices. In this section two major tests will be introduced.

4.1.1 Thinking Aloud

[Andrews, 2012](#) Thinking aloud tests are used to get find problems and or strengths of user interfaces. The test subject is asked to perform a series of tasks on a given interface and talk out loud what he or she is thinking while doing so. During the test the users facial expression aswell as the Interface are recorded together with the vocal recoring. This makes it easier to analyse the data after the test. It is also vital for the tester to not interfere with the subjects thought pattern as not to influence the outcome of the experiment. This method finds many usability problems and also gives insight on why the problems occur. On the downside a this type of test can change the users behaviour by forcing them to think more about what they are currently doing.

Doing thinking aloud tests might be more of a challenge when trying to test on mobile devices due to there limited capabilities in screensize. A lab environment might also not be the best place to conduct a thinking aloud test because mobilde devices are usually used in a different context and this might influence the user in a different way e.g. the user being distracted by surrounding influences like noise.

4.1.2 Formal Experiments

[Andrews, 2012](#) the aim of a formal experiment is to gather objective quantitative data. This data can be:

1. Completion time
2. Number of errors
3. Time spent to recover from errors
4. Accuracy (answer to question true or false)

5. and many more.

During the test a subject will execute a number of tasks on the tested interface, while the interface is recorded. After the test the measurements can then be taken from the recording. This type of test is used when the performance of an interface is tested, or multiple interfaces are compared. One thing to keep in mind when constructing a formal experiment is to test with the correct kind of user, testing the correct tasks and that as mentioned in the thinking aloud test, the context in which the user will actually use the interface will differ greatly from any lab environment.

4.2 Break Point Testing

This test is unique to responsive design. It shows if the web design works as intended on all different screensizes and devices.

To tests the different screen sizes one can scale the browser window or use one of many tools. One very useful website is <http://mattkersley.com/responsive/> where a url can be entered and loaded into many different sized frames. Another method is to install a so called bookmarklet available here: <http://responsive.victorcoulon.fr/> which will insert javascript to any website that can alter the view size and orientation of the view thus simulating smaler screens. The current version of Firefox even has a feature implemented within its developer tools that can scale the browser size.

To simulate the different technical abilities of devices, features of the browser can be deactivated e.g. JavaScript and Flash.

4.3 Functional Testing

Functional testing is the most common of all tests. It checks if the implemented methods work as expected. One standard way of implementing functional test is called unit test. Unit tests are available for almost all programming languages and mostly using a library. This has even become available in JavaScript recently.

The example shown in here was created using qunitjs available at <http://qunitjs.com>.

To conduct a unit test in JavaScript the qunitjs file needs to be included and then following code carries out the tests.

```
1  <script>
2    test("Basic Test", function() {
3      equal(myFunction(), "expected Value");
4      equal(myFunction(), "failed test");
5    });
6  </script>
```

The result is shown in image 4.1 . Unit tests basically execute a function end compares the result of the function with an expected value. In the shown example the first test passes while the second fails. Qunitjs displays the status of each test and gives information about why a test failed. While testing multiple tests can be executed each consisting of multiple executions. In our example there was one test executing two function calcs.



Figure 4.1: Result of example unit test

Chapter 5

Documentation

5.1 Pattern Primer

Pattern Primer is a simple tool to create documentation for css styles. It basically takes HTML patterns and styles them according to a given css file. It requires node.js which is a commandline based JavaScript interpreter. A HTML pattern is basically a combination of HTML elements that make up a part of a website. e.g.

```
1 <div class="feedback">
2 <p>Some feedback text</p>
3 </div>
```

The HTML patterns are collected in a single folder which makes organising the patterns easy. The Pattern Primer then takes all these HTML patterns and combines them to one html file which looks like image 5.1. Additionally to the styled HTML pattern the defining file and the html code are displayed alongside. The

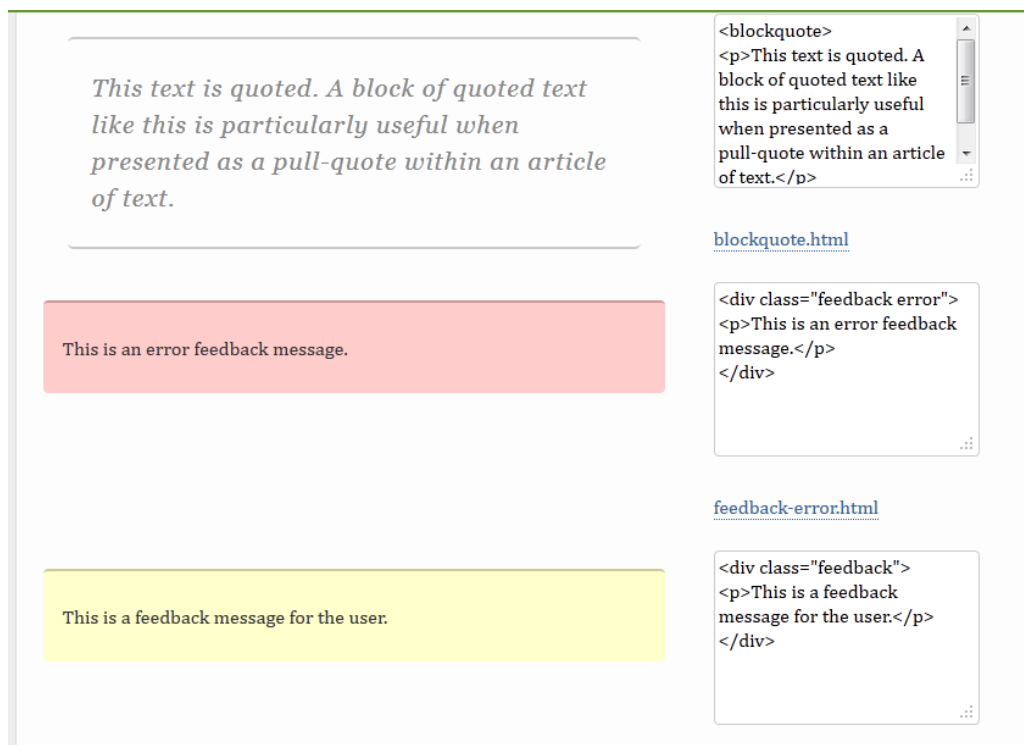


Figure 5.1: Pattern Primer example

Pattern Primer can be obtained from <https://github.com/adactio/Pattern-Primer>

5.2 DEXY

Dexy is a simple documentation system which enables live code to be inserted to any plain text file. Common plain text files may be HTML and Latex. Dexy uses so called filters that can be executed consecutively. For the JavaScript documentation in the given example phantomjs was used to execute the javascript. After execution of the filters dexy uses jinja, a python templating engine, to insert the results in to the resulting file. With this method the source code can be added together with the execution result in to the documentation file. Following is a short example of using dexy with JavaScript.

This simple JavaScript will serve as example code to be documented.

```
1 var x = 7;
2 var y = 6;
3
4 console.log(x*y);
5 phantom.exit();
```

phantom.exit(); is a phantomjs specific command and tells it where the execution ends. Additionally to the code two files are needed:

- dexy.txt
- a outputfile

The dexy.txt file holds the instructions on how the documentation is processed:

```
1 hello.js|phantomjs
2 hello.js
3 hello.txt|jinja
```

the result of each line in this configuration file is stored in a hash map for use in the jinja templating engine. The first line tells dexy to execute hello.js with phantomjs. The second line stores the plain text of the hello.js. And finally hello.txt is run through the jinja templating engine. In this example hello.txt is the resulting documentation file.

the last file needed is the documentation file for the output:

```
1 Hi, welcome to DEXY
2
3 Here we have JS code
4 {{d['hello.js']}}
5
6 and here we have the output:
7 {{d['hello.js|phantomjs']}}
```

The elements starting with "" and ending with "" are replaced by the corresponding value created by the previous dexy steps. the result of running dexy on these three files is:

```
1 Hi, welcome to DEXY
2
3 Here we have JS code
4 var x = 7;
5 var y = 6;
6
7 console.log(x*y);
8 phantom.exit();
9
10 and here we have the output:
```

11 | 42

More information about dexe can be found at <http://www.dexe.it/>.

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