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DEVELOPMENT AND ANALYSIS USABILITY VIDEO TOOL BY PRAILS WEB FRAMEWORK

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ABSTRACT

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Userlutions GmbH is a young innovative company which specializes in testing and optimization of website and promotional product. Working as an ambition agency, combining a scientific and pragmatic approach, Userlutions GmbH starts with providing a great consulting and testing service at the good price to assist customer obtaining a maximum benefit. The most well-known product is the online usability test at web address: RapidUserTests.com which is one of the market leader usability testing tool, was published in 2010. In the autumn of 2013, Userlutions GmbH renovated and present various modules to response the demand of market. One of them is an analysis usability video tool that is used as the object of this thesis. It is commissioned to Userlutions GmbH, based in Berlin, Germany.

The main purpose of the thesis is illustrating the developing process in order to meet the predefined requirements from Userlutions for its analysis usability video tool. The software development lifecycle, tools also have been explained to provide a clearly view of inside developing process from design to deployment. The major development tools are Prails web framework, various jQuery library and MySQL database.

The theoretical part discusses about user-centered design which has been applied in design analysis video tool. In addition, qualitative is the major research method included interview with client and market research. Books, digital articles, documentation on internet and advices of colleges and supervisor are used as the main resource of this paper.

As the main results, the analysis usability video tool has been completed on time with the good feedback from client. Although there are some changes which have been made during project due to optimization reason, the final product responded all pre-defined requirements.

Keywords:

User-centered design, Usability, Prails Web Framework, Software Development Lifecycle.

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1. Introduction

1.1 Userlutions GmbH

There is no doubt that usability plays a highly fundamental role, it improves the chance of survival and success of a new product or service. Usability is concerned such as a vital part in order to appropriate the time and budget, generates more profit by increase the conversion rate, enchant the loyal customer and accrues the industry competition ability. In the IT industry, among of 1.74 billion of webpages on the Internet (worldwidewebsite homepage, cited 22.03.2014), investment in design to create an efficient usability is the key weapon to attain attentions from client. The fact is that time changes rapidly, as a sequence demands of client shift dramatically either. As recent years have shown, user requires the better design website which is easy to interact, effective, understandable and convenient. If the website fail to respond those requests, client eliminate it. Since the obvious result, bankrupt is a potential unexpected destiny because the business goes down due to its failure of catching up.

The effect of usability on the amount of website's visitor is already proven but creating a good design, in general, is not piece of cake mission. Travis Lowdemilk has stated in his book 'User centered design': "The most common and misguided presumption I find, especially within the developer community, is that the practice of usability is just subjective. These developers believe that usability decisions are arbitrary and can be decided by simply applying their own personal preference. Additionally, many of these decisions are made for reasons that have nothing to do with users." (Travis, L.2013, page 5). It needs to be done by experts who have in deep psychology, human-computer interaction and research knowledge, great verbal and visual communication skills, sense of opened mind, creativity and vision. Last but not least, delivery the best product is their passion. From this point of view, Userlutions GmbH has been set up in Berlin in 2010 as a small but ambitious group of young psychology experts who are willing to sever qualified services with cheap prices to push up the customers' businesses by testing and carrying optimization usability. Having approximately 93 percentage of customer satisfaction rate, more than 505 customers, over 11000 testers in Germany, 7 awards and 16 employees, Userlutions has grown up significantly, secure and being one of the German market leaders in the domestic testing usability sector.

1.2. Development and goals task

Being optimization is always considered as the main target in every single step of Userlutions's operation in day-to-day life, included in administration, production, development or financial operation and so forth. It can be asserted that innovation is the key value to build up the strength for a young start-up company as Userlutions. It is one of core factor to robust performance. Thus Userlutions always seek to enhance its platform to maximum the benefit of innovation. There is a video analysis tool which is utilized to create annotations where user can watch the uploaded videos by testers. In fact, the previous tool version has been published for almost two years during startup period, and the performance remains stably. Indeed, it deserves to be optimized to provide better results. The main object is build a tool which is available in Userlutions's platform that allows to control the annotations more effective, efficient and stable with self-describe user interface.

The aim of this thesis is to illustrate the new version of video analysis tool which is a part of Userlutions's platform. To be exact, the core function of this tool is manager user's annotations when review record video. During the time to watching usability testing video, user is able to interact with player and saves the notes whenever they consider necessary. Comprehensively, cross platform and having a good designed structure are the other criteria's that demand to be concerned when developing these tool. In addition, this thesis has an inclination for elaborating the ideas about user's interested in design theories and how these theory have been applied for purpose of improving the quality of this feature.

2. Research method

During the whole process, qualitative research method has used as the main method to collect data and statistics which are utilized in almost every step in the whole development life cycle. Combining with agile method, qualitative research provides the most up-to-date information from testers or clients which is deemed pretty saved time and also costs for development due to its flexibility. Moreover, qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. There are some noticeable examples of qualitative methods that should be heeded: action research, case study research and ethnography. (Myers, M.D. 2009, cited 22.03.2014). As mentioned above, qualitative research involves different states of development life cycle such as design, analysis, implementation and also pilot test. For gathering the expected information, there are two major approaches (interview and questionnaire) which are selected and performing through the Userlutions's mail system, limits the range of participant in order to focus directly on company's sectors and its clients.

There are two states in gathering data process, interviewing and doing pilot test with user experience expert. In the first state, interviewees have been asked few questions about their opinions mostly by emails of what are the most useful functions which should be included in the new version of analysis tool, how it should look like and so on. Interviewees have chance to experience the prototype of this tool without giving instructions in certain time and prepared tasks. By doing it, the development team could gain more profound knowledge of customer's perceptions to build a suitable product prototype which might offer more opportunities to satisfy users, even the tough ones. Furthermore, some user experience experts were invited to do pilot test as participants for the build version of this tool inside office and the data of interaction. Thereafter, all opinions of these professional people were recorded for later customize.

Moreover, in some case, quantitative research is applied also. For instance, doing the research of the current video player on the market, the global market share of operating system and browser or even though the most popular feature for usability video analysis tool have been done with quantitative research method. Combining the data from both of qualitative and quantitative research methods, researchers have more precise and accurate understand of client expectations of product in general.

3. Development Environment

There are abundant tools which are used to develop the video analysis tool. Almost all development tools are open source or software which are free to distribute. It contains Prails Web Framework, some of JavaScript libraries, html5 video player (free for personal purpose), and phpMyAdmin and Balsamiq software to create a prototype. The main tool is Prails Web Framework which allows developer team working with php program language as an IDE, collaborate, synchronize, track changes faster and more effective. Prails offers various supported function such as editor for development, deployment packet and Unit test module also. Even though there are several frameworks like Zend, Symfony or Cake Framework, the most important reason to use this platform due to its successful history, Prails grants various advantages such as, increasing the development process. The detailed information will be discussed more at the bottom of the work.

3.1 Prails Web Framework

Prails web framework is a PHP tool which is developed by Robert Kunze, former IT staff in Userlutions GmbH. Robert is the co-founder with Benjamin Uebel, who is presently CEO of Userlutions in another project. Robert has contributed a lot for company when it was founded in 2010. In the beginning, Robert created the website rapidusertest which is utilized as a platform for Userlutions to interact with testers and users. Admittedly, most of the work has been done with Prails web framework. The original idea of author is creating an efficient tool which is easy to use such as rails for PHP. That is the reason why the Prails comes from, "P" stands for PHP plus "rails". In general, Prails have many advantages compared with other frameworks for php such as Zend or Symfony. According the documentation of Prails, its benefits consist of "application and code scaffolding, Online code editing, including PHP debugger, Integrated CMS, easy to set up, User & role management, Internationalization and localization, database management ; supporting SQLite, MySQL , PostgreSQL. And almost no memory and processing overhead for increasing the development process". Prails was developed with a faster and more efficient web development in mind, supporting rapid and heavy changes to applications developed with it. Originally it was more or less just a set of scripts for DB access and generation of HTML code that evolved over lots and lots of projects written using it into the current state. Prails is an open-source PHP framework that is optimized for fast and efficient web development. It is designed to change the way you write PHP. (Prails homepage, cited 30.3.2014).

In contrast, Prails has a weakness point about source version control. As can be seen, Prails has limited slot to save the change of code. At times, it is difficult to revert the previous version if there is an issue in the current

version. In some case, old and new versions are combined and separated by comment in the file which is unstructured and unreadable. Moreover, if there are two developers work on the same time in the same handler, source code is duplicated by Prails processor. It automatically generates the change and puts comments of what was changed in inappropriate way. Another case is, the handler is likely to be rendered again which has to be eliminated manually by developer. This issue has been discussed and one potential solution is to promote. In the future, source code pretends to store in the GitHub, a version control software hosts base service, developers modify source code push it to GitHub, and then only the finished code in the completed folder is used as the source for website.

3.2 MySQL

Regarding to MySQL, it has been one of the chosen tools for interact with Userlutions's database. Although MySQL is distributed nearly free for client, its benefits appeared small declines. This relational database management system (RDBMS) is cost-effective owing to the fact that MySQL has a free version of its software under the terms of the GNU General Public License (GPL). In addition, based on the documentation of MySQL, the company or institutes which is selecting MySQL for their web-based applications, startups and established corporations alike are realizing significant cost savings. "Accomplished through the use of the MySQL database and scale-out architectures that utilize low-cost commodity hardware, organizations are finding that they can achieve very high levels of scalability, availability and performance, while significantly lowering their Total Cost of Ownership". (MySQL homepage, cited 20.04.2014)

It is also worth noting that MySQL can be installed easily in all major operating systems like Windows, Linux and Mac. Developers have flexibility ability to their own favorite operation systems to develop. Furthermore, MySQL is integrated in Prails Web Framework as the database module, include SQL editor. Actually, user is able to execute various kind of command with the database via database queries in Prails without switch to another editor. In accordance to the Prails document, it also offers ability to manage the connection to the underlying database automatically, database cache in order to reduce the processing time of large queries. Constantly synchronizes contents with other external database and give easier access by user friendly usability. This point also bring a huge advantage for Prails platform. (Prails documentation cited 20.04.2014).

In fact, MySQL is not a hard to learn because of many available tutorials on the internet, simply by using searching engine. In the homepage of MySQL, it provides the complete reference manual for users in almost the major digital format. The new user can quickly seeks for information and enhances their knowledge about this

language very deeply and fast. Also the MySQL community is utterly vast, active and fast response. In case, there is some confused issues happened, user can look up for the answers or immediately ask for help from the community.

Moreover, MySQL was designed and optimized for web applications. As subsequent and different requirements emerged with the Internet, MySQL became the platform of choices for web developers, and the default database for web-based applications as well. It was used by a great deal of big websites, such as, Facebook, Twitter, LinkedIn, Yahoo! and myriad of successful startup ones. (MySQL homepage, cited 20.04.2014)

Furthermore, MySQL is integrated with Prails, therefore this is a strong point to decided using MySQL. It can allow users to store information, grab that information when needed and organize the information that is stored (Prails homepage, cited 22.03.2014). MySQL is the world's most popular open source databases, enabling the cost-effective delivery of reliable, high- performance and scalable Web-based and embedded database applications. (Oracle website cited 25.03.2014)

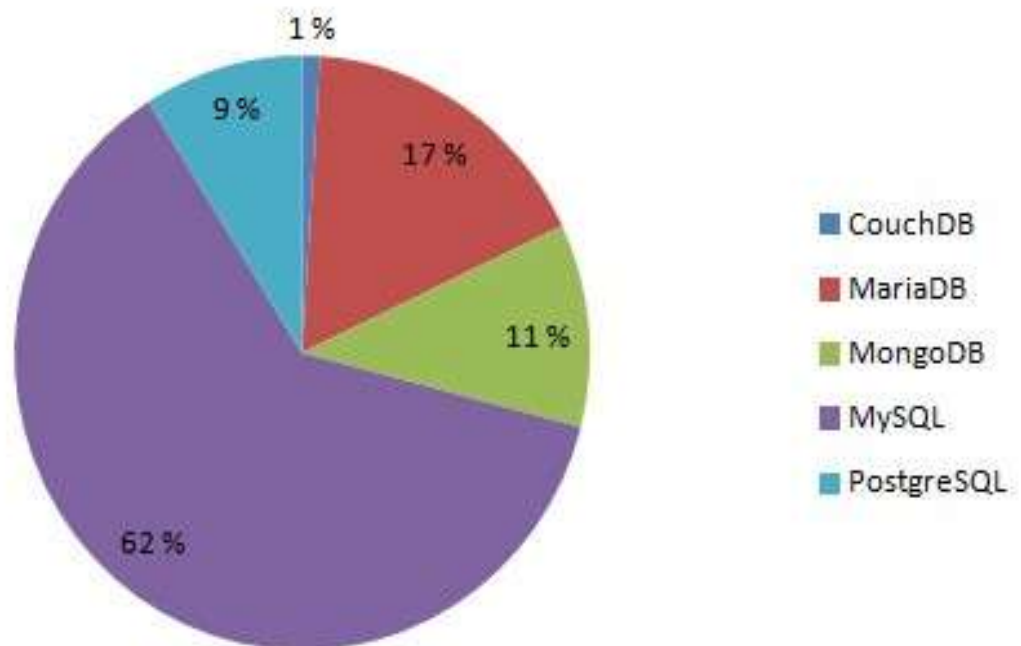


FIGURE1: database market research, August 2013

(Source: Jelastic.com - hosting statistic date of retrieved 24.4.2014)

Here is a figure of database market research in August, 2013 from the website: Jetlastic.com. The pie chart indicates how many percentages each of five main core databases were amounted up. To be clearer, CouchDB, MariaDB, MongoDB, MySQL and PostgreSQL are actually five factors which have been analyzed in the chart.

As can be seen, contribution of each database is utterly different. Standing in the first place, undoubtedly, is MySQL platform with 62 percentage - more than the rest four factors combine together. Following right after is MariaDB, which just only amounts up to 17 percentage. MongoDB and PostgreSQL are in the third and fourth positions (with 11 and 9 percentage respectively). The last one - CouchDB, is recorded to have a pretty poor contribution in market (just only 1 percentage).

3.3 JWplayer

Video player definitely plays an important role in the usability analysis video tool of Userlutions. A suitable video player will guarantee to encourage the whole operation of new tool. In order to archive this target, it requires a magnificent video player in order to improve its operation. There are two features that are considered as the most important things of video player, should provide two inherent features included well performance and flexibility. Generally, video player is able to interact harmony with the new tool of Userlutions's platform – having the ability to playing all files which are exists currently on server without any problem. Even when the video player has to play a large file or user tries to change the speed of player and so on, video player has to provide the stable quality of video without interruption, blur or overloading.

Moreover, there are myriad of types of clients coming to Userlutions, for instance from small companies to corporations within Germany as well as some multinational organizations all around the world. As theirs different cultures, back-grounds, and special realms to focus on, autonomous interaction plays a highly rudimentary role in determining successes of this tool. The truth is that various customers have plentiful characteristics, properties and demands. They have the different devices that using different operating systems, browser. So one player is deemed as optimal if it is able to interact with many devices, cross browser and supports abundant types of files so as to offer users the best experiences without errors due to conflicting with player. In addition, player needs a good availability to fulfil the demand of analysis Usability which is seen as sophisticated task and requires ramifications. It also requests some special configurations to intensify the productivity and quality of the task.

The mission of video player is providing various, clear and easily interacted API for development team. If it succeeds in doing this task, development team could optimize methods which can meet requirements of user experience designers. In order to archive this target, several players are evaluated for implement because constructing a video cross platform, browser consumes a lot of effort rather than integrate exists solution. As the result, JWplayer, due to its efficient performance, is promoted to be the targeted player for the new tool of Userlutions GmbH. JWplayer has a long and solid history since 2005, it is the leading of Flash video, and now this company is publishing the html5 player with the same name. Almost all features that are supported in flash video, playlist, playback etc. They have distributed for more than 2 million of sites and streams billions of videos each month, in different devices such as phones, tablets and desktops as well.(JWplayer homepage, cited 20.04.2014) With a lot of standout features, a large amount of customers, clear instructions, easy to embed with setup wizard and great supports from forum and other active developer, it usually places at the top of the list of available html5 player on internet with a vast of positive recommendations. (Praegnaz website, cited 22.03.2014)

3.4 Library

For the purpose of optimizing, there are several available libraries and frameworks which have been selected in order to improve the quality of user interface for this tool, containing bootstrap, jQuery, Handsontable, stupidtable js and Google chart API.

3.4.1 JQuery and Bootstrap

On the basis of the evidence currently available, jQuery seems fair to be claimed as a popular library for JavaScript, its utilities are surely undeniable. According the jQuery homepage, it declares that "jQuery is a fast, small, and feature-rich JavaScript library. It makes things like HTML document traversal and manipulation, event handling, animating, and Ajax much simpler with an easy-to-use API that works across a multitude of browsers. With a combination of versatility and extensibility, jQuery has changed the way that millions of people write JavaScript." (jQuery homepage cited 22.04.2014). On these grounds, jQuery is widely accepted and used in the community of JavaScript developers due to the benefits of this library. Regarding to the jQuery homepage, many corporations manage to implement it in their website included Google, Amazon, IBM, Dell Microsoft, etc. Indeed, there are several strong points of jQuery which can be listed below.

Firstly, jQuery is asserted to save development time. It has a simple, clean and powerful syntax compared with the pure JavaScript. Application which uses jQuery library requires less code, limited the chance to make error but still providing the same performance, developer saves time to fix bugs. As the result, jQuery becomes easier to learn and practice for developers. Due to this reason above, jQuery diminishes the amount of time for developing, which is highly important in order to delivery products as soon as possible for users.

Secondly, jQuery is browser compatibility. There is the fact that some of features of JavaScript cannot work cross browser but jQuery does successfully. It is limited the crowd browser to the minimum level. Hence, this is absolutely a huge advantage for the new video tool of Userlutions due to the diversity of client's browser. It will guarantee a stable performance, the same reaction and independence of browser.

Last but not least, jQuery provides a great documentation and tutorials in the homepage. Basically, every detail about functions, events or parameters will be discovered clearly and elaborate. Several simple examples are included to illustrate how it works normally. This comprehensive documentation brings an in deep knowledge for developers and decreases the misunderstood errors. Furthermore, another huge good point of jQuery is supporting

Ajax. Some of jQuery plugins which can combine with Ajax included in the new tool save as Handsontable, JWplayer. As the result has shown, jQuery is deemed as an inevitable part of the new tool naturally.

Another tool of the new tool is bootstrap framework. Bootstrap is described as “sleek, intuitive, and powerful front-end framework for faster and easier web development.” (getbootstrap homepage, date of retrieved 15.5.2014) This framework is selected because it offers many benefits which are absolutely necessary for Userlutions. Additionally, it allows a better design with the grids system, responsiveness and less processor. And also it saves developing time by provide many predefined piece of code, tailor designed HTML elements. The primary mission of developer is choosing these correct elements in order to archive the expected result.

3.4.2 Handsontable and stupid table

Before starting to design prototype for the new tools, development team has discussing with user experience experts and consulting team about some features of current tools. Both strong points and hindrances are carefully analyzed, indeed. One survey has been conducted by consulting and user experience teams – also those who directly experience the tools in order to evolve ideas for the new ones. There are several questions which are sketched out as a basic instruction for them, for instance: after 2 years, have the tools fulfilled their requirements or not? What should be developed? And what kind of features that user would like to add in the next version? Gathering all information, thereafter development team analyzed and jumped to a conclusion that one function should be improved – way of storing annotation.

Since Userlutions was established in 2011, the previous layout of the analysis tool has two main parts with the small player on the left hand side and the annotation field on the right hand side. The questionnaires and answers are located at the bottom of page. During the period of 2 years, there are some disadvantages of this design have been found. First of all, due to the midget size of video player, tester has trouble to distinguish the details difference of tester video. For example, if the quality of video is low or it contains many object in the screen, user often gets confuse about the movement of mouse or the small thing in the video. User is not able to watch a big size screen and take note at the same time because the limited of monitor size. In addition, the design is caused of a trouble in case user inserts a long note or a large series of annotations. The fact is that this design makes the whole space narrow down. User will faces difficulties in saving the long annotation due to the limit of the textarea's space. The width of the storing cell is not enough that leads to words jumping in the next line.

Moreover, user is not able to modify annotation flexibility, they have to move the cursor, highlight and delete the annotation manually in case user considers it as redundant part. Whenever user wants to check for quotations,

they have to scroll up or down the scrollbar and it somehow condenses the effectiveness of working as well as increasingly waste time of scrolling. Besides, there is no clear separation between annotations, break lines is the current solution but does not seem to be a perfect approach. If user wants to have a break line within an annotation or creates a new note, cursor needs to be placed in the last position of storing cell manually. Development team decides to use sheets (like ones in Excel) which is the panacea to this situation. The reason is sheets provide pretty many functions that help to enhance the quality of the task and save time for user experience team at the same time. It offers a logical, user-friendly structure and separated from other annotations. Moreover, it is also quicker to access target annotations, easier to fix, updates or deletes just by clicking which has been done manually before. Nevertheless, there is no connection between annotation and video timestamp. Textarea does not save the timestamp of video when issue is happened, so user has no clue about when or they have to write down the timestamp by themselves. This action is inconvenient and cost the time of user to search and eliminate unused annotation. The task has to be executed automatically as much as possible for the purpose increasing the speed of process. Handsontable is a good solution, easy to embed and often updated. "Handsontable is a minimalistic Excel-like data grid editor for HTML, JavaScript & jQuery" (Handsontable homepage, cited 20.04.2014).

Handsontable provides an excel version by jQuery which allows to interact with database by sending Ajax request with highly customized ability. Via Handsontable, user is able to replace the original data source by simply edits data in the grid. In addition, Handsontable is an open source software hosted on GitHub. API is quite easy to use and gains a wide range of users. Despite being a free solution and on the way of developing, Handsontable is expected to be suitable for development team's objectives at the moment. The way of Handsontable operation is not very complicated and also, the instruction is published and enclosed with the example code on the main website, for example, say on jsFiddle.com. The benefits of integrate Handsontable is undeniable. In the aspect of Userlutions's tool, annotations, which are stored in database, will be loaded into arrays by requests from php handler and used as a resource for Handsontable. They collect data from arrays showing every items of arrays into sheet lines. When users interact with data of Handsontable, changes happened in lines will be saved. After this event ending, an Ajax request is send to database in order to synchronize data. This process runs in background.

Additionally, Handsontable gives a strong customize ability with html tag for user. By doing that, it allows adding into table a various buttons which can be programed to interact with video player. From the prototype, when using Handsontable, a timestamp is aimed to be saved automatically and people can easily access this by clicking the play button. Play button fires an event which sent a request to JWplayer with the giving timestamp. Based on the syntax in JWplayer API, video player receives the request and then seeking to the time stamp's position on the sheet. The previous tool, actually, was not added this ability, there is no approach to interact with player excepted to

seek player control bar by mouse. As a result, saving and share note give a better user experience. User barely needs to spent time in order to find where the annotation belong. Simultaneously, user can identifies the time that annotation is saved easier. Also, delete button is added into the last column on the right of the sheet to aid people to eliminate annotation by one click. Furthermore, Handsontable offers a sorting function for column by ascending or descending. Handsontable is able to customize, which allows user can sort annotation table by category or priority. Simply, by clicking the header of column, table is sorted based on the data in this column in A-Z order. The burdensome task is simplified by adding more features from library compared with old version of this tool, thus productivity has been improved.

Last but not least, Handsontable gives ability for user to have an automatic suggest collection based on input data. This feature is implemented in two column, priority and category. In case of priority column, there is four priorities predefined. It performances as a dropdown list which lets user can select note priority inside Handsontable. In category, it creates an auto suggest field, user type their own category, Handsontable will save it automatic, then next time, the category can be doing auto suggestion and they do not have to enter the whole word. Basically, user only provide some characters then Handsontable will auto correct it.

In nutshell, using Handsontable increases considerably in productivity, saving time and offering new user experience. It brings a huge advantage for the new tool by allowing user interaction more comfortable, convenient and faster.

Stupidtable js library is aimed to display annotation in the report page. Stupidtable js is a jQuery sorting table plugin so it cannot be editable, the plain text is used to illustrate the input data. This library allows to show data from any array which is exported from database. As an outcome, all notes are loaded in a table format which is quite clear and logical structure. Currently, stupidtable offers only one function that is sorting, but it still gives an opportunity for user to define the own ways of sorting table column. (Stupidtable homepage, date of retrieved 10.5.2014) Sorting function can be triggered by clicking the header of each column, after that an arrow will appear on the right hand side of header. It is a light, stable performance even with the larger amount of data.

3.4.3 Google chart

Regarding to the outcome of user experience expert discussing, video analysis should have an ability to export the visual report for users. This is a necessary function which offers a clear, logical structure and visualization summarization of complete analysis. User can have a straightforward view about the statistics of annotation which has been produced by all tester during the video analysis testing.

Google Charts is chosen as a powerful tool for generating the different kind of chart. “Google Charts provides a perfect way to visualize data on your website. From simple line charts to complex hierarchical tree maps, the chart gallery provides a large number of ready-to-use chart types.” (Developers google homepage, date of retrieved 16.05.2014) The usage of Google chart is quite simple. In order to use Google chart, users have to involve two major subjects, which are customization and data handling.

Firstly, customization is not a complex task with Google chart. Regarding to the API reference on the homepage, there are plenty of options which are assigned for users to interaction with the chart. The detailed information which contains various knowledge of how to interact, modifies and also exposes events with different kinds of chart. In order to embed the chart, on the web page, a div tag is created to display chart which has a specific predefined id. The location of chart is recognized by this id. Thereafter, Google charts that are exposed as the JavaScript classes, are embedded on the web page follow the syntax on references. To complete the frontend side, user is able to change the way of presenting chart in order to meet the requirements of website.

In addition, Google chart is a cross browser compatibility, the chart is rendered using two popular technologies, namely HTML5 and SVG. Therefore, user can customize chart freely based on their designs. Actually, the benefits of this approach to rendering is that Google chart is generated on in different web browsers and cross platform without the conflict due to that. This is absolutely a strong point which promoted this solution.

```
<html>
<head>
<script type="text/javascript" src="https://www.google.com/jsapi"></script>
<script type="text/javascript">
google.load("visualization", "1", {packages:["corechart"]});
google.setOnLoadCallback(drawChart);
function drawChart() {
var data = google.visualization.arrayToDataTable([
['Year', 'Sales', 'Expenses'],
['2004', 1000, 400],
['2005', 1170, 460],
['2006', 660, 1120],
['2007', 1030, 540]
]);

var options = {
title: 'Company Performance',
vAxis: {title: 'Year', titleTextStyle: {color: 'red'}}
};

var chart = new google.visualization.BarChart(document.getElementById('chart_div'));

chart.draw(data, options);
}
</script>
</head>
<body>
<div id="chart_div" style="width: 900px; height: 500px;"></div>
</body>
</html>
```

FIGURE 2: Example code of a simple bar chart diagram

(Source: google-developer, API reference, bar chart diagram example code)

Secondly, all data is handle by DataTable class in array. This array is used as the resource passing to visualization. In general, DataTable Object is recognized as a 2 dimensional table. It hold data in each cell which contains information about the label, data type or the style of an element in the table. In next figure, it is a basic example for declaring a datatable object in literal string from Google API reference.

```
var dt = new google.visualization.DataTable(  
  {  
    cols: [{id: 'task', label: 'Task', type: 'string'},  
          {id: 'hours', label: 'Hours per Day', type: 'number'}],  
    rows: [{c:[{v: 'Work'}, {v: 11}]},  
          {c:[{v: 'Eat'}, {v: 2}]},  
          {c:[{v: 'Commute'}, {v: 2}]},  
          {c:[{v: 'Watch TV'}, {v:2}]},  
          {c:[{v: 'Sleep'}, {v:7, f:'7.000'}]}  
    ]  
  }, 0.6);
```

FIGURE 3: Example of a new DataTable Object by literal string.

(Source: <https://google-developers.appspot.com/chart/interactive/docs/gallery/barchart>)

3.4.4 Balsamiq

There is no doubt that prototype is an inherent part in design, which is irremovable. A good prototype brings a clearly holistic look to producer, eliminates the misunderstood and diminishes the development time. It is not only benefited for video analysis tool but also it was used in different pages in Userlutions's platform and various projects which belong to consulting department. With a large collection of items, it allows user to create a diversity mock up with different purposes, for desktop, mobile, or even Mac OS, etc.

4. Design and Implementation

To archive a better result when design a new video analysis, a design process has to apply entirely. Every step in the process have been gone through. "Setting a plan is much more than just setting timelines and adhering to your due dates. Planning should be quintessential practice, for projects, events and even day-to-day implementation to your life. Having a detailed, structured plan is what the Design Process encompasses. It is a series of steps that one follows during the formulation of a product from start-to-finish. In short, the design process is a five-step design thinking process." (zurb homepage, cited 30.11.2014)

Another definition from teach engineering website is: "The engineering design process is a series of steps that engineering teams use to guide them as they solve problems. The design process is cyclical, meaning that engineers repeat the steps as many times as needed, making improvements along the way." (Teach engineering page, cited 01.12.2014)

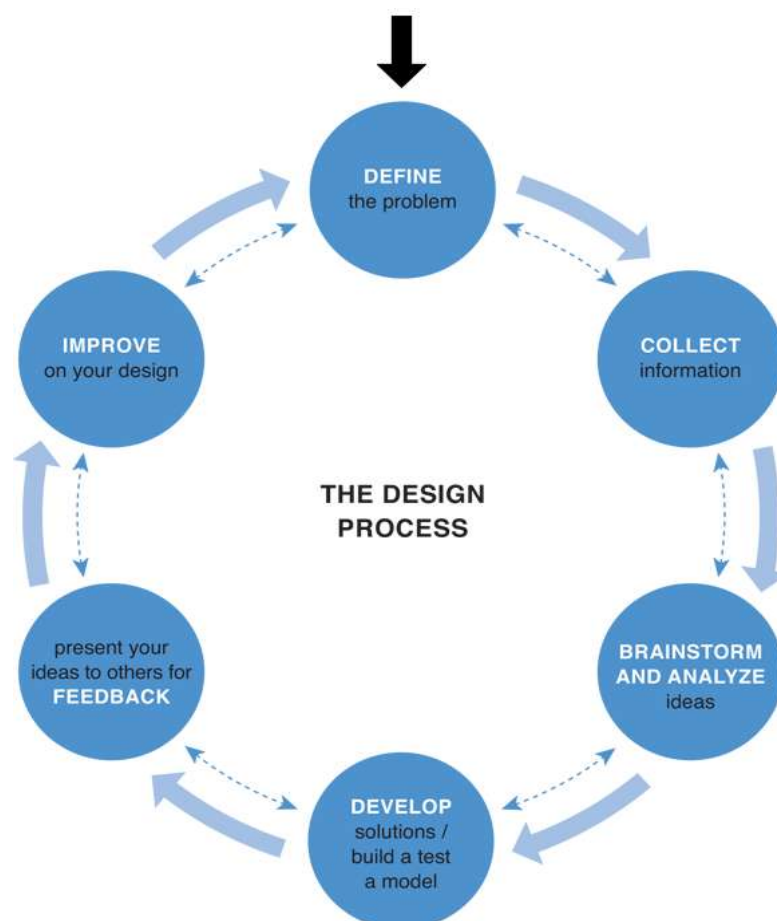


FIGURE 4: Design process cycle
(Source: discover design website)

4.1 Requirement

In general, defining software requirement means establishing blueprint of new service or product. The first step, gathering requirement usually is done in the prime step. A clear and well defined requirement document brings many advantages for the final result. Regarding microtoolsinc website, it prevents from ambiguities issue, trouble which is related to misunderstanding because it establishes the basis of agreement between the customers and the suppliers on what the software supposes to performance. Moreover, it reduces the development effort, saving time and money in case there are some worst problems in the end of development process that original loosely requirement define. Provide a basis for estimating costs, schedules, and baseline for validation and verification. Finally, it serves as a basis for enhancement, in the next version, develop team will improve or add more features of this tool the describe in requirement specification. (microtoolsinc page, cited 02.12.2014)

“A software requirements specification has a number of purposes and contexts in which it is used. This can range from a company publishing a software requirement specification to companies for competitive tendering, or a company writing their own software requirement specification in response to a user requirement document. In the first case, the author of the document has to write the document in such a way that it is general enough as to allow a number of different suppliers to propose solutions, but at the same time containing any constraints which must be applied. In the second instance, the software requirement specification is used to capture the user’s requirements and if any, highlight any inconsistencies and conflicting requirements and define system and acceptance testing activities.” (informatik page, cited 28.11.2014). In short, a semantic requirement document is a necessary part as a starting point of every project.

Usability Geek website, Justin Mifsud gave a definition about requirement, “A requirement is a statement about an intended product that specifies what it should do or how to do it. For requirements to be effectively implemented and measured, they must be specific, unambiguous and clear”. For this project, there are two main specifications which is focus on are user requirement specification and system requirement specification. The next figure classify the difference between three kinds of requirements: business, user and system requirement.

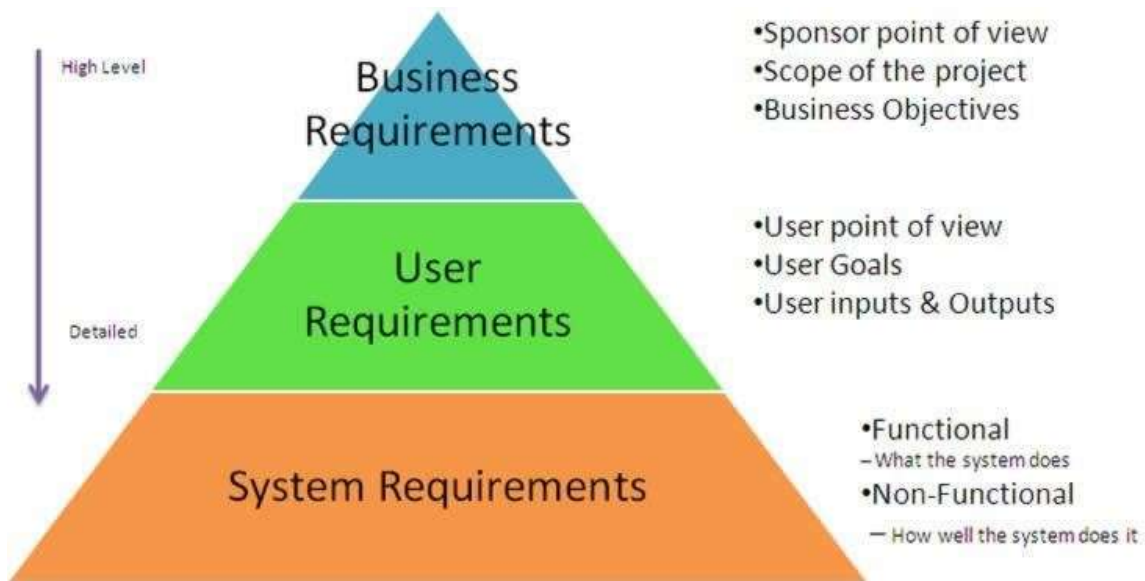


FIGURE 5: Diagrammatic representation of the different types of requirements

(Source: Satheesh Practice website)

4.1.1 User requirement specification

To improve the quality of development process, an unambiguous clearly user requirement specification (URS) is absolutely valuable and mandatory. There are many definition of URS, in simple way, regarding definition in ofnisystem website, it said” The User Requirements Specification describes the business needs for what users require from the system. User Requirements Specifications are written early in the validation process, typically before the system is created. The URS is generally a planning document, created when a business is planning on acquiring a system and is trying to determine specific needs.”(ofnisystem website, cited 02.12.2014)

URS is considered as a completed set of requirements from end user about of software system. It profits team in several ways and it is also a compass for whole project. In this document, the scope and purpose are set down, user announces product perspective, function, characteristics. There are various user case, test case and validation have been created based on URS. Hence, URS reduces the development effort, saving time and resource. In addition, this document also allows team to estimate the goal, scope, and schedule, setting milestone and estimating a development plan. From the beginning, Userlutions’s URS has been set up by consulting, R&D and UX expertise. Consulting people create customer surveys, interviews to gather the public ideas,

analyzing market, researching similar product and providing a completed valuable list of expected features. After that, all team members cooperate, brainstorm and analyze the information to decide several issues which effect to the new tool. For example, what are the suitable features for embedding to the current company's platform, how user will interaction and how to handle? In short, URS presents the brief, unambiguity guideline of the interaction between users and Userlutions's system, behaviors and also response.

4.1.2 System requirement

A system requirement is the second specification document video analysis. All system requirement is write down in this document which contains function and non-functional requirement for this. In details, it includes a description of function, performance requirement database structure and also use cases, class diagram. Search software quality website gives a summary about software requirement specification (SRS) which is a clear explanation for it. "An SRS minimizes the time and effort required by developers to achieve desired goals and also minimizes the development cost. A good SRS defines how an application will interact with system hardware, other programs and human users in a wide variety of real-world situations. Parameters such as operating speed, time, availability, portability, maintainability, footprint, security and speed of recovery from adverse events are evaluated. Methods of defining an SRS are described by the IEEE (Institute of Electrical and Electronics Engineers) specification 830-1998". (Search software quality page, cited 02.12.2014)

4.2 Analysis.

Analysis plays an important role in Userlutions's improving quality process. It covers 2 major tasks, user analysis and task analysis. According Worcester polytechnic Institute website, "User Analysis is concerned with determining those characteristics of the user that may make an impact on the design of the interface. Task Analysis is concerned with determining those characteristics of the task that may make an impact on the design of the interface. The User Analysis and the Task Analysis together help set the requirements for, and constraints on, the interface design activity"(Worcester Polytechnic Institute, cited 02.12.2014) These actions include several steps from gathering data, analyses and produce an overview about an issue. In this case, to

develop the new tool, all same steps are taken into account right beginning of the development cycle. The first step is collecting raw data about a video analysis usability tool. In general, the raw material comes from various sources such as customer interview feedback, published market researches and some other internal statistic sources. After that, data which is in different forms, has been pre-processed to generate several summary about trends, most popular expected characteristics and also market share of operator system, device types and so on.

Next step is examination the pre-process data form from the first step to generate more useful information. Every number and figure are organized, inquired and categorized. Most of quantity data are transformed to quality data to conduct visual chart for superior view. There is no doubt that this is one of the most important step which determine to the success of whole project. Thus, this step is finished with conscious discipline, self-responsive and critical thinking. (Usability geek page, cited 03.12.2014) It has been divided in several sub-steps contained: user groups, personas, scenarios and task analysis. Three first step have been done by consulting and UX experts. Using the collected data, end users have been grouped by some criteria such as personal, academic background or attitudes.

From categories above, three unique personas has been built within their suitable scenarios included basic information, social and technique background, user motivation. "A persona is a precise description of user and what he or she wished to do when using a system" (Travis, L.2013 User-centered Design, page 48). The reason to create difference personas is helping develop team to recognize the major user ground, exploding the demand of this group, their expectation, potential reaction with the new analysis tool. Each of persona has represented for a major user group of new tool. It stands for a realistic customer which allows develop team narrow and focus to specific customer group, testing before go live. Last but not least, develop team focused on task analysis, observing the different approach which customer pretend to use for acquire an object.

A traditional method has been used is write down an action in small paper, then a develop team discuss about possible user's action flow, and then define several user diagrams for each persona. By doing that, the result is remarkable. The major characteristics of new tool has been set up, analyzed deeply by the existing module, eliminated the redundant feature and combined with some new ideas from internal stuffs. After all, there is a presentation to illustrate the result for whole company because this is a new important tool which is involved every member.

In addition, based on the summary of new video tool, a development schedule has been set up. At the beginning, develop team decided the first version of this tool should be finished from 3 to 3.5 months. The reason is that I was about to end my internship duration there. In fact, there is a long list of deserve features which customers require, but due to the limited time, the list has been organized again according the most popular and high priority of feature. At the end, a completed development plan is approved after 2 weeks. Most of requirements have been recognized, prioritize in pre-design stage.

4.3 Design

The next step in development process is designing a great user interface. Although designing is a single step, but it has a tremendous effect to the final products. First impression of product is very important, it encourages users to go further to experience or not. A well-designed, well-structured products and concrete user interface offer a great experience for users. Moreover, it is not only about how the user interface looks like but it also about how it works. Usability is an essential dimension. "A close interaction with the user community leads to a well-chosen set of benchmark tasks that is the basis for usability goals and measures. For each user type and each task, precise measurable object guide the designer through the testing process" (Design user interface, page 32). Userlutions uses "user center design" as the main approach for designing the new tool. User-centered design process (UCD) is also called human-centered design process. Human centered design processes for interactive systems, ISO 13407 (1999), states: "Human-centered design is an approach to interactive system development that focuses specifically on making systems usable. It is a multi-disciplinary activity." (3w website, cited 03.12.2014).

Another important dimension of Userlutions design video tool is that it follows several design principles. It includes simplicity, structure, consistency and tolerance (User interface design and evaluation, page 171). According to the agreement of the whole team, the new tool should have a simple user interface, self-described so users will not be confused. Moreover, easy learnable and memorable is other obligation of the tool. Thereafter, user interface also needs to have well nature organized, the related part will stay in the same location. It also has to fit with the user interface of the rest of Userlutions platform.

Due to a tight schedule, development team aims to have a quick design and improvement in process. Thus, a RR2I approach has been applied. RR2I stands for "Prototype → Review → Refine & Iterate". In general, this approach allows development team improving communication with other parties such as end user, user experience in short cycle. The core idea is details, while well-made prototype is not a main target. Instead of this, a fast response, and flexibility and reusable product are selected as the main characteristics for this prototype. Develop team is able to build quick prototype and then presents it for others, and then gets the fast feedback for them. By doing this, even users can involve themselves in the development process in the early state through design process. One benefit is that it allows more interactions between development team and users.

Unlike the traditional waterfall method, feedback explains which block that user consider as needed to be re-designed, whether it is the correct feature and the expected behavior according URS in the beginning step. As the result, development time could be decreased dramatically. The prototype is reusable, development team spends most of the time to improve the demand rather sketch a new one from beginning, and then the cycle is repeat. The next FIGURE presents about RR2I method.

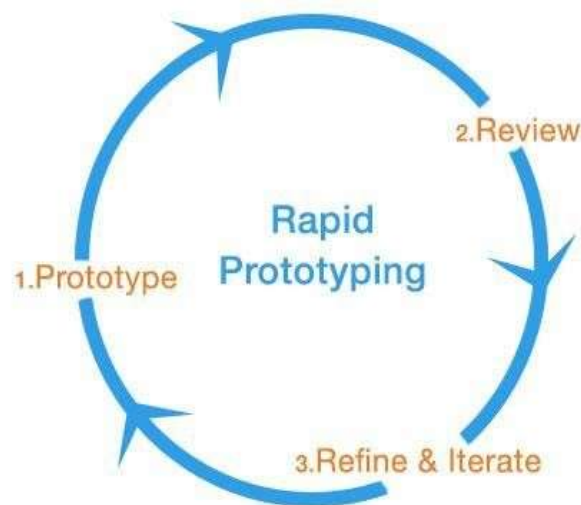


FIGURE 6: RR2I rapid prototype approach. (Source usability geek website)

After all requirement is collected, use story is created. It is used to identify task object, their attributes and actions (Travis, L. 2013 User-centered Design, page 150). Predicting user action, user's story is formed in a short sentence, no more than 50 words and how the system response is written also. For example, "As a customer, I want to move to next video record". System response: "system has a navigation to switch video record". The example above is a simple user's story, which is based on the collection of this user experience drawing in paper a prototype with basic functions and noting down user interaction, event handler for development team.

Development team used Balsamiq to create a visual mockup based on paper prototype for the new tool. A prototype in the beginning has two basic functions: saving annotation and displaying report.

The fact that saving annotation page contains several sub tasks. It allows user watching video records, displaying and modifying annotation, rating tester. According this task list, user scenario, and task flow, the prototype have been built up to meet all these requirements. Due to this reason and consistency issue of website, saving annotation page has a layout which is used 1-column style for user in order to archive not only a better working flow, but also for efficient issue. There are 4 main blocks in layout: navigation, video block, and user input and data table.

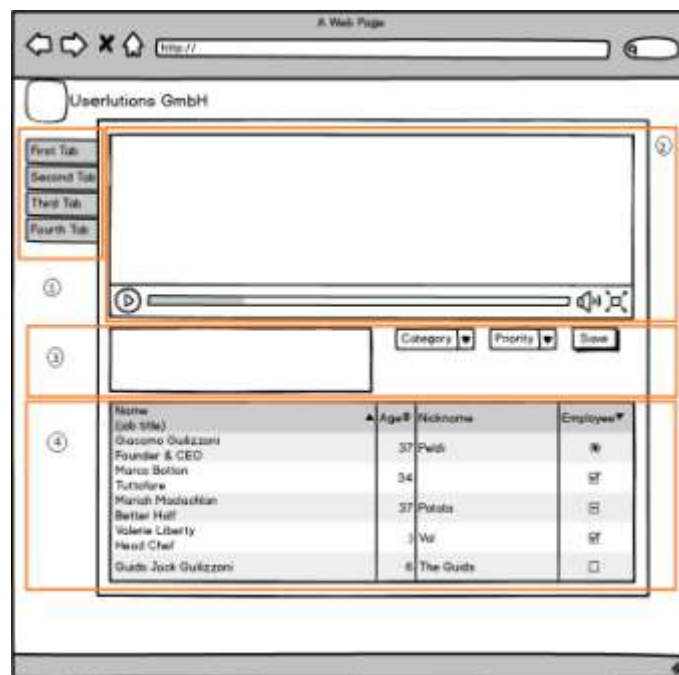


FIGURE 7: The first prototype of video usability analysis tool

First block is a vertical navigation. It is located in the top left corner of page. Inspire from Steve Krug, Don't Make me think authored, web user usually do not read every words but they scan through a particular block or section instead of the whole website to find out their interested information (Gerry Mcgovern website, cited 30.11.2014). Therefore, the location is very important, how to get the attention of user absolutely increasing usability for new tool. The popular nature reading order is from top to bottom and left to right. So that is the reason we decided to put it there. In this navigation block, users find some useful links which connect to user dashboard, reports, sale pages, and so forth.

The second block contains a video player (JWplayer) which displays both of record video and also information of tester, video and rating system. Users get brief information of video record and tester here. On the top of video player, in the center of navigation bar, it displays a name of tester as the link (redirected to profile tester page),

identification of video. There are two arrows which allow quick access to the next or previous video. On the left hand side, information of testing system such as browser name, version of browser, operating system of computer or mobile device depended on the test type (there are desktop and mobile test type) are showed. In the right corner is guideline link, when the mouse is hovered on this link, a tooltip box which contain a shortcut of tool appear. Referring to the video player block, JWplayer provides a flex screen size that is double-sized compared with the current version. Video player has a custom control bar which lets user can play, stop, and change speed and volume also. There is two models of video for users: normal and full screen mode.

Below of video player, there is a rating system for customers where they give their feedback about testers who perform the video record test (Userlutions using 5 points rating which 5 is the best result). This information is saved directly to database and it is used in the algorithm for invitation. The reason is Userlutions offers 24 hours response service in order to archive this mission in short time but also remaining the quality of service, Userlutions need to find out the better tester. Rating point is a key to determine performance of tester. Of course, tester has a good rating will receive more invitations.

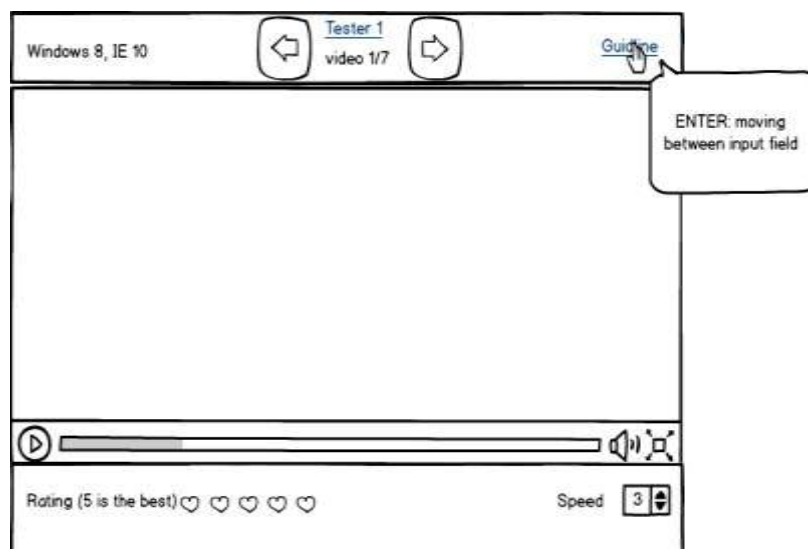


FIGURE 8: video player block mockup

Next, third block is a form for user giving input data. The first text area allows users typing comments which describe the issue that users find when they watch video record. There is a header helping users understand what they can do in this block. In order from the left to right, there is a duration of video which is synchronized with duration in video player. Customer is able to change this value to seek for the special position of video. Two next drop-down menu gives a predefine category for users quickly selecting. However, unlike priority menu, category does not only have predefined item but customers are also able to add a personal category by themselves. This issue is mentioned in the tooltip next to category menu.

FIGURE 9: Annotation saving form.

For displaying annotation, table is considered as the property format due to a huge amount of data and same structure. Unlike the previous version, the whole data is loaded in one text area without any format, customer get confused when they have a large amount of information. It is hard to follow as well as search for needed information. In the new version, data is loaded in Handsontable, hence, it is more readable and organizational. Each annotation takes a row and separates data in different one. So users can search data more easily compared with the old version. There are 4 columns which are located with the same order as in third block. In addition, the width of column is resized in order to fit with the size of field in Annotation block. The reason is to improve the usability of the page, by doing this, there is a connection between two blocks. These columns are self-explained because of consistent factor. Moreover, Handsontable allows users to sort data by clicking icon on the right hand side of the header of the column. It can be sorted by duration, comments, category and also priority. By defaulting, data is sorted by duration and priority by ascending order. In addition, there are two columns in the right hand side of table which let customers interact with annotation. Pressing play button, customers can shift video to the position which is in duration column in the first column. By clicking delete icon, an annotation is deleted directly in database. Customer is able to change data by editing directly in table.

	Comment	Category	Priority		
00:30	The top menu layout is broken in mobile screen size	Layout	High	▶	🗑️
15:20	Make logo is smaller size 200x100	Frontend issue	Medium	▶	🗑️
17: 54	Product displays discount price incorrect	backend issue	High	▶	🗑️

FIGURE 10: annotation table in saving annotation page mockup

In report page, a summary information offers an overview about test result for customers. In details, it combines an annotation table and several charts which provide a visual report. On the top is an annotation table which lists all notes from every tester. By default, data is sorted by tester and duration. In general, it looks similar with table in saving annotation page, however this report consists of all testers instead of one as in annotation

page. At the bottom, there is several charts about category, priority etc. From here, customers have a clear view about the situation of their website how many issues they have in each category and what is the important issue which need to solve first.

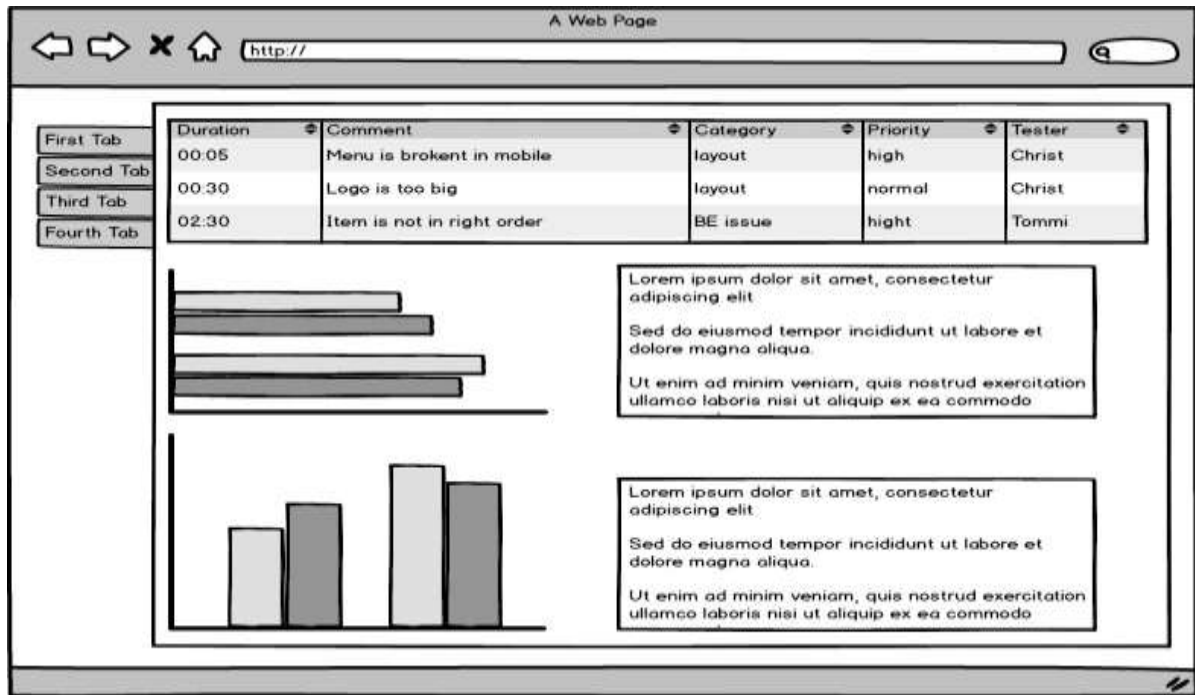


FIGURE 11: report page mockup

4.4 Project manager

Agile method is selected as the main development process for this project. It is a software development process in the model of agile. Agile Technology provides a lot of methodologies, processes and experiments for the development of software to be quickly and easily. The Scrum methodology of agile software development marks a dramatic departure from waterfall management. In fact, Scrum and other agile processes were inspired by its shortcomings. The Scrum methodology emphasizes communication and collaboration, functioning software, and the flexibility to adapt to emerging business realities — all attributes that suffer in the rigidly ordered waterfall paradigm (Scrummethodology website, cited 05.12.2014). Scrum project is divided into the loop developed called the sprint. Each sprint usually takes 2- 4 weeks (30 days) to complete. It is suitable for projects with many changes and requires high speed. A sprint finish some function, purpose in the whole system. The tasks in the sprint are divided into categories, the teams will develop and reassess how to achieve the original purpose of the set time period. For dividing task in each sprint, trello provides a sprint board system where user customized the board.

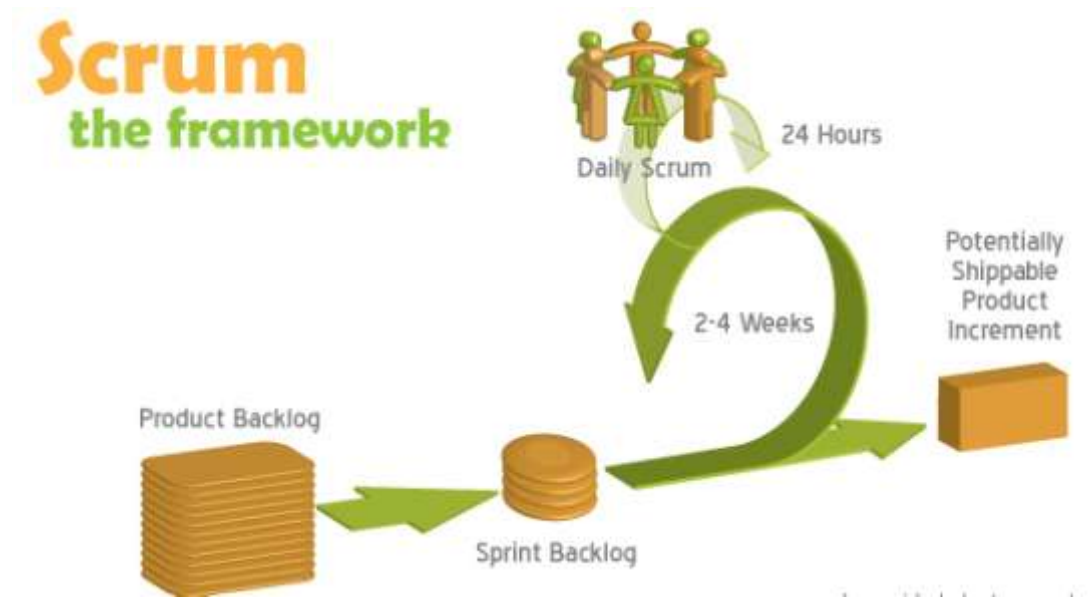


FIGURE 12: scrum diagram (Scrum framework, cited 04.12.2014)

4.5 Implementation

In this section, it shows some major issue when this video analysis is implemented, the major challenge and how does it solves. At the beginning, develop team separated project to several modules which are simpler to focus. Module is categorized by their function. For example, in front end side, there are video player module, datatable and visual report module.

4.5.1 Install layout page

The important thing when installing the layout of this page is that it needs to be implemented exactly as it was designed on mockup. In other words, the layout and elements have its' own positions, developer has to place in correct location and style. In this part, most of tasks have done by implementing style in css. Styling is a collection of rules which tell the browser how to generate the frontend of this tool.

There is the fact that in Prails framework every style is defined in the main css file. Unlike some websites which has various style files such as BBC homepage or a combined sass file as in New York Times homepage, due to Prails structure, it has a main style file in resource folder and style code is isolated with JavaScript, php and html code. This file is available in global scope, Prails lets every page automatic referring to this file. However, Prails also allows to create an external css in resource folder, developer tend to write in main css file.

There are two major reason for this structure. Firstly, by doing this, it reduces the size of css file compared with having many small css files. Browser loads one smaller size css file faster instead of going through several files then it substantially decreases the page load time. Moreover, once when this file is loaded, it is saved in cache and then next time, browser just loads it from here. It also saves the space for client side. Hence, it improves the performance of this tool. Second reason, it is more reasonable for managing code, form develop team point of view. For instance, if there is any bug in page, developer can search to find the bug more easier if all code is in the same file instead of several part.

One of main challenger in this project is preventing overwrite situation. Develop team uses several techniques to solve this issue for video analysis tool. First thing comes to team is DRY concept (do not repeat yourself). Only semantic elements have special selector, for common element style, it is inherited from the global default variable which is defined for the whole website. So inherited values do not need to be declared again. It comes from the base rules which does not include a special class or id selector. In addition, develop team tries to avoid specification. Element uses to have a class which can share the same style with other similar element instead of id. Element has more than one class which refers to difference class. The usage of id and keywords "important" are reduced to improve reusable code. Developer tends to group reusable properties together which are potentially being used by many classes. As the result, the development time is reduced and overwrite issue is prevented in most case. Developer do not spend time to rewrite code again, stylesheet code looks more structure, maintainable and reusable.

Secondly, a unique class for video tool is declared to isolate video analysis tool page with other page. The rest of style which needs to be customized, it is placed in a separate block. Because this style is used only for this tool, to classify, there is class "video-tool" which is inserted in the body tag.

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="UTF-8">
    <title>Video Analysis tool</title>
  </head>
  <body class="video-tool">
  </body>
</html>
```

By specify the prefix “.video-tool” in the beginning of selector, any change that is targeted to this page do not affect to other page. For instance:

```
.video-tool .container .div {  
    float: left;  
    background: #000;  
}
```

There is another important thing when writing style code which developer team have to concern is cross browser capability. As mention above, the customer of Userlutions GmbH is various so verify compatibility is always considered as the first thing in testing. Because the same stylesheet code can be generated differently in different browser or in the distinctive version of browser. So it is necessary to check the performance of code in various browsers. Userlutions targets to four main browsers Chrome, Firefox, IE and Safari. Developer uses the website caniuse.com to check compatibility. In this website, the information of properties is presented in table format. This table includes main browser in market and several its version. It shows that does this property is implemented in which browser, how does it do. Moreover, it also declares the issues that are recognized in the pass. In short, by doing this, developer can prevent the unexpected bug happened due to compatibility issue.

4.5.2 JavaScript functions

JavaScript function plays an important role in this tool. Regarding isober-idev website, the role of JavaScript is defined clearly in the guideline for frontend code standards and best practices. “JavaScript is the third major component of a web page. JavaScript code, when properly applied to a web page, enhances the overall user and browser-based experience through attaching to events and controlling the overall behavior layer”. All performance of video analysis tool is controlled through JavaScript and php. JavaScript code is insert in the end of page to ensure that script is executed after loading page.


```

<!doctype>
<html>
  <head>
    <title>Video Analysis tool</title>
  </head>
  <body>
    <!-- html code -->

    <!-- html code end -->
    <script>
      $(function() {
        //code of video tool page
      });
    </script>
  </body>
</html>

```

According to the function of this page, JavaScript is divided into two main blocks. One block contains the function which is integrated logic for video player and the other for displaying data in Handsontable. Based on API document, developer has implemented business and interaction logic which are defined by UX expert.

JWplayer has a completed instruction in their API document. There are a range of articles to explain how to use JavaScript component. According to JavaScript API quick start document, JWplayer team declares that their video player provides the reference about methods, events which can be used to enhance the functionality of video embeds and/or to implement rich video-page interactions. It abstracts any differences between Flash and HTML5, so the code will work with both technologies. This feature brings an advance to JWplayer because developer only needs to write code once and then their code works in both cases. For the new version of browsers which have supported then player plays video by HTML5 mode otherwise there is a fallback by flash mode. To be able to work with JWplayer, it needs to add the library either by cloud-hosted or self-hosted.

- cloud-hosted example:

```

<script src="http://jwpsrv.com/library/YOUR_JW_PLAYER_ACCOUNT_TOKEN.js" >
</script>

```

- self-hosted example:

```
<script src="/jwplayer/jwplayer.js" ></script>  
<script>jwplayer.key="ABCdeFG123456SeVenABCdeFG123456SeVen=";</script>
```

The next thing is initial JWplayer. To do it, developer create a <div> tag with unique id as the target of video player. And then in script block, by using keyword *jwplayer()* with the above div tag's id, there are some options to set up player.

```

<div id="videoContainer"></div>
<script>
// Initial jwplayer, declare the starting value for player.
jwplayer("videoContainer").setup({
    file: "path/to/videofile.mp4",
    width: "100%",
    aspectratio: "16:9",
    primary: "html5",
    flashplayer: "path/to/flash.swf",
    stretching: "uniform"
});
</script>

```

The next block is JavaScript function block for Handsontable. Handsontable is a proper choice for video analysis tool due to its performance, easy setup instruction. As Handsontable website announces, "Handsontable binds to your data source (array or object) by reference. Therefore, all the data entered in the grid will alter the original data source." (Handsontable website, cited 08.12.2014). Data source is selected from database by php function as a string and then parse to a json encoded string. (Php manual website, cited 08.12.2014.)

```

<script>
    var obj = <?php echo json_encode($php_variable); ?>;
</script>

```

Handsontable is constructed as a below example code. There are several variables such as data source, amount of default columns and rows, headers and the size of table.

```

$('div#tableContainer').handsontable({
    data: obj,
    startRows: 5,
    startCols: 5,
    colHeaders: true,
    columns: [{data: "Duration"},{data: "Commment"}, {data: "Category" }, {data: "Priority" } , {data: "" },
{data: "" }],
    minSpareRows: 1
    width: 400,
    height: 300
})

```

All data are handled by Ajax requests which invokes to a php function to modify database in order to archive demanded results.

4.5.3 Refactoring

Refactoring is always an important task in software development. It improves the quality of code and also performance of tool. Martin Fowler declares the definition of refactoring in his book "Refactoring is the process of changing a software system in such a way that it does not alter the external behavior of the code yet improves its internal structure." (c2 website, cited 08.12.2014) Refactoring has two main benefits, it improves the design of software and makes software easier to be understandable (source making website, cited 09.12.2014). Refactoring restructures the previous poorly code. At the beginning, due to lack of information or bad design, the code is longer even it performs same thing to produce the same result. Refactoring helps to decrease the amount of code, code becomes more shaped and easier to understand for future programmer. By doing it, code is more reusable and not difficult to maintain. Moreover, another reason to do refactoring is that the bug may be found during this process.

There are two times when developer does refactoring. It is the time when a new function is added, reviewing the existed code, testing or before deployment. These are suitable times which are suggested as the suitable time for checking code. In general, develop team has several methods which are used during refactoring. Mostly, extract method to eliminate duplicated code comes first. In case, if there is a duplicated code which is execute the same task in two function then it will be extract to another function and then the other is invoked to this function. In another case, if there is a long method which does some tasks then developer splits this function to few functions. The target is each function performing only one task and keep it short instead a long function. As the result, code has a good structure which is easier to understand, more reusable for future improve.

5. Conclusion

The project aims to build a first version of video analysis tool for Userlutions GmbH during three months training period. The main purpose is implement a new tool which brings to customer and also internal staff a new experience when performing video analysis. The requirement is that user needs to have a convenient tool which lets they have ability to increase interaction with system, rich content and well design. After the defined period, this tool have done with many pressure from its tight schedule. The first version has been using by internal staff for actual product testing and they plays the role of pilot test. There are some bugs is reported through trello dashboard in each sprint but it is fixed. At the end, this tool performs exactly what is planned in the beginning. There is no major error about this tool is announced.

During the time to build this tool and writing the bachelor's thesis, there is many researches have done to retrieved information. Many knowledge has been built up in this time. Author gains more experiences which is related in web developer sector. It is not only about code but also about the development process, testing, debugging and refactoring. In other words, it changes the way how author program. The code should archive the target is the most important thing, the work need to be done on time. However, programmer has to think also about usable. Does the code is maintainable, readable, reusable and testable

Author has change to learn more about some program languages such as php, jQuery and html5. The way to find solution for daily issues and bugs is one the most valuable experience that author get in this time. In addition, how to applied agile method to real project, the benefit of this method when compared with traditional software development method such as waterfall in the business environment. . Moreover, author got the experience about scrum in real project. From the author point of view, this method deliveries many benefits which enhances the performance of whole process.

6. Discussion

The first version is used by internal staff already, video analysis tool is considered as a valuable part for Userlutions GmbH. It enhances the compatibility for company by attracting more customer due to its performance.

Although the video analysis tool working properly, due to lack of time, develop team selected the most basic function to implement for this tool. There are many tasks which need to work for improving the quality of this tool.

Firstly, this tool is designed for desktop user, however, mobile device becomes more popular nowadays. As the result, the tool is displayed incorrect if user uses mobile device to perform it because of broken layout in small screen size. So one suggestion is redesign the layout for mobile first. Choosing the important features of this tool then future developer embeds it in mobile screen size. In short, it is highly recommended to create a responsive layout for this tool.

Secondly, the documentation is in initial stage, from the point of author's view, design, development and guideline instruction needs to have more content. There is no doubt that it is more understandable and working with the tool for enhancing the future. Not only author but also future developer and user, documentation brings advantage to become familiar with this tool in shorter time.

Last but not least, test automation definite deliveries a strong power for development process. Most of time during testing, developer used print command to print value to check. It is not a reasonable way to do testing. Test automation is higher suggested to speed up the development time. It is more accurate, efficient and saving more time compared with the way author used to do. There are several available choices in the market such as Selenium, Jasmine which are considered as a potential testing framework for Userlutions video analysis tool.

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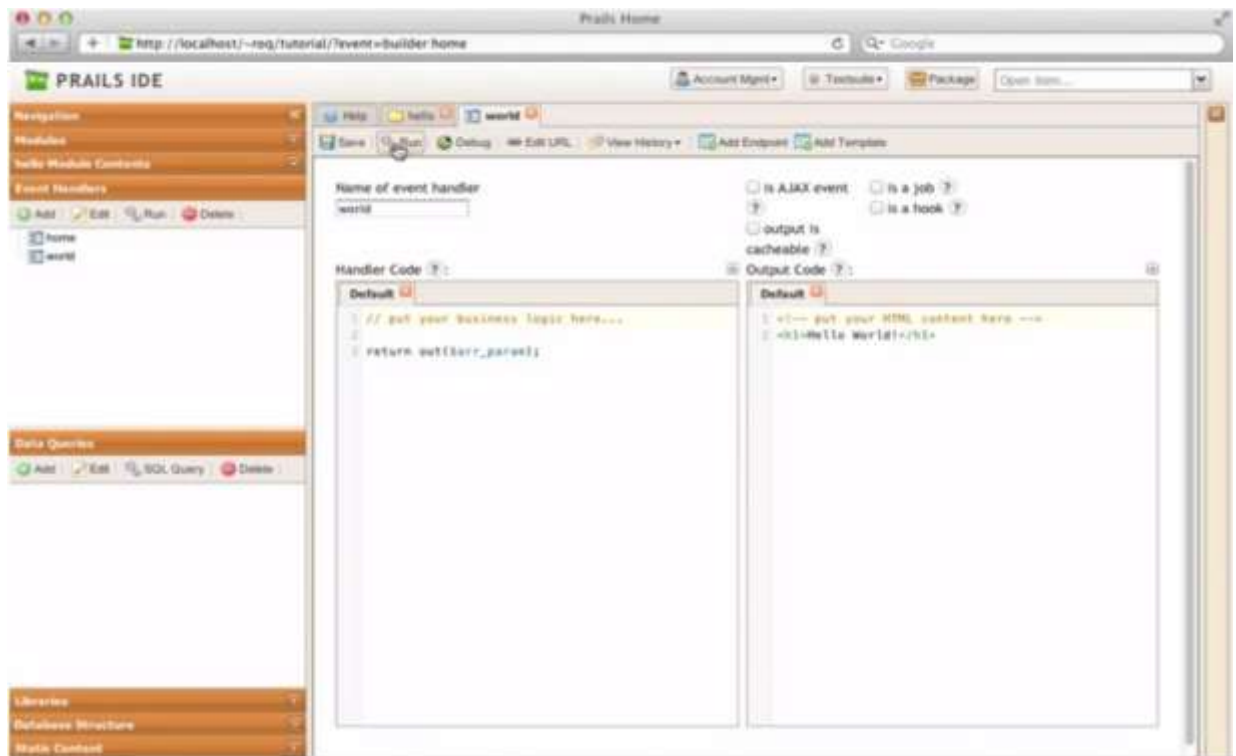
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APPENDIX 1

Prails web framework



Can I use website



APPENDIX 2

Trello

