

Development and Usability Evaluation of a Web Application as an Appointment Platform for Athletes

Masterarbeit

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1 Introduction

Almost every visitor of a web site can remember the following scenario: After entering a web site there is no overview given, no structure is recognizable and a flood of information is hitting the user. Based on this, the decision to leave the web site has fallen quickly and an alternative product has been found with ease (Mattscheck, 2013). Static pages are almost overcome and replaced by web applications, so that especially the development of a web application requires very fast reactions in regards to the always changing environment and therefore, the software development process has to adapt those changes to avoid costs and delays in advance. On the other side, many chances are resulting in regards functions and performance (Dias et al., 2012 and Ali-Shahid and Sulaiman, 2015). More and more web sites and online businesses are delivering different types of services and products. Web applications, which are featuring the newest technology stack are forming the basis, however, the quality and especially the usability, as a crucial factor, often are moving into the background (Aamir and Mansoor, 2013). Therefore, usability decides about the success or failure of a web site by making it easy or hard to use. Based on this, testing and evaluating usability has gathered attention within the last years, which is reasoned by the fact that usability tools or methods are still limited (Tezza et al., 2011). Additionally, the use of usability guidelines are not leading to a higher usability with certainty, because needs and expectations differ from user to user (Leporini and Patern, 2008).

1.1 Motivation

Referring to the previous section the motivation to implement UEM (usability evaluation methods) is reasoned by the following facts:

Usability directly influences the user's satisfaction and therefore has an indirect impact on more aspects in regards to the perception of a web application. Based on this, usability can be seen as the interaction element between the user and the web application (Dias et al., 2012).

Usability issues need to be disclosed within an early phase of the development process, so that delays or cost aspects can be avoided before the deployment of the final application. Subsequent restructurings regarding the software architecture or general aspects can lead to additional costs or delays, because without usability testing the reasons leading to these issues are not disclosed timely (Folmer et al., 2003).

Based on this, economic factors resulting from a high usability are a higher overall perceived value or a general competitive advantage (Dias et al., 2012).

All in all, web sites are representing the companies and therefore, the presentation directly influences the opinion-forming process of potential and existing customers (Geng and Tian, 2015).

Wrapping up, a high usability is an indispensable competitive factor for each company interacting with the world wide web and therefore, each company should focus on a high effort within this discipline (Yusof et al., 2010).

1.2 Objective

The focus of this elaboration is to make a statement to what extent usability guidelines can lead to a higher usability. In order to reach this goal a web application prototype will be developed based on chosen usability guidelines and a user testing as evaluation method will be carried out. Furthermore, the impact and need of usability testing within the software development process will be discussed in regards to operational and strategic factors.

Besides answering the research question, additional drivers of usability in the context of this elaboration will be exposed and based on this, treatment recommendations shall reflect the extracted knowledge in regards to the usability and aims to make this approach applicable for different use cases.

In addition to the usability orientated topic of this elaboration, information about the need for an appointment platform for athletes will be provided. The underlying knowledge will be extracted from additional questionnaires and evaluation methods placed before, during and after the usability evaluation.

1.3 Structure

The thesis will be structured after the publication schema for a design science research study as recommended by Gregor and Hevner (2013). Therefore, after giving a short introduction in which the problem, significance and motivation of the underlying topic and the resulting goals will be presented, a literature review will take place to present and summarize prior knowledge from previously published studies.

For this work, the underlying method is going to be a usability evaluation of a web application prototype and based on this, in connection to the literature review, the process of developing the prototype will be presented. The prototype therefore will function as the artifact to apply the evaluation upon and therefore is the underlying evaluation instrument.

The evaluation will take part after the artifact description. First of all, prior work based on the literature review will help to choose the right type of usability evaluation method and on top of that, the evaluation itself will be prepared. After conducting the evaluation, the results will be extracted. Based on the results, the discussion will aim to present a summary of the generated results and will show limitations, advantages, disadvantages and the theoretical and practical significance. As the last point, the conclusion and outlook aims to highlight the important and relevant parts of this elaboration and therefore will again show the main results. Regarding future studies, ideas and thoughts regarding improvements or approaches will additionally be given.

2 Web Usability

2.1 Definition

Usability, as a crucial section of the human-computer interaction (HCI) is getting more and more into the focus, which is reasoned by the fact that it represents the bridge between technology and the users. Therefore, usability has become an important part of the HCI literature and research (Aamir and Mansoor, 2013 and Agarwal and Venkatesh, 2002). The HCI therefore directly links the needs and expectations of the users with the technology (Yan and Guo, 2010). Especially the software engineering (SE) sector got affected by this rethinking. The usability of software now besides functionality, reliability, efficiency, maintainability and portability is a subsection of software quality criteria. All in all, it has become one of the most important factors in the SE process because it forms the connection between the user and the computer (Aamir and Mansoor, 2013).

In general, there is no definitive or final definition of usability (Chen et al., 2009). When trying to define the term usability, the most common definitions are provided by Jacob Nielsen and the International Organization for Standardization (ISO). The ISO defines usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use“, meanwhile Nielsen expects usability to meet the following criteria “easy to learn, efficient to use, easy to remember, low error rate and meets user satisfaction“ (Nielsen, 1993 and ISO, 1998). The ISO breaks down

functions and methods have been disclosed to create a basis to make redesign suggestions upon. Due to this, the overall output has a high relevance for the re-working phase and can prevent from errors in the deployment phase.

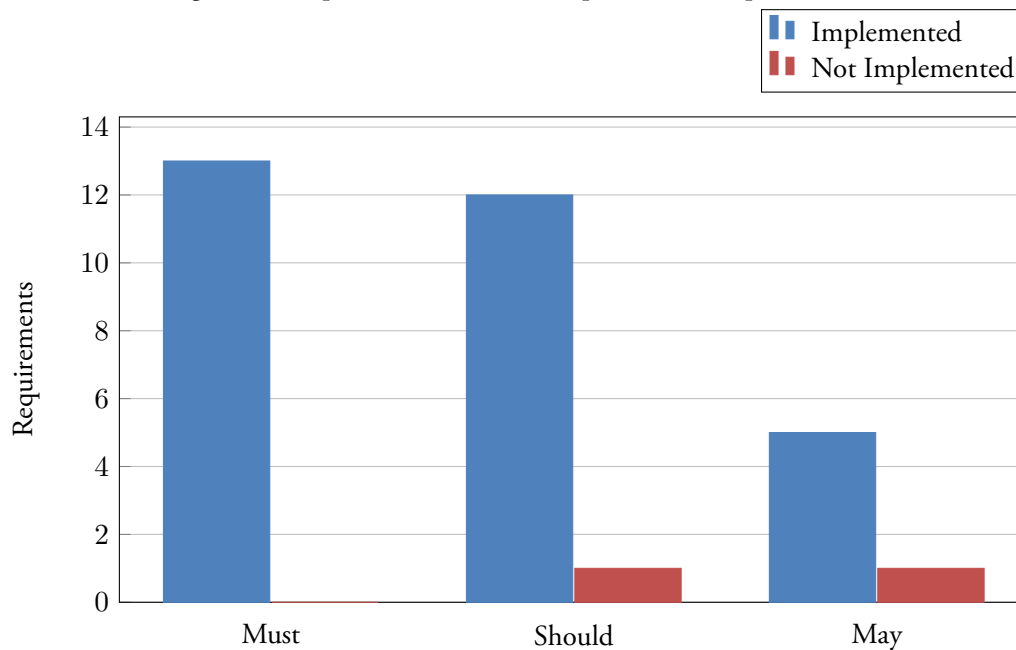
All in all, the implementation of usability evaluation methods at the right point within the software development process can lead to a better product and a satisfied customer, what on the other hand positively influences economic factors, while equalizing short term costs resulting from the testing process. On top of that, implementing usability methods at the right point prevents restructurings at a later stage of the development process. In total, the benefits resulting from considering usability aspects are worth the short term costs, which on this basis will be amortized with a high certainty.

9 Conclusion and Outlook

In the course of this elaboration, a web application as an appointment platform for athletes has been developed. Within the conception and planing phase for the development different scientific papers with the focus on reaching a high usability were evaluated. The paper provided by Folmer et al. (2003) was chosen as the underlying usability guideline and on this basis, all factors leading to a higher usability were considered within the requirement analysis. After the development of the prototype, different UEM were presented and discussed. As the next step, a framework for the usability evaluation of the web application was created by selecting questionnaires and the think-aloud process as the underlying user testing methods. The resulting questionnaires were forming the basis for the usability evaluation and were asking different parameters to gather knowledge about existing or missing usability factors. Based on the extracted results, redesign suggestions were made and the results were discussed, meanwhile addressing limitations and expressing treatment recommendations.

Starting with the requirement analysis, 28 out of 30 requirements in total have been successfully implemented. Regarding usability requirements, 10 out of 12 usability requirements were realized. Addressing must requirements, none of the planned functions are missing in the web application. For the should requirements, only the administration function was not realized and for the may requirements, the creation of avatars was not implemented. In total, most of the planned functions have been implemented and therefore the process of the implementation can be seen as a success in regards to the achieved and applied requirements. Considering the concept, the idea, design decisions and mock ups have been transformed in the best possible way with the aim to apply and implement the requirements in an appropriate way.

Figure 39: Implemented and Not Implemented Requirements



Source: Own Illustration.

The resulting web application prototype was used for the UEM to answer the research question of this elaboration, which was defined as follows: What are the key success factors of a web application for sport appointments in regards to the web usability?

To answer this question, the test users of the evaluation were stating that providing a general overview, clear structural aspects, providing feedback, easy to use core functions, clear and intuitive input possibilities, redirections/guidance and the creation of a social environment in total can enhance the usability.

Furthermore, most of the extracted key success factors are matching the stated requirements by Folmer et al. (2003) within the requirement analysis and therefore, another result was that the underlying usability guideline can be used as a scaffold to reach a higher level of usability.

Besides the disclosure of key success factors, test users were also able to detect fatal or critical errors. For example, it was stated that at some point the side bar menu items were not named clear enough or the possibility to delete or edit a created activity was not found. In addition, ideas and visions to further improve the web application were provided by the test users.

All in all, the discovered errors, ideas and key success factors in total were leading to the creation of redesign suggestions, which are reflecting the power of usability evaluation methods. Besides providing the chance to bring together potential users and the web application before the final deployment, usability testing can also lead to economic advantages. To name some, additional costs and time delays can be avoided due to the timely detection of errors and problems. Therefore, operational blindness can be prevented in case the UEM are applied in the right phase of the development process, which at least is before the deployment.

As stated in an earlier section, the resulting redesign suggestions can lead to a higher usability after being implemented. Therefore, the errors, ideas and key success factors are going to be transformed and applied, which in total will lead to an overall increased usability, more functions and an overall better appearance.

The appearance can be improved by implementing the suggestions in regards to the structure. In addition to that, further details like the support of choosing a location on a map are going to be implemented. Users will be able to change their profile pictures and to interact in a social way by following other users. Working on details like hover effects or animations may enhance the overall user experience and can positively influence the acceptance.

Furthermore, in case a final deployment is contemplated, questions regarding the scalability need to be answered. Besides making the application even more responsive or developing an independent native application, the creation of a future-proof progressive web application could also be considered. In regards to the server structure, the final backend needs to be designed in a way, which offers the possibility to always react on higher amounts of requests. Referring to the overall performance, the underlying programming language and framework can also be questioned, which is reasoned by the fact that many web applications nowadays are based on JS backend and frontend frameworks, which offer a high level of scalability and compatibility.

Another important point regarding the ongoing development would be to ensure a high level of code quality. Therefore, test driven development and continuous integration, module or system testing can lead to a better understanding and function of the code base.

Regarding the chosen UEM, further tests can lead to an even higher level of usability, which is reasoned by the fact that the evaluation of usability can be seen as a dynamic process. Therefore, an extension of the chosen user testing methods and a revision of the questionnaires eventually can point to further incidents, which have not been detected so far. Falling back on another user sample probably is also influencing the results and can lead to changing revision aspects.

Another thinkable scenario would be to test the used UEM. Therefore, the web application would be revised by implementing the redesign suggestions and ideas and afterwards another usability evaluation using another sample would take place. In case the rate of errors is reduced, one main goal would have been achieved - to reduce the overall usability rate. As a second point, in case the users are still stating missing functions or usability, an additional weighting on how to implement different objective suggestions, ideas and visions needs to be made.

Further research could point to the direction of merging UEM and web applications, because so far most of the methods suggested and applied are created for various types of software, for example native applications, web applications, web sites or computer programs. Based on this, working out fitted methods for the specific types of software can lead to optimized results and an overall higher usability. This is mainly reasoned by the fact that a fitting of the testing methods in regards to the different types of applications will lead to determined results for specific content.

Another point would be to apply the extracted key usability factors for different purposes. Therefore, the question could be whether the factors may also work for applications in another environment or having another main function, so that the results of this elaboration can be also applied for other applications or programs and may be representing an ubiquitous approach.

As the last point, this elaboration has proven the power of UEM when being applied in the right phase of the development process. Testing the web application together with potential future users has disclosed errors and usability lacks, but also has left potential and space for new ideas, visions or redesigns worked out in the course of the evaluation process. In this case, no economic impacts could be avoided, but for a practical appliance

the use of the right UEM can prevent companies from unplanned restructurings and expectation differences between the is and should, leading to cost explosions and time delays. Regarding the costs for UEM, the short term costs may seem to be high, but in a long term view the costs will be amortized over time. As the final sentence, the appliance of UEM is a good investment into the success of a company's figurehead, which is representing the interface between the company and a potential and consisting customer.