Intelligent Environments 2020
C.A. Iglesias et al. (Eds.)

doi:10.3233/AISE200064

Realisation of Usability Tests: A Social Media Marketing Software Development Case

Christina EBERHARTER[a] and Anna FENSEL[b, 1]
[a] *Department of Information Systems, Production and Logistics Management, University of Innsbruck, Austria*
[b] *Semantic Technology Institute (STI) Innsbruck, Department of Computer Science, University of Innsbruck, Austria*

Abstract. Social networks such as Facebook, Twitter or LinkedIn opened the door for new ways of online marketing—social media marketing. In order to use social networks efficiently for marketing purposes and reach (potential) customers, marketers rely on social media marketing software (SMMS), supporting companies and individuals with publishing, engaging, promoting or listening on social media networks. In order to make a competitive SMMS, some of the most important quality factors are usability and user experience. In practice, often only user interface (UI) experts are used for design updates as usability tests can be time intensive and costly. Based on the use case of the social media management tool Onlim (www.onlim.com), the extent to which usability tests can detect user experience issues and suggest improvements was studied by conducting a usability lab. The data of 20 participants of the conducted usability lab was used for an in-depth analysis. The analysis identified fifteen usability problems whereas five are system and ten operational problems. Overall only 40% of the problems were resolved through the implementation of a new UI design when not taking usability tests outcomes into account, and 60% of the problems still remain in the new interface or are only partly solved. Therefore, on an example of SMMS, it has been shown that the usability tests on one hand are valuable, and on the other hand, are difficult to incorporate in the development of the software in rapidly evolving fields.

Keywords. usability, software development, web applications, social media, online marketing

1. Introduction

Nowadays users communicate on a regular basis with each other via online social platforms. According to [7] from Tech Crunch, by June 2017 Facebook had 2 billion monthly active users and was one of the largest social networks with a global reach. Other popular social networks like Twitter and Instagram reported 328 million and 700 million monthly active users, respectively [7]. Besides general social media networks, business social networks gained attractiveness. LinkedIn, for example, has over 310 millions of active users per month in 2020 [2].

[1] Corresponding Author: Anna Fensel, Semantic Technology Institute (STI) Innsbruck, Department of Computer Science, Technikerstrasse 21a, Innsbruck, 6020 Austria; E-mail: anna.fensel@sti2.at.

Acknowledgements: The authors thank Dr. Ioan Toma (Onlim GmbH) for contributing to this project. The work has been partly funded by the Eurostars project *WordLiftNG: WordLift New Generation* (FFG - Austrian Research Promotion Agency, European Union Horizon 2020 Framework Programme).

This importance of social media and the resulting opportunity to reach out to target groups, publish information, and engage with customers in a bi-directional way signals an immense value for companies of all sizes and types of businesses. Utilizing social media as part of a company's online marketing strategy often means not only using one social platform but being present on several platforms simultaneously to increase a firm's online visibility and engagement [1]. Managing and monitoring online presence can be a time-consuming task, therefore most organizations make use of online social media management tools to manage their social media accounts. One well recognized social media management tool is Hootsuite (www. hootsuite.com), which allows scheduling posts in advance, monitoring, and posting to multiple platforms. Other providers of similar management tools include Buffer (www.buffer.com), TweetDeck (www.tweetdeck.com), and Sprinkler (www.sprinkler.com).

Competition among social media management tools is substantial. Since it is easy to switch providers of such Web applications, these providers have the obvious goal of pleasing their users to keep the musing the application. One important factor in achieving user satisfaction is ensuring an application's high usability. If applications are poorly designed and lack ease of use, users will reject them. Therefore, a main objective of Web applications is that the user achieves his or her goal effectively, efficiently, and satisfactorily [14]. According to [3] usability can be defined as "the ease of use and acceptability of product for a particular class of users carrying out specific tasks in a specific environment".

Usability is not a one-time task conducted in the Web application, it is more an iterative process throughout development and beyond. To ensure well-specified usability of the final product, usability itself must be seen as an ongoing series of actions [14]. Usability feedback is currently often difficult to implement practically, but its importance is still considered to be important in theoretical research [5]. In our work, we confirm the latter thesis from a practical perspective.

In the domain of information systems, the term usability is mostly associated with software development and Web applications. As social media management tools can be assigned to the category of Web applications as well, usability also plays a decisive role for these tools. Therefore, based on the example use case of the social media management tool Onlim (www.onlim.com), this paper aims to identify to which extent usability testing of social media management tools can be useful for the improvement of the tools. This leads to the following research question:

➢ To what extent can usability tests detect user experience issues and consequently improvements for the use case of a social media management tool?

The practical questions applicable to the use case included identification of the weaknesses exist in previous user experiences, problems when performing tasks in Onlim, issues resolved over time through a regular software development process without having explicit feedback from a usability test.

The structure of this paper is as follows. Section 2 a theoretical analysis that introduces the background and the state of the art in the main research fields: social media marketing, usability and common usability tests. In Section 3, the use case is explained with some background information about the company, including a description of the software's features and the current UI. Section 4 introduces the applied methodology for the practical application of a usability lab. Section 5 examines into evaluation of the results of the applied method that form the basis for proposing usability improvements for Onlim as well as general recommendations for SMMS. Section 6 concludes the paper.

2. Background and Related Work

In the following subsections, two relevant topics are discussed to provide a better understanding of the subject of this work: the content and social media marketing, usability and user experiences within Web applications.

2.1. Social Media and Content Marketing

Social media is often used as a synonym for Web 2.0. According to [13], social media is "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content". In general, social media allows people to connect to each other, form communities and share knowledge, experience and user generated content (UGC). In addition, the authors state that UGC describes "the various forms of media content that are publicly available and created by end-users" [13]. A more open definition for self-interpretation is given by [21] who define social media as "the online means of communication, conveyance, collaboration, and cultivation among interconnected and interdependent networks of people, communities, and organizations enhanced by technological capabilities and mobility".

Web 2.0 and all its forms of social media created a shift in market power and also changed the consumer behavior of individuals. Market power shifted from producers toward the direction of consumers. The main reasons for such a power transfer include that through the new functions of Web 2.0, such as bi-directional communication between users, new created communities and social networks, users are allowed to access more information and knowledge than before [6]. Furthermore, brand information is not only provided through corporate Web sites or mass media, but information and experiences about products are shared by the consumers themselves [6].

Prior to Web 2.0, market power was centralized on the producer side and only traditional marketing was applied. Organizations made use of the marketing mix to reach their goals of creating, communicating and delivering offers that have value to customers. The marketing mix consists of the 4 Ps which stand for *product, price, promotion and place* [21]. Through the emergence of social media marketing, the state that a fifth *P*, which stands for participation, should be added to the marketing mix [21]. The authors argue that consumers' daily lives are changed through social media and therefore marketers also need to reshape how they are doing marketing. Using social media for business and marketing purposes means to take part in it and, particularly if it is to create brand awareness, maintain relationships with customers or promote new products [21]. Participatory systems involving the users actively in the information sharing are currently intensively investigated, including the systems enabling sharing of the data that have a potential private character [10].

2.2. Usability and User Experience in Web Applications

As the term usability is widely used in different research fields, there are many definitions. In the field of Human-Computer Interaction (HCI) the most common definition is provided by the International Organization for Standardization (ISO). The standard ISO 9241-11 for human-system interaction [10] defines usability as "the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use".

According to [9] this definition applies best to the perspective of human interaction, as it focuses on the interaction of users with software products and the capability to meet customer expectations. Another widely-accepted definition comes from the Software Engineering (SE) field. ISO 9126-1, the predecessor of ISO 25000, provides the following definition [9]: "the capability of the software product to be understood, learned, operated, attractive to the user, and compliant to standards/guidelines, when used under specific conditions". This definition sees usability as an attribute of the software product quality and does not necessarily imply the interaction with users as usability is a characteristic that just needs to conform to predefined specifications [9]. As standards define usability in different ways, [4] defined two categories, the "top-down" approach which defines usability as a quality objective with reference to ISO 9241-11 and the "bottom-up" approach which focuses on a product-oriented view where usability is seen as an attribute of software quality with reference to standard ISO 9126. For the purpose of this paper the usability definition from ISO 9241-11 applies throughout.

In Web engineering, usability is seen as a quality factor. Usability describes the product quality from a user standpoint and provides answers to occurring problems between people and technology interaction [17]. Web usability as it is also called in web engineering recognizes the usability definition provided by ISO 9241-11, but also states that the usability definition provided by [18] is commonly used. [18] states, that usability must be "systematically approached, improved and evaluated" in order to have measurable criteria which support the goal to move toward "an engineering discipline where usability is not just argued about".

One of the most common usability evaluation methods is a usability lab conducted with a small number of participants. Typically, only 5-10 participants take part in such a test, as it requires one-on-one sessions between participant and moderator. This form of a moderated usability study allows the moderator to ask questions about the product itself, records the user's behavior and gives the participant a set of tasks to complete related to the product. The advantage of such a moderated usability lab is that the moderator can question specific actions the participant performed, providing more insights. Furthermore, the thinking out loud method is often applied so that the participant expresses his/her thoughts out loud while performing the tasks. The whole session is recorded in order to evaluate data afterwards. This form of evaluation is often used in formative studies for iterative design improvement during the development phase [12, 20]. The main metrics collected focus on issues, their frequency, severity and type. Other metrics that are also tracked include performance metrics, such as success rate, task success, error rates, time on task, or efficiency.

3. Use Case

A Tyrolean based start-up Onlim (www.onlim.com) that provides online marketing solutions builds the fundament of this work. The main purpose of the usability part of this work is to evaluate the usefulness of usability tests based on a conducted usability lab on the Onlim social media management UI. The results have been compared with a new UI solution to discover if all usability problems are solved through the new UI created by user experience specialists without more extensive user experience testing with users.

The company provided a solution for managing social media profiles. As this market is already well served with Software as a Service (SaaS) applications from competitors,

the company started out by targeting the Austrian Tourism sector and made use of semantically-enabled online communication in their application [8]. The innovative tool set based on semantics, learning algorithms, and rules is the foundation of Onlim and therefore provides an easy-to-use platform for creating, managing and distributing content to several social media channels such as Facebook, Twitter and LinkedIn. An additional new feature is the chatbot which operates on the same platform. The Onlim team creates customized chatbots for customers which can be integrated into corporate Web sites and Web- based applications.

Onlim provided SaaS and comprises several features which make the life of a content marketer much easier in maintaining and feeding their social media channels. Among the main strengths of Onlim are the various content sources like Web sites, blogs or RSS feeds for a semi- automated content creation process. The available functions have included *Dashboard*, *New Post*, *Calendar*, *News Feed*, *Statistics*, *Channels*, *Chatbot LiveChat*, *Chatbot Content*, *Tutorials*.

4. Methodology

Here we describe the procedure of the usability lab based on the use case. The lab test is a qualitative user test conducted with the support of an online usability tool that allows background or screener questions, tasks and follow-up questions to be setup. The usability lab is based on the usability study scenarios of [20], a more precise combination of "completing a transaction", "evaluating navigation and/or information architecture" and "problem discovery" scenarios. Completing transactions and navigation evaluation make use of task success and efficiency metrics. Tasks are defined through a clear beginning and end, and are measured for task success, failures and efficiency. Problem discovery is often used for already existing products in order to identify significant usability issues.

Participants go through a predefined script of tasks and questions. In order to understand the participants' thoughts as they interact with the tool, the concurrent thinking-aloud technique was applied [12], and the participants were asked to think out loud and give comments during performing the tasks. During the entire session, audio and screen activities were recorded. At the end of the session, participants answered four questions about the tested application, Onlim. The goal of the usability lab was to identify design improvements for an increased user satisfaction and ease of use before comparing it to the latest UI design of Onlim. The following functions/sections were examined:

- Registration and connecting of social media accounts,
- Help function/demo: page guide for new post section,
- Use of suggested RSS feeds and Facebook pages
- Use of calendar and draft function,
- Creation and scheduling of posts.

As a support tool for the evaluation of the usability lab, a Web tool for recording the user interaction was used in order to capture participants' screen movements and oral comments. The usability testing platform used for the lab was Try My UI (www.trymyui.com).

Planning a usability lab also requires determining what to measure to get an accurate, overall picture of the user experience. It is crucial to look on performance as well as on satisfaction metrics. Performance focuses on the user's interaction with the product, whereas satisfaction deals with the user's thoughts and words about his/her product

interaction. Most of the time, performance and satisfaction go hand-in-hand, although, performance and satisfaction does not always correlate [20]. The following metrics selected to be measured in the usability study were based on performance and satisfaction metrics [20]: *Time on task*, *Task success*, *Task completion perceived by user, Single Ease Question (SEQ), Open-ended questions.* For the last metric, the following four questions provided by the online usability support tool were used in the Onlim usability lab:

- What was the worst thing about your experience?
- What other aspects of the experience could be improved?
- What did you like about the Web site?
- What other comments do you have for the owner of the Web site?

For analyzing the participants feedback, the MAXQDA software for qualitative and mixed methods research (www.maxqda.com) was used in order to summarize and segment the verbatim comments. The code system for segmenting the answers to open-ended questions is derived from the answers itself.

After defining performance and satisfaction metrics for the usability study, the tasks were further defined based on the main functionality and Onlim's user goals. Table 1 lists the defined tasks which were performed by all participants. In addition to the tasks, each participant was asked to answer four open-ended questions, listed above, after completing the usability lab.

5. Results

In addition to the real-life usability study, an online usability study also was performed through crowdsourcing. In total, 20 out of 27 participants could be used for the analysis. Seven participants were excluded due to incomplete data sets. Eleven participants were from the online tester community of the usability testing platform and nine participants performed the real-life usability lab. Fifteen (75%) participants were male and five (25%) were female, all ranging from 18 to 54 years old. All participants were located in North America or Europe, had a college or university degree, and were daily social media users. The maximum length of the usability test was set at 30 minutes, as this was the maximum per-session recording time offered by the support tool, *try my UI,* for individual sessions. Therefore, the six tasks for the usability test, listed in Table 1, were defined in a way that an average experienced Web user could manage all tasks within 30 minutes. The following metrics were measured for the usability lab: time on task, task completion, level of success, and single easy questions. In addition to these metrics, four open-ended questions were asked at the end of the usability lab. The first metric to be measured was the time on task, providing a first impression of the overall performance of the participants for each task. The three longest times were measured for tasks 1, 3 and 6. These are also the tasks with the longest error bars, indicating a broader range of participant time per task results. It was also the first indication that the participants struggled the most with these specific tasks. This was then confirmed through the results of the successful completion rate by task and the level of success metrics. The biggest failure rate was detected in task 3, involving the selection, publishing, and saving as drafts of suggested posts. Also, a quite high rate of problems appeared in the level of success analysis for tasks 1, 4 and 6. The SEQ allowed the participants to rate the level of difficulty for each task (1= very difficult, 7 = very easy). For all tasks the average SEQ

was above 5 and three tasks were rated with a 6 or higher, indicating that overall the tasks were not perceived as very difficult by participants.

Table 1. Task Descriptions

Task ID	Task asked to be performed	Associated functions in Onlim
1	Register to Onlim, connect social media account, walk-through with page guide for post creation	Participants should go to the Onlim page, register themselves and connect one to two of their social media accounts. Afterwards, the page guide walks them through the post-creation process.
2	Select RSS feeds and add a Facebook page	Participants should go to the Content Source page to select RSS feeds and add a Facebook page for using content later created as a post.
3	Select two suggested posts, publish one and save the other one to the draft section	Participant should go to the Suggestion page, save one article as a draft post, and immediately post another article on his social media account.
4	Edit the draft article saved previously and schedule the post for the next day	Participant should go to the Calendar page and edit the previously saved draft by including some additional text and schedule the post for the next day.
5	Create a post including an image and schedule the post	Participant should go to the New Post page, create a new post with text and an image, and schedule the post for later at the day.
6	Change calendar view and reschedule one of the posts'	Participants should go to the Calendar page, change the view of the calendar (detailed to compact view and monthly to day view), and reschedule one of the already planned posts'.

Beside measuring the above-mentioned usability metrics, an in-depth analysis was conducted on the video recording material from each participant to further explore and analyze Onlim's UI for usability problems. Table 2 lists a summary of detected usability problems as structured by Onlim functions. Colored rectangles indicate at which task the problem was detected. Each of the listed usability problems was tracked by how often the same problem appeared. An example is provided to illustrate the type of error made by participants. All usability problems are also categorized by problem type. Two problem types are used to distinguish whether the detected problems are due to system (S) or operational (O) errors. System problems are errors due to Onlim malfunction, such as an error message like "service.account.save_error" or a wrong message displayed in the chatbot. Operational problems are errors occurring due to incorrect operation of Onlim by users, such as not finding the correct button for an action or the misinterpretation of icons. Table 2 also provides the basis for proposing potential usability improvements for Onlim.

Basing on the usability summary, suggested improvements were defined for each of the usability problems. Furthermore, the detected usability problems were compared to the current Onlim UI since the usability lab was conducted when the previous UI was in place and before UI designers performed a makeover of the UI.

6. Conclusions

To discover to which extent usability tests can detect user experience improvements, a usability lab was conducted with 27 participants who used the previous UI version that

existed before the introduction of a new and improved UI design. By identifying usability problems in the older version of the Onlim UI, it was possible to compare the findings against the new UI to see how many problems had been solved without considering the outcome of a usability test. The collected data consisted of video material taken from participants' screens while they performed six predefined tasks. The task ratings included time per task and SEQ as well as answers to four open-ended questions. The participants were also asked to think aloud to provide a better understanding of the reasoning for their performed actions. In the end, a data set for 20 of the participants was used for the analysis. Usability metrics were also measured in addition to an in- depth analysis of the video material to discover exactly where participants made errors and to identify the actions that caused them to struggle while performing the tasks.

Furthermore, the self-reported SEQ metrics rated the task difficulty perceived by the users, also task success perceived by user and provided answers to open-ended questions were analyzed. The time on task provided a first indication that participants struggled the most at Tasks 1, 3 and 6. These results were confirmed through the task completion rate and level of success. The highest failure rate was detected in Task 3 and was confirmed through the found usability problems in the in-depth video analysis. The SEQ indicated that overall the participants found the tasks mostly easy or very easy. This provided a strong indication that there existed actual usability problems in Onlim.

The conducted usability lab involved a qualitative user test categorized as a summative usability study that was described in Section 2. The applied method was based on the usability study scenarios of [21] with a focus on completed transactions, navigation evaluation, problem detection and information architecture. According to [19],

Table 2. Usability Problems Summary

Problem ID	Onlim function	Identified usability problems	Problem type	No. of errors	Error examples
1	Registration	Notification that password was too short, was shown after clicking "create account".	S	1	User registered through connecting one of his social media accounts. After signing in to his Facebook account and acknowledging the access for Onlim, the user was sent back to the Onlim registration in order to enter a password for his Onlim account. When entering a password, the user chooses a too short password, the notification about the too short password appeared only after he clicked on "create account".
2	Registration	User was irritated by "surname" at the registration.	O	1	User was a little irritated by surname. Note: User was most likely from North America.
3	Registration	Onlim Web site opened in German language in a new browser tab after clicking on the confirmation link in the registration email.	S	2	In two cases the user chose in the registration form English as language. When he confirmed the registration through the link sent in the email, Onlim Web site opened in German language.
4	Connecting social media accounts	Error message "services.account.save_error" when returning to Onlim after connecting the Facebook account.	S	1	User added his Facebook account but deselected the option that Onlim can manage the page. For publish as page, the user clicked on "Not now" and returned to Onlim where than the error

5	Page guide	User was not able to find the page guide.	O	4	Some users missed clicking on "Create first post" in order to come to the page guide for post creation or closed it by accident. They were then not able to reopen the page guide.
6	Chatbot	Message of the chatbot, that no social media accounts are connected, didn't change when the social media accounts were connected to Onlim (occurred only in the German version).	S	7	One of the users who used the German version of Onlim was irritated by the chatbot message that there were no social media accounts connected even though he had already added his accounts.
7	Suggestions (News Feed)	Actions for suggested posts (articles) from the news feed not visible. Down arrow icon was not recognized right away or at all.	O	19	User had problems finding the call to action in order to publish suggested post or save it as draft.
8	Suggestions (News Feed)	Post preview in Facebook was irritating for users.	O	6	User assumed the article was already posted on Facebook as the article preview in the Facebook news feed appeared.
9	Suggestions (News Feed)	Detailed view of suggested post with like, comment and share icon from Facebook caused irritation.	O	1	User tried to click on the Facebook share icon of the preview in the detailed view of a suggested post in the detailed view.
10	New Post	Misinterpretation of "Update" button in new post section.	O	7	User thought he was publishing the post by clicking on "Update" button. They didn't see the down arrow icon for further actions.
11	Drafts	Difficult to find draft options in order to perform actions (e.g., edit, schedule) for a saved draft.	O	12	User didn't immediately find possible actions, like editing or scheduling for the saved draft.
12	Drafts	Drafts are hidden in calendar section.	O	1	One user mentioned that it would be more natural to him to find this functionality directly in the menu bar.
13	Post scheduling	Scroll icon for setting the minutes when scheduling a post didn't work properly as the time picker has a five-minute interval.	S	5	User had problem selecting the correct minutes with the scroll icon for the exact scheduling time (e.g., jumped from 59 to 04 instead to 00).

usability tests with 20 participants can detect between 95% and 98.40% of usability problems. Other methods to find usability problems would include a cognitive walk-through or heuristic evaluation. A heuristic evaluation would be more successful on the level of skill-based and rule-based user performance whereas a usability test is advantageous at a knowledge-based level [19]. In the conducted comparison of heuristic evaluation and user testing by [11], the heuristic evaluation found 34 out of 39 usability problems while the usability test found only 21 problems. A possible reason for the result can be that usability experts are specialized in usability problems that are independent from domains. [19] state that it becomes apparent that these different methods identify partly different information and, therefore, they cannot be compared against each other.

Overall, applying Onlim as a use case tool, this work has identified usability problems. Their comparison to the new features of the newer UI created with only a development process with limited implicit real user feedback, indicated that not all problems were solved through the new UI. In fact, 60% of the detected usability

problems still existed, although some are partly fixed or are system problems. Having identified this, we recommend involving usability testing in the development process of SMM tools and Web applications in general, while also aiming to overcome the possible limitations such as the ones described above (for example, with a more efficient integration of the usability tests in the software development process).

References

[1] Akbar Z, Fensel A, Fensel D. (2017, November). Enabling analysis of user engagements across multiple online communication channels. In *Research Conference on Metadata and Semantics Research* (pp. 147-159). Springer, Cham.

[2] Aslam S. (2020). Linkedin by the Numbers (2020): Stats, Demographics; Fun Facts. Retrieved April 7, 2020, https://www.omnicoreagency.com/linkedin-statistics

[3] Bevan, N. (1991). What is usability. *Proceedings of the 4th International Conference on HCI*. Stuttgart.

[4] Bevan, N. (1995). Human-computer interaction standards. Advances in Human Factors/Ergonomics, 20(B), 885–890.

[5] Borsci, S., Federici, S., Malizia, A., & De Filippis, M.L. (2019) Shaking the usability tree: why usability is not a dead end, and a constructive way forward, Behaviour & Information Technology, 38:5, 519-532,

[6] Constantinides E, Fountain SJ. (2008). Special Issue Papers Web 2.0: Conceptual foundations and marketing issues. *Journal of Direct, Data and Digital Marketing Practice* 9, 231–244.

[7] Constine J. (2017). Facebook now has 2 billion monthly users... and responsibility | TechCrunch. Retrieved April 7, 2020, https://techcrunch.com/2017/06/27/facebook-2-billion-users/

[8] Fensel A, Toma I, García JM, Stavrakantonakis I, Fensel D. (2014). Enabling customers engagement and collaboration for small and medium-sized enterprises in ubiquitous multi- channel ecosystems. *Computers in Industry*, *65*(5), 891–904.

[9] Fernandez A, Insfran E, Abrahão S. (2011). Usability evaluation methods for the web: A systematic mapping study. *Information and Software Technology*, 53(8), 789–817.

[10] Flouris G, Patkos T, Chrysakis I, Konstantinou I, Nikolov N, Papadakos P, Pitt J, Roman D, Stan A, Zeginis C. (2018, October). Towards a Collective Awareness Platform for Privacy Concerns and Expectations. In *OTM Confederated International Conferences" On the Move to Meaningful Internet Systems"* (pp. 135-152). Springer, Cham.

[11] Fu L, Salvendy G, Turley L. (2010). Effectiveness of user testing and heuristic evaluation as a function of performance classification.

[12] Jacobsen J, Meyer L. (2017). *Praxisbuch Usability et UX: was jeder wissen sollte, der Websites und Apps entwickelt*.

[13] Kaplan A, Haenlein M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. Business Horizons.

[14] Kappel G, Pröll B, Reich S, Retschitzegger W. (2006). Web engineering: the discipline of systematic development of web applications. West Sussex: John Wiley & Sons Ltd.

[15] ISO. (2010). ISO 9241-210:2010 (en), Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems. Retrieved April 7, 2020, https://www.iso.org/obp/ui#iso:std:iso:9241:-210:ed-1:v1:en

[16] ISO. (2018). ISO 9241-11:2018 (en), Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts. Retrieved April 7, 2020, https://www.iso.org/obp/ui#iso:std:iso:9241:-11:ed-2:v1:en

[17] Matera M, Rizzo F, Toffetti Carughi G. (2006). Web Usability: Principles and Evaluation Methods. In N. M. Emilia Mendes (Ed.), *Web Engineering* (pp. 143–180). Springer.

[18] Nielsen J. (1994). *Usability Engineering*. Elsevier.

[19] Sarodnick F, Brau H. (2011). *Methoden der Usability Evaluation wissenschaftliche Grundlagen und praktische Anwendung*. Huber.

[20] Tullis T, Albert W. (2013). Measuring the user experience: collecting, analyzing, and presenting usability metrics (2nd ed.). Elsevier.

[21] Tuten TL, Solomon MR. (2013). *Social media marketing*. Boston: Pearson Education.