Design factors influencing the Graphical User Interfaces of Healthcare portals

Doctoral thesis

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Introduction

Retrieving information on the Internet is growing in popularity among users of all ages. Therefore, the low acceptance of Healthcare portals is incomprehensible because they provide important up-to-date information on topics such as healthy eating, symptoms and disease patterns, care, family and much more. In the German-speaking world alone, 23,000 Healthcare portals were registered in 2014. As early as 2009, the consumer magazine "Stiftung Warentest" dealt with the comparison and evaluation of 12 German-language portals. The focus was on technical aspects, such as accessibility, comprehensibility of the text, correctness of the information, length of the individual sentences and more. Design aspects were not considered. During the initial analysis of some of these portals and the detailed analysis of the Healthcare portal Onmeda, it was found that most web designers did not observe the design rules for a user-friendly Graphical User Interface when developing Healthcare portals. These rules were brought together in the 1980s and 1990s by various experts from the fields of design, media design, programming, psychology and perception psychology.

This research project started with an empirical survey in the summer of 2012 in which the use of the Healthcare portals was queried. The test persons had to decide whether they would use Healthcare portals more frequently if the design and content structure were more user-friendly. As a clear statement, 10 out of 11 test persons confirmed that they would use these more frequently if the content and design were more user-friendly. A new Onmeda Healthcare portal was developed, considering the currently valid design rules for the design of portals. Thirty-one test persons had the task of comparing both portals and their operations were recorded.

Objectives

The objectives of this research work are to obtain the following results based on empirical surveys and their evaluations:

1　Are the rules for a user-friendly usability of Internet portals still up to date? Do these rules still apply today or has the user behavior changed?

2　If the state of the art is no longer up to date, these research results should provide new insights for the recommendation of a new or revised set of rules.

3　Do design factors influence the acceptance of Healthcare portals?

4　Can a ranking of the importance of the design elements be developed based on the research results? This serves the web designer as a relevant aid in the user interface design of new Healthcare portals.

5　Can patterns be derived from the decisions made by the test persons and from their socio-demographic data? Are there any correlations between the age and the color preferences of the participants or between gender and the preferred portal (the original Onmeda portal at www.onmeda.de or the redesigned portal with identical content, but a completely different structure, new layout and overall design under www.phd.manuelakrauss.de)?

6　Are there any new insights into the user reaction to advertising and image motifs?

The answers to these questions are the main objectives of this research work. However, it is to be expected that further new findings will arise during the evaluation of the results.

Thus, the hypothesis was established: "Design factors and content structure do influence the acceptance of the Healthcare portals." It was predicted that most of the test persons would prefer the newly designed portal when comparing the two Onmeda Healthcare portals (the original portal and the newly designed portal).

Methods

At the beginning of the work, the empirical survey on the improvement of acceptance by a user-friendly design formed the basis for this research work.

Several medical portals were compared and a platform with typical design deficiencies—Onmeda—was selected and analyzed in detail. This revealed that many design rules for user-friendly Graphical User Interfaces were either ignored or not known. To find out whether the acceptance is improved by adhering to all rules for Healthcare portals, the Onmeda portal was redesigned and restructured with 73 subpages while retaining the original text.

A questionnaire was developed whose questions were answered by a group of test persons after a detailed comparison of both portals. In addition to the comparison, the test persons recorded their socio-demographic backgrounds, information on education, leisure activities, computer literacy and more.

The comparisons made by the test persons were recorded, which is why the eye-tracking soft- and hardware Gazepoint was purchased. By evaluating these recordings, further new insights into user behavior should be identified.

A group of test persons was required. More than 157 people were asked to participate in this research project. Of these, 31 people finally participated in the project.

The research project, objectives, content, procedure and utilization of the data were explained to the test persons. Then, the personal data in the questionnaire were asked. Subsequently, under the supervision of the researcher, they were placed on a workstation specially equipped for this purpose. Everyone got three minutes to orientate oneself on Portal A (original Onmeda portal). Then, the test person had to search for certain information (in the form of two tasks). This task was limited to two minutes as a maximum. The test person then looked at the newly designed Portal B for up to three minutes. There, the person also had to search for two specific pieces of information (different from those on Portal A). This task was also limited

to two minutes as a maximum. Throughout the whole period, the eye-tracking software Gazepoint recorded the behavior of the user.

Subsequently, the test person answered the remaining questions in the questionnaire.

All answers were digitized into Excel. In the case of several questions, answers had to be grouped together to compare results. The recordings made with Gazepoint were evaluated and digitized. Here, in addition to the expected answers, the user behavior could be analyzed. This also led to new insights.

The evaluation of the results was planned to take the longest time. Even this was not enough and had to be extended. Through the digitization, personal characteristics and sociodemographic data could be correlated with the decisions shown in the questionnaires or the recordings made by the eye-tracking software.

Subsequently, the results were compared with the expected objectives.

The ranking of the importance of the different design elements was determined by the method of induction and visualized using the statistical model Structural Equation Modeling (SEM). This model became apparent to be an optimal representation of the importance of the individual design objects for the user.

In the beginning, several Healthcare portals of German-speaking countries were examined and one of them exclusively analyzed in detail: This was the German Healthcare portal Onmeda. This portal is not only aimed at people who are just interested in general health matters but also at healthy and sick people who mostly might possess little or no medical expertise at all.

The users of general Healthcare portals were chosen as a target group for the qualitative research approach to determine whether different design aspects may be derived from different target groups. These users may have different determinants in different age clusters, genders, occupational fields, professional training or even leisure time activities.

A total of 31 test persons between the ages of 22 and 63 years were obtained for the implementation of the research project. This group consisted of 16 women and 15 men. This odd number of test persons guaranteed clear results of the decisions in the evaluation, especially when the comparison between the two Onmeda portals (preference for the original Healthcare portal or the newly designed portal) was required.

To carry out the empirical survey, at least 35 minutes were planned for each participant.

Results

The basis of the design rules represents the gestalt laws dating back to the first years of the 20th century. They consider important aspects of the perception of information and cognition, and they have their roots in the perception psychology based on the findings of Christian von Ehrenfeld (1890). On this basis, various experts and professionals from the fields of psychology, design, media design and computer sciences set up various rules for the diverse types of advertising media in the late 1980s and early 1990s. Their intention and objectives have been and still are to provide designers with a set of rules representing a homogeneous tool for the professional design of their respective products.

The objective of all these rules is to present the information on the medium in such a way that the viewer can perceive it quickly, unconsciously and as one consistent style. Therefore, both a font style that can be perceived fast and unconsciously and a design concept matching the content should be selected. There are different rules for the various print media, depending on the format, the type area, the corporate identity and, derived from them, the corporate design desired by the specific customer.

Different rules for a user-friendly Graphical User Interface, on the other hand, determine the different design and computer science education and training at universities and training centers. These are documented in many specialist books for study, teaching and jobs. They aim solely at facilitating the user's information reception and cognition, accelerating perception and avoiding the rapid abandonment caused by the user's lack of interest.

These rules were incorporated extensively and in detail into the new design of the existing Onmeda portal.

The research project showed more new insights about the user behavior than originally expected. A review of the results based on the expected objectives revealed the following:

1 and 2 The currently valid rules are obsolete and need to be revised. This is particularly true of the rules dealing with typography of web portals. This requires a complex revision of the rules.

3 Design factors and a user-friendly interface, structure and navigation concept influence the acceptance of Healthcare portals.

4 The priority list of the design elements places the professional color concept in the focus of most users. In this way, the color takes the priority weighting of the users, followed by the typography concept and then the image representation. Most participants considered the content of the adverts to be unimportant. The latter aspect takes the last place.

5 Many correlations could be detected. The answers to the question "3.1.1 Which portal was more clearly arranged at first glance?" showed that more people of nature (35.486% of 48.39%) opted for the original portal, whereas more technology enthusiasts (22.582% of 32.26%) preferred the newly designed portal. Thus, many new insights were found in the correlations of different information.

6 Preference was given by most users to image motifs with nature photos or conversations between doctor and patient. The test persons found particularly important the content reference of all pictures to the content explained.

In addition to these findings, the confirmations of hypothesis and prognosis were very important. As a whole, it must be noted that the hypothesis was confirmed. The design elements as well as the content structure influence the acceptance of Healthcare portals. The user-friendly interface makes the cognition easier for the user. A clear and quickly recognizable structure guides him through the application and leads him quickly to the information desired. The prognosis, on the other hand, could not be confirmed in its entirety. The reason for this is in the antiquated rules for a good Graphical User Interface.

However, this research project has yielded many new insights. In the evaluation of the user behavior, it was found that men (38.71% of 48.39%) on Healthcare portals rather use/click the navigation as a

first action, while women (29.03% of 51.62%), as a start, rather scroll once after having entered the homepage. This behavior was detected on both portals, although on the original Onmeda portal the user realizes that lengthy scrolling is needed.

The professional groups are as follows, from a total of 100% participants, there are 3.226% craftsmen, 45.164% office clerks, 6.452% pedagogues, 3.226% health staff, 41.938% media specialists. Looking at the specific professional groups, the following result can be seen: on portal A (as the first action), 25.80% of the office staff, all educators and 29.03% of the media specialists scrolled (as the first action).

When answering the question "3.2.3 Where was the amount and length of text per paragraph/chapter more user-friendly?," 51.61% preferred the newly designed portal, while 48.39% favored the original portal, whereas 25.808% (of 48.39%) of the people of nature rather opted for the original Onmeda portal, 19.356% (of 32.26%) of the technology enthusiasts chose the newly designed Onmeda portal.

The recording with the eye-tracking software at the end of the comparison of both portals (after approx. 10 min) showed the main gaze point of each test person. While up to now the center or optical center has been recommended as a gaze point for the most important information on portal pages, a completely different behavior was found among the test persons. Less than half focused on the central side area, while the other test persons perceived most information above, below, on the left and on the right.

Conclusions

All in all, it should be noted that, in addition to the expected results, the research project provided further comprehensive new findings. Because of the rapid development of digital communication, Internet research and information services on the Internet are now of considerable importance. This was not to be expected to this extent in the 1990s because small monitors, slow transmission rates and slow computer performance slowed down or thwarted digital communication. For the past 15 years, however, computer and transmission speeds have changed, monitors have become larger and can now display more information on one screen. The user perceives more information on one monitor, which requires a clear structure and content distribution. Because of this flood of information, user behavior has also changed considerably in the past 15 years, which is the reason for the necessary revision of the set of rules for portals—in particular, Healthcare portals.

The various results provide an important basis for the redesign of Healthcare portals. This provides web designers an up-to-date set of rules and additional information on the user behavior on Healthcare portals, which are largely also applicable to the portal versions on mobile devices.

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