FAKULTÄT FÜR !NFORMATIK
Faculty of Informatics

Quality assessment of users on medical content on the internet

DIPLOMARBEIT

zur Erlangung des akademischen Grades

Diplom-Ingenieurin

im Rahmen des Studiums

Wirtschaftsinformatik

eingereicht von

Stefanie Rumpold
Matrikelnummer 0825325

an der
Fakultät für Informatik der Technischen Universität Wien

Betreuung: Assoc. Prof. Dr. Dipl.-Ing. Hilda Tellioglu

Wien, 24.07.2014

(Unterschrift Verfasserin) (Unterschrift Betreuung)

Erklärung zur Verfassung der Arbeit

Stefanie Rumpold
Degengasse 70 / 3 / 18, 1160 Wien

Hiermit erkläre ich, dass ich diese Arbeit selbständig verfasst habe, dass ich die verwendeten Quellen und Hilfsmittel vollständig angegeben habe und dass ich die Stellen der Arbeit - einschließlich Tabellen, Karten und Abbildungen -, die anderen Werken oder dem Internet im Wortlaut oder dem Sinn nach entnommen sind, auf jeden Fall unter Angabe der Quelle als Entlehnung kenntlich gemacht habe.

(Ort, Datum) (Unterschrift Verfasserin)

Acknowledgements

At first I want to thank my supervisor Assoc. Prof. Dr. Dipl.-Ing. Hilda Tellioglu for the opportunity to investigate this interesting topic and for her guidance and feedback through out the whole research process.

Thanks to my colleagues from netdoktor.at for many interesting discussions and feedback regarding the topic of my thesis.

My boyfriend Philipp Blaschke for his continuous support during my studies and for his understanding for the time-consuming work on this thesis. Thank you for answering all my questions about grammar and spelling and of course for all the hours spent on proofreading this thesis.

I also want to thank all my friends with whom I have had a great time over the last years.

Thanks to Tina, the best sister ever, for her understanding, interesting discussions about scientific work and talks about upcoming problems with my thesis, during our car drives to the most beautiful horse in the world. And I also want to thank her and all other participants for their time. Without them this thesis would not have been possible.

And last but not least I want to thank my mother for always being there for me, all the emotional and also financial support during my education.

Abstract

In the past medical professionals were more or less exclusive experts in their field. Now-a-days more and more people are going online. Every third person has at least once searched for medical information online. The average online health information seeker starts with a search engine and in most cases, the user selects one out of the first ten search results. Due to the changes in the health care system, an informed consumer will be more important and take over more responsibility concerning their own health.

Since everybody can contribute to the Internet it is questionable whether the information users find online are trustworthy enough to at least partly replace doctors or other health care professionals as an information source. There are certain certification programs which aim to help users to find high quality content but users do not know many of them.

Since quality is a huge issue especially concerning health information, this thesis aims to find out whether users are able to distinguish between trustworthy and non-trustworthy sources. Therefore the characteristics which influence the users quality assessment shall be studied in detail.

The practical part of the thesis is split into two phases. In the first part, interviews and eye-tracking are used to find out which criteria the users relate to when they judge the quality of medical content. Out of those findings, hypotheses were formulated which were tested in the second part with several prototypes. For each hypothesis at least two prototypes were created where single characteristics were manipulated to test whether the quality assessment of the user is influenced.

The results of the practical part show to which amount users are influenced by popularity, brand, design, sources, date, author information, advertisement and content when they evaluate quality. Based on the results of the practical part it is questionable if users are able to distinguish high quality from poor quality content in most of the cases.

Kurzfassung

In der Vergangenheit waren medizinische Fachleute meist die einzigen Experten und Expertinnen in ihrem Gebiet. Heute suchen viele Patienten und Patientinnen nach Antworten und Informationen im Internet. Jede dritte Person gibt an, mindestens einmal im Internet nach medizinischen Informationen gesucht zu haben. Dabei beginnt der durchschnittliche User mit einer Suchmaschine und wählt in den meisten Fällen eine Seite aus den ersten zehn Suchergebnisse aus. Da sich das Gesundheitswesen stark verändert, wird dem Patienten und den Patientinnen eine immer größere Rolle zugesprochen und sie übernehmen immer mehr Verantwortung für die eigene Gesundheit.

Da es keine Einschränkungen gibt, wer etwas im Internet veröffentlichen kann, ist es fraglich, ob die Informationen, die User im Internet finden, vertrauenswürdig genug sind, um zumindestens teilweise die Information, die sonst von Fachleuten kommt, zu ersetzen. Es gibt Qualitätssiegel und Richtlinien für medizinische Inhalte, jedoch sind die Wenigsten davon auch den Usern bekannt. Da Qualität gerade bei medizinischen Inhalten eine große Rolle spielt, befasst sich diese Diplomarbeit mit der Frage, ob User in der Lage sind, vertrauenswürdige und nichtvertrauenswürdige Informationen zu unterscheiden. Um diese Frage zu beantworten, werden die einzelnen Charakteristika, die einen Einfluss auf die Qualitätsbeurteilung haben könnten, untersucht.

Der praktische Teil der Arbeit ist in zwei Phasen unterteilt. Am Beginn wurde durch Interviews und Eye-Tracking versucht herauszufinden, welche Kriterien die User in der Qualitätsbeurteilung beeinflussen. Für diese Kriterien wurden Hypothesen formuliert, welche dann im zweiten Teil mit Prototypen getestet wurden. Für jede Hypothese wurden Prototypen erstellt, auf denen die einzelnen Kriterien verändert wurden, um so ihren Einfluss auf die Qualitätsbeurteilung der User beurteilen zu können.

Die Ergebnisse des praktischen Teils zeigen, wie stark Bekanntheit, Marke, Design, Quellen, Datum, Authoren, Werbung und Inhalte den User bei seiner Qualitätsbeurteilung beeinflussen. Es ist fraglich, ob User immer in der Lage sind, hochwertige Inhalten von falschen Informationen zu unterscheiden.

Contents

CHAPTER 1

Medical Content on the Internet

Many patients nowadays rely on information from mass media sources, such as newspapers, magazines and the Internet [12]. Among all other mass media sources, the Internet has quickly become a relied source of information, also concerning health information [22]. An American survey reported that one out of three Americans have gone online to figure out a medical condition [36]. Population-based studies showed that over 52 % of the European citizens have at least once consulted the Internet for health-related information [66].

A study from April 2014 shows that 35 % of the Austrian population has at least once searched für medical information on the Internet [54]. In Austria the biggest website for health information `www.netdoktor.at` had over 3 million visits in January 2014 [79]. This access to understandable medical information could help to balance the relationship between healthcare professionals and patients. It is a possibility for users to become a more mature patient and to take over more responsibility for their own health. Beside this the opportunity to look up health information at any time and almost any place could lead to better treatment decisions and also a greater satisfaction of the patients.

1.1 Historical Development

Already with the first static website without any social interaction, the Internet showed its capability *"to connect clinicians, patients and materials"* [9]. In 1997 the Danish physician Carl Brandt and the journalist Rune Bech launched the health information portal NetDoktor in Denmark. It was based on the research findings of Carl Brandt's about the influence of communication between patients and healthcare professionals. It was the one of the first papers that showed that the way of communication is at least as important as the information itself [10]. The goal of Brandt and Bech was, to provide access to understandable medical information for everybody. The concept was exported to many different countries.

The term Web 1.0 describes the very early state of the World Wide Web. In Web 1.0 users could view websites but they were not able to socially interact with them. A typical Web 1.0 page did not allow external editing [21].

Web 2.0 does not refer to a new technical specification of the World Wide Web. The term rather describes the way users are now able to interact and contribute to the web. Typical examples for Web 2.0 are social networks, blogs and video sharing. Web 2.0 changes the Internet to a *"more dynamic, interactive space"* where *"information is continually requested, consumed and reinterpreted"* and by that it creates a new environment for connecting patients and doctors [42]. Web 2.0 provides new possibilities for consuming health information. The collaborative concept of Web 2.0 is part of web-based electronic health records. Such records can be accessed from patients and doctors and allow a faster information exchange and better communication [9].

Wikis are a core feature of Web 2.0 and can be seen as a social writing application since wikis are mainly used to share information. Beside the main free encyclopaedia `www.wikipedia.com`, which also provides a lot of medical content and health related topics, there are also specialized wikis such as a wiki for surgery [105].

Another good Web 2.0 example is the blog Clinical Cases `www.clinicalcases.org`, which describes itself as a *"free case-based curriculum of clinical medicine"*. They aim to close the gap between the theoretical education of medical students and practice.

Web 2.0 provides a huge range of new interactions between the users and new ways of social learning [9]. An survey from 2006 showed that only few patients have the possibility to communicate with their doctors online, but most would like to have a tool to do so [83]. Also online consultation becomes more popular. The online plattform Dr. Ed `www.dred.com` that offers online consultation has treated over 200 000 patients since 2005.

Video platforms such as YouTube `www.youtube.com` are also part of the Web 2.0 and medical information can also be presented as multimedia content. A study from 2010 analyzed videos found about prostate cancer. They found 51 videos with an average of 1480 views and as a result they discovered that even though some videos provided good information the imbalance of quality among the reviewed videos makes YouTube *"an inadequate source of prostate cancer information for patients"* [104].

With the possibility in Web 2.0 that everybody can contribute the problem of quality concerns came up. Potts said that if something can combine the democratized nature of Wikipedia with the quality requirements of healthcare it would be the killer application in e-health. (P57). This idea of collaborative filtering is also called "Darwikinism" of content on Web 2.0 [106].

The definition for Web 3.0 is not consistent yet. Some experts see the most important features of Web 3.0 in semantics and personalization [2] and others expect Web 3.0 to be the return of experts and authorities [60]. A neurologist devised a medical metaphor for the Web 3.0:

> *"The development of the graphical web from its early days in 1995 to the social web of late 2007 is comparable to the developing brain. Whereas Web 1.0 and 2.0 were embryonic, formative technologies, Web 3.0 promises to be a more mature web where better 'pathways' for information retrieval will be created and a greater capacity for cognitive processing of information will be built"* [43].

The new semantic features of Web 3.0 might one day attach metadata to web content to help the computer understand the meaning of the content and through that simplify the human-computer interface [9] and this also holds new possibilities for health related content.

1.2 Wikipedia as a Source of Health Information

With the rise of Web 2.0 social writing applications, such as Wikis, became a popular source for information. A lot of information concerning health issues can be found in the main free encyclopaedia `www.wikipedia.com` but there are also some specialized wiki projects focusing on medical content.

Wikipedia startet in 2001 and contains over 4 400 000 articles [115]. It is the sixth most popular website on the Internet with around 362 million visitors monthly [20].

2008 the English Wikipedia had a higher average search engine ranking for health terms compared to other health resources such as WebMD `www.webmd.com`, Wikipedia was in the first place in 25 % to 33 % of the cases [68]. In 2009 the search results for several keywords were tested and the average position of Wikipedia was compared to other websites. In 71 - 85 % of the search queries, Wikipedia ranked in the top 10 search results. Especially for rare diseases, Wikipedia ranked highest. Overall Wikipedia exceeded the position in the search results of MedlinePlus and NHS Direct Online and also Wikipedia articles were viewed more often. This shows that Wikipedia is a very important source of online health information [68].

Medical content on Wikipedia receives over 150 million page views per month and the top 200 medical articles get more than 1 000 000 views per month [74]. This shows the huge influence of Wikipedia in medical context.

Beside Wikipedia over 70 medical wikis are cataloged. Since wikis need to reach a critical mass of contributors to achieve sustainability, Wikipedia has a very unique and dominant position [51]. WikiProject Medicine is one of those medical wikis. It was founded in 2004. Its members, mainly doctors, medical students, scientists but also patients, discuss the medical content on Wikipedia. The project provides guidelines for writing health-related articles. The members of the project also grade articles on Wikipedia based on defined characteristics [51].

1.2.1 Wikipedia's quality control

Since everybody can contribute to Wikipedia articles, it might seem surprising that there is very less misinformation in the articles.

If someone edits an article on Wikipedia, those additions are reviewed by other users and might be eliminated if the addition is not verifiable, easy to understand or complete. By this mechanism "only the fittest" of the changes survives [72].

Wikipedia established multiple layers for quality control which include volunteers that judge the recent changes, bots that fix common spelling or grammatical errors and also protection of pages which are known for attracting vandalism. Additional to those and other quality control mechanism the German Wikipedia uses a system where changes from anonymous and new users had to be checked by an established user before they are set live [51].

1.2.2 How is Wikipedia used?

Health information on Wikipedia is used by lay public but also healthcare providers. 70 % of the junior physicians and 50 - 70 % of practicing physicians use Wikipedia as an information source [52, 53]. Junior physicians even use Wikipedia more frequently than other websites, excluding Google [52].

Even though Wikipedia has established a lot of quality control and studies show that articles only contain a few errors, a user can never be absolutely sure that the information is correct. Beside this, the user should be aware that omissions can happen. Because of this, a user should always mind to check facts presented in the text.

1.2.3 Empirical Studies on Wikipedias Medical Content

Studies that evaluate medical content on Wikipedia empirically have emerged in the last years. In a study about drug information, Wikipedia was able to answer 40 % of the questions, compared to 82,5 % by Medscape Drug Reference. Wikipedia articles did not have any crucial errors but were missing information like dosage, interactions and contraindications [17].

Another study that compared articles about surgical procedures found that the overall quality was accurate but the articles still missed some important content [25].

A paper compared content on Wikipedia with other platforms, such as UpToDate, eMedicine and AccessMedicine, for medical students' use. They found out that even though Wikipedia was the easiest one to use, it still lacked in depth and accuracy compared to the other traditional online sources [87].

An analysis of 10 articles about cancer found that errors *"were extremely rare on Wikipedia"*, with less than 2 %, but compared to the US National Cancer Institute's Physician Data Query, which offers a peer-reviewed cancer database, the Wikipedia articles were less easy to understand [89].

The conclusion that can be drawn from those studies is that medical information in Wikipedia articles contains only few errors but the depth of the articles and the ease of understanding should be improved.

1.3 Social Changes

78 % of the health information seekers reported that they felt better about what their healthcare provider told them after finding information online. Studies show that two out of five people use the Internet to search for health information try to diagnose a problem. One out of three also tries to treat the problem accordingly to what they found online. Since physicians find it challenging to stay up-to-date by reading all current literature and an informed patient might speed up the diagnosis and treatment process. This also points out that it will be an important task for the physician in the future to educate the patient about reliable healthcare websites and to align this with the traditional healthcare [117].

Some concerns that the Internet might lead to poor social and mental health [65] are disproved by the growing literature on this topic. 47 % of the non-Internet users and 33 % of Internet users reported that they are feeling unhappy. Comparing 24 % of the non-Internet users to only 8 % of the Internet users who said that they are feeling lonely, this indicates that those concerns are not true [117].

1.3.1 Changes in the patient-doctor relationship

Internet influences the work of physicians since the last years. Beside the more intense patient-provider communication this also includes the advances of telemedicine and improvements in disease monitoring [117].

Due to the availability of information on the Internet, more and more people tend to arrive at a physician's office with information they found on the Internet. Medical professionals raised concerns that this might lead to a delay for visiting a physician [18].

A study suggests two cases for most people who go online for health information. The first search is performed by the patient before the clinical encounter to manage their own healthcare by themselves or to decide whether they need to see a physician. The second time patients go online is after the clinical encounter because they are not satisfied with the information provided by the health professional or because they are searching for reassurance. The availability of information leads to a shift in the relationship between healthcare professionals and patients. It is important that healthcare professionals recognize the patient's desire and search for knowledge and to discuss the information together. Beside this, the healthcare provider should guide patients to reliable sources of health information on the Internet [73].

1.3.2 Internet as a diagnostic tool

Since the Internet is also used as a diagnostic tool, health professionals have concerns about the impact of increasing health information on the ratio of the people who seek medical care to those who need it.

When comparing characteristics of people who looked up online health information and reported that they contacted their healthcare provider afterwards, an additional hour on the Internet is associated with a 10 % increase in the odds of contacting a healthcare provider. Moreover people who were searching online for a specific health issue which concerns themselves or a loved one, were significantly more likely to contact a health provider afterwards. Health information seekers who tried to diagnose a problem with the information they found online, were 2.5 times as likely to contact a healthcare professional than seekers who did not try to diagnose a problem [117].

CHAPTER 2

Health Information Seeking

Health information seeking is defined as the search for and receipt of messages that help *"to reduce uncertainty regarding health status"* and *"construct a social and personal sense of health"* [107].

In the past, healthcare professionals have almost been exclusively the experts in this knowledge field. Based on the fact that patients had less power in healthcare, the relationship between patients and healthcare professionals was unequal [98]. Maybe this unbalanced relationship was also the reason for patients to not show information seeking behaviour in the company of their doctors [6]. Doctors report that their patients frequently search the Internet regarding health issues, but they do not always discuss these online activities with them [14, 110].

With the change of the healthcare system and the rise of e-health, an informed consumer will gain importance and it might also happen that the responsibility of knowledge and choices is more and more taken by the patient himself [38].

Since the usage of mass media can depend on the characteristics of the consumer [57] it is important to know who goes online and what they do with the information they find.

2.1 Advantages and Disadvantages of Online Health Information Seeking

The Internet offers immediate access to a huge amount of medical and health-related information. It offers privacy, convenience and a wide variety of information and perspectives for individuals available any time. Especially the anonymous nature of the Internet allows users to ask very detailed, sensitive or awkward questions without facing judgement or stigma. Another advantage to other media formats such as newspapers is that the information can be updated

quickly. Privacy concerns are one of the biggest disadvantages of online health seeking. People who go online for health information are fearful that their searches might be revealed and that others, also insurance companies, might have access to this information. Beside this, the information overload which is provided by the Internet can be seen as a disadvantage and the credibility and quality of the health information on the Internet is a huge concern. Because of missing clear regulation of online health content, users face the risk of official looking websites that provide wrong or incomplete information [22]. This is an important concern, becuase individual users are more likely to give information from a computer a higher credibility than from other media sources [18].

2.2 Online and offline health seekers

Because of the potential impacts of e-health and the large numbers of people who look up health information it is necessary to know more about the characteristics of the online and offline health information seekers. We need to understand who is more likely to use the Internet for health information. Therefore it is important to know the characteristics, such as gender, age, but also Internet usage and reasons for using the Internet.

Comparing the two groups of online and offline health seekers, individuals who are older, less educated and have a lower income, are less likely to be in the group of online health seekers.

A study from 2006 reports that people who are looking up health information on the Internet are more likely to rate themselves as having poor health status than non-health seekers [117]. And adolescents going online for health information are more likely to show depressive symptomatology than those who are not going online [46].

80 % of the online and offline health seekers reported that they also use doctors and nurses as a source of information. Friends and relatives were often mentioned as a source of information among both groups [22].

2.2.1 Gender Differences in health seeking behavior

Different to the overall Internet users which have a higher percentage of male users, people who are searching for health related topics are more likely to be female. 72 % of the women going online are health information seekers, but only 51 % of men look up health related topics online [92].

Female online health seekers tend to focus on an illness or its symptoms. The focus of men's searches is mainly on prognosis and treatment of a disease. Compared to women, men incline to use the information they found when they are talking to their physicians, by asking follow-up questions. Concerning credibility of the information, women tend to be more concerned than men [38].

Comparing health information seekers that looked up information about a specific condition males and females are equally likely to do so. An explanation for this might be that females look for non-specific health information just as others may search for general travel information [117].

2.2.2 Characteristics of offline health information seekers

Offline health information seekers tend to be older. While the mean age of online information seekers is 40, offline information seekers are 52. Beside this, offline information seeker seem to have a lower income and are less educated. Additionally to contacting their physicians, relatives or friends, offline health seekers also use health magazines (61 %) and television or radio (51 %) [22].

Only 15 % of the offline health information seekers reported to spend more than 3 hours per week using email. Concerning the self assessment of their health status, only 60 % of the offline seekers said that their health status was good or excellent, which is less then 86 % of the online health seekers.

2.2.3 Characteristics of online health information seekers

Studies show that 48 % of the health information seekers indicate that their findings help them to take better care of themselves [38] and 67 % of adults report that the health information they found on the Internet has increased their understanding of health issues [4]. A majority of the users (89 %) said that they feel confident about getting health information online if they needed to in the future [117].

Young adults view the Internet as a powerful tool for healthcare information [8] and 53 % of the people between 15 and 17 years looked up health information online and had a conversation with their caregiver about what they had learned. Also 41 % of adolescents have changed their behaviour because of information they found online [94]. Adults between 40 and 59 years are the biggest group among online health information seekers and teenagers are the smallest group. One reason for this could be the higher self-awareness about health conditions. Another aspect could for a higher number of adults could be the increasing number of caregivers for elderly parents. Several studies show that females are significantly more likely to use the Internet as a resource for health information than males [117].

Out of people who used the Internet in the previous year, 56 % said that they used the Internet as resource of health information. Internet users, and especially those who seek for health information online, tended to report a higher education level and family income [117]. Out of the online health information seekers 91 % have health insurance [38].

Out of the 80 % of health seekers among all age groups, who reported that they found most of what they were searching for:

- 44 % said that the outcome affected their decision on how to treat an illness,

- 28 % were influenced to ask their doctor a new question or got a second opinion,
- 34 % changed their approach for staying healthy or maintaining the health of someone they care for,
- 30 % changed their mind about diet, exercise and stress

25 % were affected in the way they deal with a chronic condition and 17 % reported that the outcome of the information search influenced their decision about seeing a doctor [92].

71 % of the health information seekers said that they use the Internet as one out of many resources when they are looking for health information. Out of those health information seekers, 75 % reported that they also use the Internet to search for information about a loved one's health issue [117].

In the Pew survey from January 2002, 24 % of the Internet users who were affected by a medical condition themselves and 26 % of those who helped another person dealing with a major illness, stated that the Internet played a crucial role [64].

Most people search very infrequently for health information. 2 % said that they look up health information every day, 14 % several times a month and 78 % every few months or less than that [37].

2.2.4 The average online health information seeker

A study suggests that the average online health information seeker is 46 years old, female, white and comfortable using the Internet. The average online health information seeker also shows a longer internet usage and higher level of skills using the Internet compared to non-seekers [117].

The average health seeker starts with a search engine, visits up to five websites and spends at least 30 minutes on the search. If the advice matches what she already knew, she feels confirmed. Also if she finds the same information on more than one site, it makes her feel confident about that information. If a website is selling something or does not provide the source of information, she is very likely to turn away from this website. Beside those quality checks, about 30 % of the people going online for health information take the information they find to their doctor's to get a final quality check [92].

2.3 Health Information Seeking Behaviour

Mostly all online health seekers use search engines to find relevant pages. If a search is medicine related, it differs from other information searches, since medical terms, disease knowledge and treatment options are often used when performing a search on medical information. Studies show that the search strategy is only suboptimal. 35 % of the search queries (99 out of 280) consisted of more than one search term. In 97.2 % of the searches, the participants clicked on one of the first 10 search results. In 206 out of 289 cases (71.3 %) users chose a link that ranked

in the top 5 search results [32].

The majority of the online health information seekers limits their search on the Internet to one search engine, even if there are many search engines available. The question is, whether one search engine alone is good enough for searching medical or health related information.

In a study from 2012 researchers performed a search for the keyword "breast cancer" in the four main search engines Google, Yahoo!, Bing and Ask.com. The top 200 results from each search engine were saved. Volunteers assigned a score from 0 to 10 to each website, where 10 is the rating for the most helpful website. To help the volunteers, a physician and breast cancer researcher defined six gold standard websites that had the most useful content about breast cancer. All those six websites were found in the top 30 search results of all four search engines. The search results of the different engines had a high overlap. Within the user satisfaction analysis Bing scored the highest value, followed by Yahoo!, Google and Ask.com [113].

Most users only go through the first few pages in the search results and if they find them not good enough, they change the keywords. In most cases they add a keyword which was suggested by the search engine. Especially users with less search experience tend to trust the results from the search engine and often think that the best ranked result also has the highest quality [113].

Those results show that the quality of search results chould be improved, if health information seekers use multiple search engines. Even though their search strategies were inefficient, users were successful in finding the information they need. This indicates that users are better at finding the right answer to health related questions, maybe because they are more fastidiously than expected [32].

2.3.1 Reasons for Using the Internet as a Source of Health Information

40 % of the online health seekers said that the main reason for using the Internet to find health information is that it is easy to find. 31 % of the health information seekers needed the information quickly and therefore chose the Internet, because they considered it as the fastest method [117].

In a survey from 2001 [92] the main reasons for going online were:

- someone they know has been diagnosed with a medical condition (81 %),
- they have been diagnosed with a new health problem of their own (58 %),
- they are being prescribed a new medication or course of treatment (56 %),
- they are dealing with an ongoing medical condition (47 %),
- they have unanswered questions after a doctor's visit (47 %),
- they are deciding to change their diet or exercise habits (46 %), and
- they are a caregiver to someone else (38 %)

A survey from December 2002 [37] detected that the most popular health topics on the Internet are:

- specific disease or medical problem (63 %),
- certain medical treatment or procedure (46 %),
- diet/nutrition/vitamins/nutritional supplements (44 %),
- exercise or fitness (35 %),
- prescription or over-the-counter drugs (34 %),
- alternative treatments or medicines (28 %),
- down to medicare/medicaid (9 %),
- problems with drugs or alcohol (8 %) and
- how to quit smoking (6 %)

In November 2004 [36] the most frequently searched topics were mainly constant, but with an increasing frequency of the topics

- increases in diet/nutrition/vitamins (51 %),
- exercise/fitness (42 %),
- prescription or over-the-counter drugs (40 %),
- health insurance (31 %),
- a particular doctor/hospital (28 %) and
- experimental treatments/medicines (23 %)

Only 4 % of the health information seekers reported that they used the Internet because the topic was private or they were embarrassed about it [117]. Other studies found contradictory results. They stated that 33 % of the people searched for information about a sensitive health topic which they would not have discussed with others [39]. A study from Norway supports those result. They found that almost half of the participants discuss personal problems online which they would not discuss in a face-to-face conversation [67]. A research paper from 2000 states that 19 % of the people reported that they looked up information on sexual health issues [11].

Users prefer the Internet to learn about sexual health because it reduces the pressure to talk about it with educators, partners or healthcare professionals [47]. Especially young people search for sexual health information more frequently than older age groups. The Internet has the potential to educate users and empower them concerning their health and this also holds for sexual health [77].

2.3.2 Patients with serious illnesses

Cancer patients reported that the information they got from their health professionals had been *"patchy, inconsistent, contradictory and haphazard"* [95]. They also had the problem that they found out many important facts after the time they would have needed the information the most. Especially in the period between diagnosis and treatment most patients would have needed more information. Right after the diagnosis, they were too shocked to listen to information or to look it up, but within a few days the need for information was high. The missing information made the difficulties they had with dealing with a serious illness even worse. After the treatment, the people wanted information about what to do to support their own recovery. People said that many health professionals they met, were not willing or maybe also not able to advise them. The lack of this information lead to frustration and the feeling of disempowerment. The patients said that they would have liked Internet-based information if the credibility is given. If patients used the Internet, they preferred non-commercial websites or sites that were supported by a well-known institution or medical center [95].

People with chronic conditions or life-threatening illnesses are often having a different relationship to doctors and the Internet than people with minor illnesses. Beside this, people with serious illnesses often also develop an expertise on their own condition [118]. Information on the Internet helps cancer patients to compare treatments and through that it might change the behaviour when it comes to accept the doctors offers [118]. People with cancer search for information on the Internet to become active collaborators. They also use Internet support groups or contribute their own content to share the information they got with others [50].

Parents of children with type 1 diabetes, are facing a great responsibility for managing the disease. Effective approaches are needed to reduce the stress of the parents and help them to support their children's self-care [81]. Surveys show that having access to multiple information sources are associated with better perspectives of adolescents with type 1 diabetes [88]. Web 2.0 technologies have a huge potential for health information. Parents use different channels to find out different things. They said that for safe information, they relied on healthcare professionals at the clinic. When looking up information online, they had a critical attitude and different strategies how to evaluate the online information and preferred websites from official sources such as government or healthcare providers. Parents tend to use methods they considered appropriate for the situation and often used a search engine as a starting point for their information seeking [81].

2.3.3 Medical professionals

60 to 70 % of the physicians have access to the Internet and this ratio is increasing. Several studies show a strong correlation between the age of the physicians and the usage of the Internet. The main online activity of medical professionals is to search journals and databases. Most physicians found the Internet useful or extremely useful for finding medical information. Beside using the Internet like a large library of medical information, only a few doctors use emails with colleagues and patients. Especially the usage of emails to communicate with patients had a strong resistance in the past, but there seems to be an increasing trend. Higher efficiency,

delivering better care, saving the practice money and the demand from patients seem to be encouraging factors for a higher use of e-mails [71].

2.4 Caregivers

Parents are known to be online health information seekers. They tend to use the Internet to gather health-related information and especially for health issues concerning their children. But we know that the health information on the Internet is often of poor quality.

The majority of online health information seekers starts be using a search engine [32]. A study evaluated the first 100 results from Google for five common paediatric questions. 39 % of the websites gave correct information, 11 % were incorrect and 49 % did not answer the question. Among all 500 websites, no sponsored site gave the correct advice. News websites gave the correct advice in 55 % of the cases and governmental sites constantly gave accurate advice [96]. This shows that the quality of the information is very variable and methods for quality assessments are needed for patients to find the high quality websites.

Parents searching the Internet for advice risk to find incomplete or not evidence-based information. Various strategies have been proposed that help parents to distinguish trustworthy from unreliable information. One of those strategies is to provide a checklist for the appraisal of websites on different aspects.

A study from 2013 evaluates the applicability of this strategy when it comes to home management of cough of children. Therefore three checklists were created. The first one focused on components such as author information and references. The second checklist included aspects concerning the completeness of the information, e.g. causes and mechanisms of cough and different treatment options. The third checklist was for the quality assessment of the information by comparing it to a document of the American Academy of Pediatrics. 10 out of of the 19 selected websites contained more incorrect than correct information. This shows that parents searching for information about home management of cough in children face a high risk of finding incorrect advice. The checklist strategy, proposed by many researches, did not allow consumers to reliably select the higher quality websites in this experiment. Among all websites there was no relationship found between the quality of information, technical aspects and content completeness. Due to the fact that the Internet is a huge possibility for online healthcare, new strategies must be created to produce and validate appropriate information to guarantee access to high quality information for all healthcare consumers [85].

CHAPTER 3

Quality Assessment

Quality assessment is an important issue on the Internet, since everybody can contribute. Especially in medical context, the quality is a crucial aspect. In this chapter, the differences in quality assessment of users, search engines and the different approach of quality assessment on medical content will be discussed.

3.1 Quality Assessment of Users

During an experiment with focus groups, researchers evaluated the search technique of users and compared the findings with the statements from interviews. In the interviews, the participants stated that beside a professional design with an official touch, they also look for the sources of the content. Contrary to this, no participant opened the ”about us” section of the websites nor did they check for a disclaimer or disclosure statement [32]. This shows that users do have a sense for credibility of content on websites, but sometimes fail to actually look for the information they need to judge.

A study with fifteen women who faced decisions concerning the menopause and hormone replacement therapy proved that most of them were efficient to sift and reject sales websites. But in some cases it happened that the participants rejected high quality content because of poor design. In the next stage the women developed theories about the treatment options and tested them with the information they found. They combined online advice with offline advice from physicians, friends and relatives before they made their final decision. The women reported that personal stories from others influenced their trust perceptions in a positive way. Even though they excessively used the Internet as an information source, they still saw their physician as the primary source for advice and information [101].

3.1.1 Staged Model of Trust

Trust seems to be a key factor for the decision of users whether to engage with a website or not. A staged model of trust helps to distinguish between hasty and more considered evaluation of trust. Those models suggest two stages.

In the first stage, people show very different strategies when it comes to evaluating trust in different situations. They tend to use more intense analytical processing for more important tasks than for decisions where they lack in motivation [3].

A study with experts and ordinary customers who reviewed health and finance information websites found that experts with a high involvement with the websites topic are more influenced by reputation, information quality and perceived motive compared to customers with less expertise who were more influenced by the attractiveness of the design of the website [103].

When processing information in an online context, users often need to filter a huge amount of information, which often also includes irrelevant information, before they concentrate on one or two websites to explore in more depth. Therefore rapid screening can be very helpful in the initial stage of contact with a health website. In most cases, users are able to recognize general portals or sales sites within a very small time frame. The reason for that might be that such websites tend to have very similar design features such as too many graphics or pop-up advertisements. In the second stage further involvement with the site and a careful evaluation of the content takes place. Especially for health related topics, the assessment of customers about the credibility of the information depends on the perceived impartiality. In some cases customers viewed the information about medicine on pharmaceutical companies as official and others preferred governmental organizations. Websites which are able to show their expertise by including information about the author or references are often able to gain more trust from the customers [99].

Additionally to those two stages, other studies [27, 28, 49] suggest that a third stage, where a trusting relationship between customer and website establishes, is necessary for a more realistic assessment of the development of trust. A study from 2004 showed that for cancer patients, the long-term support was the key factor. They used the Internet for sharing experience or advice and to contact support groups. Literature about online communities suggests that online long-term relationships are based on trust which can develop through exchanging personal information [95].

A study compared the results of two online questionnaires from 2000 and 2005 to describe the changes in the use of the Internet for health advices. Since the number of sites increased, the consumer can choose between the available information. In 2000 the most important trust marker were:

1. The site contained contributions from like minded people
2. The advice came from a knowledgable source

3. I felt involved in the way the site tried to find appropriate advice
4. The site was easy to use
5. The advice appeared to be impartial and independent

Five years later, 2005, the most important aspects for the users were:

1. The site was easy to use
2. The advice came from a knowledgable source
3. The advice appeared to be prepared by an expert
4. The advice appeared to be impartial and indipendent
5. The reasoning behind the advice was explained to me

Comparing the results from 2000 and 2005, one can see that the trust markers for health websites have changed [100]. There seems to be a shift from expert knowledge to a more usability driven approach.

3.2 Quality Assessment of Search Engines

When it comes to measuring quality of information on the Internet, one big benchmark are search engines, because they provide the users with ranking the best results matching the search query. The biggest search engine, with over 90 % market share in most countries [82] is Google and it is Google's core business to decide which information is of high quality and which is not.

Google released information about "What counts as a high-quality site?" on it's Official Google Webmaster Central Blog [45] in May 2011. In this post, they explain the ideas behind the development of their algorithm. The authority of the author of the content is very likely affecting the rating of quality. It seems to be important that the author is an "expert or enthusiast" in this topic. Beside this, also the authority of the website on the topic of the content influences the quality assessment of Google.

Another point mentioned is the *"... quality control ... done on content"*. This might refer to quality control of the website itself but also includes external certificates such as `http://www.trustedshops.at/`. The quality of the text on a website influences the overall quality assessment. Spelling or stylistic errors give the impression of low quality and might also be taken as an indicator for low quality control of a website. Completeness of an article is also taken as criteria for high quality content. Beside this, the comprehensive description of a topic influences the opinion about the quality.

Google even has specific points for health related topics, such as *"Would you trust information from this site"*. Questions like *"Would you be comfortable giving your credit card information to this site?"* and *"Is this the sort of page you'd want to bookmark, share with a friend or recommend?"* [102] could help to elaborate the level of trust a website gains from its users and

therefore be a good indicator for the quality of the website. Another point the blog post mentions is *"Does this article have an excessive amount of ads that distract from ... the main content?"*. For most websites providing content, such as online newspapers or health portals, advertisement is the main source of income and therefore often a lot of adverts are placed next to the actual content.

All those questions are very user oriented and are a good starting point to find out what are characteristics of high quality content.

3.3 Quality Assessment in Medical Context

In healthcare the quality of information is an important aspect. In many countries the provision of a high quality standard of information is even a legal responsibility [23, 33].

The Patient's Charter and commitment of informing and empowering users of NHS services are part of the trend that health consumers are taking a more active role when it comes to decisions concerning their health. This led to an increasing demand for better information about the treatment choices [59, 76]. Patients want information about risks, benefits and uncertainty of treatment options [75, 93].

Studies show that a well informed patient is less worried and also better prepared for a consultation than patients who are not informed [76]. Beside this, patients who are more involved in the decision making process may show an improved health outcome [13, 48, 58]. Understanding the treatment options can also have a positive effect on the treatment outcome, then when the patient is not participating in the decision making process [7, 35].

In 1999 a study suggested that because of the missing standards for providers of consumer health information could cause misleading or inaccurate information which patients receive [40]. Patients that are missing access to good quality information are unable to judge the treatment options. Contrary to the situation of patients, healthcare professionals receive their information from high quality evidence-based sources such as the Cochrane Library. This might lead to an inbalance.

One of the first approaches to develop an instrument for judging the quality of literature addressing patients, was DISCERN. The DISCERN questionnaire aims to

> *"enable information providers and patients to judge the quality of written information about treatment choices and facilitate the production of high quality evidence-based consumer health information by setting standards and providing a reference point for authors"* [15].

Out of several studies international guidelines were developed. They suggest that patient information documents should be evaluated in content, structure and identification data [16].

Concerning content, the guidelines suggest that beside the description of an illness, all treatment options and their consequences should be covered. The patient information should also contain a list of sources of the information and contact information. Regarding the structure, the information needs to be relevant for the target audience, balanced, evidence-based and referenced, easy to understand, regularly updated and illustrated. The guidelines also require the date of the document issue, the name of the responsible editors and a specification of financing [16, 61]. Out of those guidelines tools have been developed to evaluate the quality of patient information [1, 15, 29, 44, 62, 78].

One of those tools is the ensuring quality information for patients, short EQIP, instrument. EQIP aims to *"assess quality of patient information, applicable to all information types, and prescribe the required action"* [78]. Some of the EQIP criteria coincide with the criteria of the British Medical Association patient information award appraisal form [16]. Both approaches were proved useful by surveys of patient information leaflets [78, 114] but still other criteria were added to evaluate patient information [34].

The original EQIP scale included 20 different criteria. For the expanded EQIP scale another 15 criteria were added. Those additional criteria were elaborated from literature on quality of patient information. The 35 points of the expanded EQIP scale included criteria like:

- document content (description of the medical problem, quantitative benefits and risks, patient precautions and alert signs and summary content item),
- identification data (e.g. date of revision, name of sponsors and bibliography) and
- structure (information clear and balanced).

The expanded EQIP scale was applied to 73 documents about an examination or diagnostic test and proved useful in quality assessment. The results suggest that guidelines should be used during the development of patient information documents and that patients should be involved more into the process of production and evaluation of such documents [16].

A study, published 2010, evaluated the usability of patient information leaflets. Three leaflets, which followed the current EU regulations, were tested among potential users. The leaflets were redesigned based on the results and evidence-based document design principles. After the revision of the leaflets the information was found faster and the comprehension scores increased. The results suggest that even within the regulations the usability of the leaflets can be improved and that information leaflets must be user tested and rewritten according to document design principles [69].

3.4 Quality Assessment of Medical Content on the Internet

In 1998 a study evaluated 47 rating instruments for medical content. The majority of those instruments did not provide a description of the criteria they used for their ratings. Therefore the study suggests that many of the instruments are incomplete to evaluate health information on the

Internet [56].

In the same year, another study pointed out that most literature focused on the problem of reliability of medical content on the Internet, but that labeling and through that filtering of information by users is also an important issue. A combination of self labeling by the authors and a systematic appraisal of the information by the users themselves but also by third parties. Those third parties should then work with validated standard core vocabulary. Medical societies and associations could act as such critical third party evaluators [31].

3.4.1 Third Party Quality Evaluation

Several studies suggested that third party evaluation and tools are an important issue for health related information on the Internet. During the last years many tools and third party programs were established. It is questionable if users are actively searching for the information whether a website is certified by a third party. Some of the third party programs and their criteria will be explained in the following section.

HON Code

One of the very first programs established was from the Health On the Net, short HON, Foundation. The goal was to guide medical professionals and users to find trustworthy and reliable sources of health information on the Internet. Today the HON Code is a worldwide accepted reference for publishers from 102 countries and currently used by over 7 300 websites.

It was founded in 1995 after experts discussed the concerns about the quality of online health information. They decided to develop a program to *"promote the effective and reliable use of the new technologies for telemedicine in healthcare around the world"* [109].

The HON Code contains guidelines for publishers to more transparency of the website to improve the quality and objectivity of the information by publishing correct data. To reach this a set of mechanisms is suggested which should provide transparent and objective medical information in high quality which fits the needs of the users.

Since the HON Code is certifying the sites at a certain time, it cannot guarantee the quality of all information at any time on the website. Nevertheless websites which got the HON Code can be attributed with the intention to provide quality information.

The Health On the Net Foundation specifies the following criteria for their certificate [108]:

1. Authoritative: Indicate the qualifications of the authors
2. Complementarity: Information should support, not replace, the doctor-patient relationship
3. Privacy: Respect the privacy and confidentiality of personal data submitted to the site by the visitor

4. Attribution: Cite the source(s) of published information, date medical and health pages
5. Justifiability: Site must back up claims relating to benefits and performance
6. Transparency: Accessible presentation, accurate email contact
7. Financial disclosure: Identify funding sources
8. Advertising policy: Clearly distinguish advertising from editorial content

AFGIS Transparenzkriterien

Another certificate for high quality of online health information comes from the Aktionsforum Gesundheitsinformationssystem (afgis) [41] and was first assigned in 2005. The afgis is a German union of companies, associations and experts with the goal to promote quality of health information on the Internet.
The criteria of the afgis focuses on transparency. Their criteria include information about

1. the provider
2. the target group and purpose of the information
3. the information about the author and sources
4. the possibility to contact the company
5. the information about the process for quality assurance
6. the separation of advertisement and editorial content

EC Quality Criteria for Health Related Websites

In 2002 the European Commission agreed on a set of quality criteria. Based on this, the *"EC Quality Criteria for Health Related Websites"* was established. The evaluation of health information on websites in EU countries is based on six different criteria. Beside transparency and honesty the quality criteria include several aspects, some are authority, privacy and data protection. Also accessibility is an issue in the EC Quality Criteria, which includes guidelines on physical accessibility but also aspects like usability [30].

Principles Governing AMA Web Sites

The American Medical Association, short AMA, developed principles that can be used as a guide for developing and posting content on websites. Beside ensuring patient's rights for privacy and confidentiality, the AMA guidelines can help to regulate the acquisition of online advertising or sponsorship to provide secure means [116].

CHAPTER 4

Methodology

To explore the different characteristics which might influence the quality assessment of an online health information seeker, the following process will be performed.

The first part is the empirical research. This includes interviews with various people to evaluate their online behaviour and their way of judging the quality of medical content by using semi-structured interviews. Afterwards the participants have to perform different tasks whilst wearing an eye tracker. This part aims to show where they look when searching for medical content on the Internet. After the eye tracking the participants are interviewed more concretely about different aspects and whether their quality assessment was influenced by those aspects. The findings from the interviews and eye tracking are combined to formulate hypotheses.

In the second part, the derived hypotheses are then evaluated by paper prototypes with a larger participant sample.

4.1 Semi-Structured Interviews

Interviews provide in-depth information of participants' viewpoints concerning a topic [111]. Interviews can be unstructured or structured. While structured interviews use closed questions, similar to questionnaires, unstructured interviews are closer to observation. A semi-structured interview allows the interviewer to divert from the question set. It is open and therefore allows to bring up new topics as a result of answers of the participants. A semi-structured interview is likely to be used if the interview aims to explore a framework of themes [80]. Beside this, a semi-structured interview should be preferred if there is no chance to get a second interview. The interview guide provides a set of questions to ensure a reliable qualitative data.

The general interview guide approach helps to ensure that the same area of information is collected from each participant. It helps to provide more focus than a conversational approach but

still leaves a possibility for adaption. The general interview guide approach also enables to ask follow-up questions based on the responses of the participants [19].

Semi-structured interviews often tend to contain open questions and discussions can emerge which leads to diverging from the interview guide. Therefore it is best to audiotape the interviews and use the records later for a transcript and analysis. Trying to capture the answer of the participant might lead to difficulties in focusing on the interview. It might result in poor notes and a gap in the relationship between interviewer and participant. Audiotaping interviews helps to focus on the interaction during the interview instead of writing down the answers of the participants. The audio recording should be transcribed as soon as possible after the interviews to keep the process simple [19].

The effectiveness of an interview highly depends on the interviewer and his communication skills. The ability to clearly structure questions and to listen attentively can influence the outcome [80].

Semi-structured interviews were chosen in this case to allow the participants the freedom to express their own views and feelings since the topic of quality assessment is very broad and the approach for seeking health information online is considered very inconsistent.

4.2 Eye tracking

Eye tracking describes the process of measuring the point where a user is looking, the point of gaze, or also the movement of the eye. The first non-invasive eye tracking was developed in 1901. Photographic techniques were first applied in the 1930s to study eye movements in reading. 1948 the first head-mounted eye tracker was developed. Since the 1980s eye tracking is also used in research on questions of human-computer interaction. Modern eye trackers capture the reflections of infrared light from the cornea and the retina. The software to setup and calibrate the system is very quick and simple which makes the modern eye tracking systems fairly reliable and easy to use [55].

Eye tracking is very established in psychology to analyse the attention patterns of users during an information processing task [91]. The analysis of the eye movements is also used to investigate the interaction of a user with an interface and the results can lead to changes in the design [5,55]. In user centered design, eye tracking became a valuable approach to evaluate visualizations. Eye movements can be recorded to study the cognitive workload of participants. In most cases the position and duration of the fixation and the scan path structure is important to analyse [90].

In eye tracking several definitions have been adopted, such as fixations and saccades. Fixations are defined as motionless staring which lasts about 200-300 milliseconds. Saccades are quick movements of the eye between the fixations which direct the viewer to the visual target. Several studies suggest that fixation is linked to an intense cognitive processing where the visual stimulus is encoded, sampling of the peripheral field takes place and the next saccade is planned [84].

The current opinion is that the visual attention is about 100 to 250 milliseconds ahead of the eye, but the eyes want to follow as soon as the attention moves [24].

A disadvantage of eye tracking is that the complexity of a task influences the duration of fixation [86]. Beside this, an eye tracker can only track the obvious movements of the eyes but it is not capable of tracking the covert movement of visual attention. Nevertheless, tracking the participant's eye movements makes it possible to follow the path of attention. Through this, we can gain insight to what the participant found interesting and what got their attention [26].

During this master thesis, eye tracking was used to gain insights on the subconscious perception of features and characteristics of websites with medical content. The recordings of the eye tracking will show where the attention focus is when searching for health information online.

4.3 Prototyping

Prototyping describes a technique where a model of a product is build to test a new design by users. With prototypes, users can see a tangible output either on screen or on paper and they can use it to find out whether something is missing. Prototyping can result in a very detailed specification of the final system if it is carefully done [70].

Especially in design processes, prototyping can be used to test theories or to develop alternatives even before producing the new product. It is a very common strategy to design, test, evaluate and modify the product based on the results of a prototype analysis.

Paper Prototyping is a common method in designing human-computer interaction. It is mainly used to design and test user interfaces. This technique became popular in the mid 90s as big companies began to use it in their design process. Paper prototyping can save time and money because by this method user interfaces can be tested even before the development starts. Therefore it allows easy modifications in the design. Beside this advantage, users also tend to feel more comfortable when they criticize a paper prototype [63].

Experiments with high-fidelity and low-fidelity prototypes show that both types are suitable for finding usability problems [112]. The usage of paper- and computer-based low-fidelity prototypes also leads to the same amount of user statements. But it also showed that users preferred the computer prototype. The study suggests that the decision about the type of used prototype should be made carefully and that still sometimes the time and cost advantages of paper prototyping can outweigh the disadvantage of the user feeling observed [97].

Due to the reasons mentioned above, paper prototypes will be used in this work to test the hypotheses which are going to be derived from the eye tracking and interviews before.

CHAPTER 5

Empirical Research

The empirical research had the goal to formulate hypotheses about the quality assessment during health information seeking and the influence on the quality evalution of different features of medical content. The session was structured in three parts, including a general interview, eye tracking and a more detailed follow up interview.

5.1 General Interview

The first part was a general interview, which aimed to find out which approach the participants use when seeking health information and how they judge the quality of the content they find. The interview was planned as a semi-structured interview to keep the questions open, to find out if participants are aware of any specific approach they follow or whether they tend to rely on their instinct.

5.1.1 Interview Guide

1. Benutzen Sie das Internet um nach medizinischen Inhalten zu suchen? Nutzen Sie das Internet regelmäßig, wenn ja wie oft?
2. Suchen Sie nach Krankheiten und Symptomen die Sie selbst betreffen oder nach allgemeinen Informationen?
3. Wie suchen Sie nach medizinischen Informationen im Internet? Suchmaschine oder direkter Einstieg?
4. Wie treffen Sie die Auswahl in den Suchergebnissen?
5. Wie beurteilen Sie die Glaubwürdigkeit der Seite? Worauf achten Sie?
6. Wie beurteilen Sie die Qualität des Inhalts auf der Seite? Worauf achten Sie?
7. Wählen Sie einen unterschiedlichen Ansatz je nach Thema (Krankheit vs. Lifestyle)?

8. Besuchen Sie bei medizinischen Problemen Ihren Arzt oder suchen Sie zunächst nach möglichen Gründen oder Lösungen im Internet? Hat sich ihr Verhalten diesbezüglich verändert?
9. Gehen Sie mit konkreten Vorstellungen an welcher Krankheit Sie leiden zum Arzt und verlanden dort ggf. auch die entsprechenden Untersuchungen?
10. Vertrauen Sie der Diagnose des Arztes und den Informationen die Sie bekommen grundsätzlich? Informieren Sie sich dann trotzdem noch einmal im Internet?

5.2 Eye Tracking

After the interview eye tracking was used to find out, how the participants search for information to answer health related questions.

Those questions were:

- Nenne 3 Hausmittel gegen Grippe!
- Wann wird Hormontherapie zur Behandlung von Brustkrebs eingesetzt?
- Ab welcher Temperatur spricht man von Fieber?
- Nenne 2 Nährstoffe die in der Schwangerschaft besonders wichtig sind!

Afterwards they were given a list of preselected websites and were asked to evaluate the quality impression of those websites. The scale for the quality was:

- nicht genügend - 6
- genügend - 5
- befriedigen - 4
- gut - 3
- sehr gut - 2
- ausgezeichnet - 1

The websites were displayed on a MacBook Pro with a 13 inches display with a screen resolution of 1280 x 800.

For the first part of the evaluation the search engine Google was opened in a single tab in a Firefox 28.0 brower. Participants were told to use the browser as they do in their daily routine and open new tabs if they wish to.

During the preparation of the second part, the websites were opened in tabs in the same order. Each participant started with the first website and was asked to rate one sample website after another.

5.3 Website Sample for Quality Evaluation

The selection of the websites should offer a variety of designs and features shown on the website such as publishing date, sources or author information. For the last two participants the selection of the websites was enlarged, to include websites with information about drugs, because one of the participant was a pharmaceutics student. A more detailed description can be found in the following section and screenshots of the websites can be found in the attachment.

The following websites were used:

5.3.1 HPV Impfung

`www.netdoktor.at/gesundheit/impfung/hpv-impfung-5339`

The first website was about immunization for human papillomaviruses. The website is a well known brand in Austria. It shows the author, a gynecologist, with a picture. The website shows only a few advertisements, mostly self-promotion. The text was rather long and had a good structure using headlines and paragraphs. At the bottom the page provides a source of information and the publishing date is July 2013. This website was chosen to get a starting point of the quality evaluation of the users. The eye tracking will show, where users tend to focus and therefore help to better compare the other results and gradings.

5.3.2 Altersschwerhörigkeit

`www.netdoktor.at/krankheit/altersschwerhoerigkeit-7876`

The second website about age-related deafness had very large advertisements placed all over the website. It was sponsored by a big company which provides hearing aid devices. The author information was next to the content on the right side. The text was well structured with headlines and paragraphs. After the text, the sources and publishing date were shown. This site was selected, to see the influence of massive advertisement on the quality evaluation of the users and whether they are noticing the adverts.

5.3.3 Behandlung bei ADHS

`www.netdoktor.at/therapie/adhs-therapie-5069002`

The third website about the therapy of ADHD, had a very prominent picture of the author. The brand and design are the same as in the first two sample websites. The structure of the website covers basic information, therapy and a diagnosis section. Headlines and paragraphs are used in the text. Compared to the two previous sample websites, this text was published in October 2011. The website provides four sources of information for this content. It was selected because of the outstanding author picture to see whether the participants are focusing on the author.

5.3.4 Blutbild

`www.gesundheit.gv.at/Portal.Node/ghp/public/content/laborreferenzwerte/Blutbild_00a_BLUTBILD_HK.html`

The fourth website was from the official governmental website. The text about a blood count was rather short compared to the websites before, but it provides a lot of links to more specific texts about laboratory values. The website does not show a specific author but provides the information that the text was approved by the editors of the health ministry. It was selected to see whether the participants are recognizing the `.gv.at` ending of the URL and how this influences their quality assessment or if the participants are more focusing on the design of the website.

5.3.5 Reizdarm

`www.onmeda.de/krankheiten/reizdarm.html`

The fifth website covers the topic irritable colon. It has a very prominent advertisement which fits the design of the website and the topic. The structure is well visible and also a pagination element is used under the content. The page shows no information about the author or sources. It uses bullet points and highlights important passages or words in bold print. This page was selected to see whether participants are noticing the navigation element for the different sections of the content. Beside this, the website should also show if participants are actively searching for information about the author or sources.

5.3.6 Allergie

`www.netdoktor.de/krankheiten/allergie/`

Compared to all other websites, the sixth page contained only very little actual text about allergies. It provides a lot of cross linking to other sections of the website. The content can be found on the bottom of the page. The information about the author is placed between the headline and the text. The website shows a lot of advertisement, also adverts which only contain text. Beside this, the page contains many different pictures and teaser boxes. The reason for selecting this website was to check where the participants are looking at if they open the website and the first impression is very different to the previous samples.

5.3.7 Migräne

`www.apotheken-umschau.de/Migraene`

The seventh sample for the eye tracking was about migraine. It shows a very prominent infographic on the top followed by the links to the different chapters such as causes, symptoms or self help. It is the only website, which places a rather big picture of the author or in this case an expert, in the continuous text. There are no headlines used in the text, but it is neatly structured

through paragraphs. The publishing date is placed under the pagination and not very visible. This page was selected to measure the impact of an infographics.

5.3.8 Hautpilz

`www.netdoktor.at/krankheit/hautpilz-7728`

This sample website was about dermatophyte. It contains a lot of text and also pictures of affected skin areas. The text was structured with headlines. Author information, sources and publishing date were placed under the text. The page showed some smaller advertisements on the right column. The website was selected to see if the participants notice the author information also if it does not contain a picture and is not placed prominent on the top right part of the website.

5.3.9 Additional websites about drug information

`www.netdoktor.at/medikamente/parkemed-500-mg-filmtabletten-274280`

`www.onmeda.de/Medikament/Aspirin/med_nebenwirkungen-medikament-10.html`

The following two websites were selected to investigate the role of topic knowledge of the participants. This websites both contain drug information, because one of the participants was studying pharmaceutics. The ninth website sample contains information about Parkemed and the last website was about Aspirin and it shows advertisement for another headache pill.

5.4 Follow-Up Interview

In the follow-up interview after the eye tracking, participants were asked to reflect their behaviour during the quality assessment. Like the interview in the beginning, the follow-up interview was also held as a semi-structured interview to leave room for comments and suggestions of the participants. The interview guideline included several characteristics of websites providing medical content.

Interview Guide

1. Fließt die Bekanntheit der Marke / Seite / Domain in die Qualitätsbeurteilung mit ein?
2. Wie wichtig war Ihnen das Design und Farbkonzept der Seite?
3. Ist Ihnen die Navigation ausgefallen – wie beurteilen Sie die Gestaltung?
4. Fließt das Designs in die Beurteilung der Qualität mit ein?
5. Wie wichtig waren Ihnen Quellen?

6. Haben Sie auf die Art der Quellen geachtet?
7. Ist es Ihnen wichtig, dass mehrere Quellen genannt werden?
8. Ist es für Sie von Bedeutung woher die Quellen stammen?
9. Wie beurteilen Sie die Angaben zum Autor?
10. Ist Ihnen das Foto des Autors aufgefallen?
11. Wenn ja, wie fließt das in Ihre Beurteilung der Qualität mit ein?
12. Ist Ihnen wichtig, dass der Autor einen Fachbezug zum Text hat?
13. Legen Sie Wert darauf, dass mehrere Personen einen Text kontrolliert haben?
14. Haben Sie auf das Datum der Veröffentlichung geachtet?
15. Wie wichtig ist Ihnen, dass die Angaben aktuell sind?
16. Stört Sie Werbung auf der Seite bzw. beeinflusst es Ihre Einschätzung der Qualität?
17. Wie beurteilen Sie die Qualität des Textes, also Rechtschreibung oder Ausdruck, selbst? Worauf achten Sie dabei?
18. Ist Ihnen eine übersichtliche Gliederung wichtig?
19. Wie beeinflusst die Verwendung medizinischer Fachausdrücke Ihren Qualitätseindruck?
20. Finden Sie einen einfach geschrieben, verständlichen Text gleichwertig in der Qualität wie einen Text mit mehr medizinischen Ausdrücken?
21. Haben Sie auf ein Qualitätssiegel wie den HON Code geachtet? Wussten Sie, dass so etwas existiert?

5.5 Participant Sample

Seven people participated in empirical research. The selection of the participants for the interviews and eye tracking was made, considering the following issues:

- people with medical background and knowledge
- people who search regularly for health information
- people with a chronic illness
- people with children

Because the results of the first part are used as the basis for designing prototypes, there was no focus on covering different ages. All participants are currently living in Vienna, but one participant originally came from Carinthia. Participants from more rural area were not taken into account because it would have been tricky to move the eye tracker and the requested participants were not able to come to Vienna during the scheduled time slots.

In the following part the results of the previously defined process of the empirical research will be explained in detail. For each participant the findings of the interviews and eye tracking will be described.

5.5.1 1st participant

The first participant was a 25 year old optometrist who is doing a training for a degree as a master optician. In the first part of the interview, the participant stated that she uses the Internet to search for health related topics if there is an occasion. Her starting point of the information search is mainly the search engine Google. The participant said that she relies on the ranking of the search results when she decides on which pages to click. In the quality evaluation she focuses whether there is a lot of advertisement on the website, because for her this leads to a bad quality impression. Beside this, she said that it is also important that the information is detailed and that the author is an expert in the field. When asked about her patient-doctor relationship, she said that she normally trusts the information of her physician.

In the first part of the eye tracking session, she only used Google to search for the answers to the questions. As stated in the interview before she mostly clicked on the first website of the search results. During the quality evaluation the participant started to read the first paragraph in detail and then began to scroll. It seemed that when looking at pages she knew, like `www.netdoktor.at`, she only had a short look at the logo and because she recognized the brand. She tended to assign a higher quality to the familiar websites. On the websites *Blutbild* the focus often was on links in the content and on the navigation elements of the page. This website got the worst quality ranking. This might be because of the less attractive design or also because the participant did not know the brand. Even though she explicitly stated in the first part of the interview that advertisement is connected to a bad quality impression - the sites that contained adverts did not perform significantly worse than those without.

When compared to other participants, she spend more time focusing on the actual content and reading it. In most cases she scrolled till the end of the page and took a short look at sources and the publishing date, but as she stated in the interview afterwards, it seemed that those aspects did not influence the quality rating very much.

In the follow-up interview the participant said that the popularity of a brand, the design and the credibility of the author were important for the evaluation of the quality. Sources and the publishment date were rated as not that important. Beside those aspects, the participant said that the structure of the content is essential for her. She wants the text to be easy to read with enough space between the lines and paragraphs. She also stated that spelling errors make the impression that the author is not well educated and therefore not trustworthy. For her the usage of medical terms has a positive influence on the overall quality impression but it should still be easy to read for lay people. When asked about the HON Code, she said that she does not know such quality labels for medical content.

5.5.2 2nd participant

The second participant was a 25 years old at the time of the interview. He is a software engineer with a bachelor degree in medical informatics. The participant said that he is not using the Internet to search for medical content on a regular basis. If he wants to look up information he

said that he would use a search engine and select the websites from the results according to his gut feeling. The reliability of a website is judged by the overall impression he has of the website.

While the participant was searching to find information to answer the questions, he used Google. If the content on a website was not sufficient enough he went back to the search results and clicked another link. When choosing between the results he sometimes also read the description text presented underneath. During the quality assessment of the given pages he said that he would usually look at the source code of the website to get an impression about the quality. He made clear that for him the quality of medical content is directly linked to the quality of the programming of the website. He looked at more than one page before finally judging on the quality which shows that he was comparing the quality among the websites. When looking at a website he was more focused on the right and left side than on the actual medical content.

In the follow up interview he stated that the most important aspects for him are the popularity of the brand and domain and the design of the webpage.

The participant had an ad blocker installed and also stated that a lot of advertisement has a negative impact on the perceived quality. He said that other factors such as the sources or information about the author are less important for him.

5.5.3 3rd participant

The participant is a 28 year old woman with migraine who was pregnant with her second child at the time of the interview. She uses the Internet occasionally to search for medical information if she or her child is sick, but she tends to go online to find information about concrete treatments. Her starting point is Google and she said that the decision which of the search results to choose is based on whether the first words fit her search query. She stated that adverts and especially pop-ups lead to a bad quality impression. Beside this, she said that the first few sentences can lead to trusting the site or continue searching. Due to her pregnancy she often searches for alternative ways to treat her migraine because the medicine she could use is very limited. Normally she only uses official websites to gain health information, but in this case she stated that she also searches communities and other social media platforms for an alternative approach. If the suggested treatments seems innocuous enough she will try it herself to see whether it helps.

During the google search in the eye tracking session the participant used very concrete search queries to find answers to the questions. At the quality assessment of the websites she focused mainly on the above-the-fold part including the logo. She did not read much but tended to scroll more and concentrated on the headlines. The average quality she assigned to the websites was a little lower than other participants did. The website *Allergie* got the worst possible quality ranking. This might be due to the fact that you have to scroll a lot till you reach the actual content.

In the follow-up interview session she said that the corporate identity for her is an issue when it comes to connecting it to how she experienced the quality on the page in previous visits. She stated that the sources and author information given on the page were not important for her.

Concerning the publishing date she said that in those cases it was not an issue for her, but it sometimes is, when she searches for a concrete problem which concerns herself. She said the structure of the text is an important indicator for the quality of the text because it highly influences the first impression. Concerning spelling errors, she mentioned that they are *"extremely embarrassing"* and if there are many mistakes it seems dubious. She said that the use of technical terms is not influencing her judgment a lot and that the terms should be explained if they are used in the text. When asked about the HON Code she said that she had had no knowledge that such quality seals exist.

5.5.4 4th participant

The fourth participant is 33 years old, married, and is employed as a building engineer. He said that he does not use the Internet regularly to search for medical information, only if something concerns himself. He was a little unsure when asked about his quality evaluation but he said that the layout of the website probably influences the impression about the quality. Concerning the content he stated that he tends to rely on his gut feelings because he *"can not really track the sources"*. The question about the relationship to his doctors and if he fully trusts their diagnosis he answered that it depends on the degree of his illness and that he tends to use the Internet to look up smaller health issues. He goes to see a doctor if he has a serious health problem and he then is confident about the diagnosis of the physician, but it might still happen that he additionally looks up some information on the Internet.

In the first part of the eye tracking he was very focused on reading the content to find an answer to the questions. In the quality evaluation part he looked more on the layout and navigation of the website. He was also paying attention to the breadcrumb element on the website and even clicked on one of the links. Beside this, he also noticed the advertisement and read the text provided by them. He focused less on the text than in the first part of the eye tracking and tended to read only the first paragraph and then scrolled through the rest of the text. During the scrolling his focus jumped between the headlines and the side elements of the websites. He also noticed the sources, publishing date and the information about the author. On some of the pages he also looked at the HON Code seal, but when asked about the HON Code in the follow-up interview session, he said that he did not know that quality seals for medical informations exist.

During the last part of the interview he again stated that the sources are not really important for him as he already mentioned in the first part of the interview. He said that the specialization of the author does not influence his quality assessment. The only exception for him would be if he knows the author by coincidence. When asked about the influence of advertisement he said that it has a massive influence on the quality impression, but during the quality assessment on the websites having advertisement were not rated lower than others.

5.5.5 5th participant

The next participant was a 24 year old student of international engineering management. He said that he uses the Internet to search for medical information about topics concerning himself

about once a month. For finding relevant information he uses a search engine and his decision on which link to click is based on the name of the website. He said that the quality assessment of the website mainly depends on whether he knows the website or not. Beside this, also the design and the structure of the website influence his impression of the quality. He stated that his approach differs if he searches for a general health topic or information about a certain illness. And he said that if it is a serious condition he tends to see a doctor first and looks up additional information afterwards on the Internet.

During the eye tracking session he used very exact search terms to find information to answer the questions. To select from the search results, he read the short description and sometimes also went back to the results to select a second website if he found that the provided information was not sufficient. In the second part of the eye tracking session, the quality evaluation, he focused more on the elements on the side than on the content. He also clicked on some links and navigation elements to get further information about a website. At the beginning of the text, he read the first paragraph on most of the pages and then scrolled through the rest of the content, only reading some of the headlines. He noticed the sources and the information about the author if they were provided.

In the follow-up interview he said that the sources were important when judging the quality of the websites because they provide information where the text comes from. When asked about the author, he said that it influences his quality evaluation and that it is important for him that the author is a specialist for the topic. He stated that advertising has a negative impact on the quality, but contrary to this statement the only website with no advertisement was graded with the lowest quality. Concerning errors in the text, he said that spelling errors are an absolute no-go. He reported that for him the structure and the headlines are very important and he even mentioned a concrete structure which he would like to see.

5.5.6 6th participant

The sixth participant was a 22 year old elementary school teacher who said that she uses the Internet to search for health related information if she has a certain reason to do so. If she goes online she uses a search engine and the selection is based on her gut feeling whether a website looks professional. She said that in the past, she used to see a doctor right away for health information, but now-a-days she tends to search for information first. If she gets a diagnosis from a doctor, she then also searches for information on the Internet, because she wants to evaluate the information she got from the physician.

In the first part of the eye tracking session, she decided very quickly on which website to click from the search results. On the websites she took a short look at the logo and then concentrated on the content and read till she was able to answer the question. During the quality evaluation of the websites she was reading less than in the first part but focused more on the headlines. She also noticed the advertisement placed on the websites but it did not influence the grading of the quality a lot. The only text she read more properly was about the attention deficit hyperactivity disorder therapy, where she also made clear that she had specific knowledge about this topic and

therefore was more strict in the quality evaluation. In this case, she also noticed the publishing date and made a negative correction of the grading after she saw that the text was written three years ago. Beside this she took a short look at the information about the author and sources at mostly all of the websites.

In the follow-up interview the participant stated that for her it is important that she is familiar with the corporate identity. She said that the design and color of the website are important for her. And she also stated that she did not notice the navigation and that the navigation is not an issue for quality evaluation for her. She reported that the sources are important for her quality evaluation and that it more then one source has a positive influence on the quality. When asked about the author, she replied that she noticed the information on one website and that it is relevant for her that the author is a specialist for the topic. Concerning the publishing date, she stated that it is important for her and that she wants the text to be up-to-date. She said that advertisement has a negative impact on the quality impression, because it makes the website look less professional. In the text itself, she mentioned that correct spelling and the structure of the text are a very important issue for her. She said that the usage of medical terms is not automatically leading to a better quality impression, and that she personally likes the text to be easy to understand. To the question about the HON Code, she answered that she did not know such quality seals and therefore did not look for it on the websites.

5.5.7 7th participant

The seventh participant was a 23 year old pharmaceutics student. She said that she uses the Internet about three times a week to search for medical information and health issues concerning herself but also for information about topics covered in her studies. She uses a search engine to find information and her selection in the search results are based on which website seems to be the most reliable one. When asked for more specific criteria she said that she tends to click websites where she knows that they provide good quality, like Wikipedia. But she also reported that she has a different approach whether she searches information for her studies or for private issues. Because for private issues she would also use forums to find reports of people who had the same condition or problem. She said that she goes online to search for information before she visits a doctor. If she sees a doctors, she usually trusts the diagnosis but still looks up additional information on the Internet afterwards.

In the eye tracking session she was looking through the first page of the search results and selected only websites she knew and who had a good reputation, e.g. the website of the Deutsche Krebsforschung even if those websites were not the first ones in the search results. For the quality evaluation she mostly looked at the logo of the website in the beginning and the navigation. She also focused on the information about the author and the sources provided. Compared to the other participants she read more during the quality evaluation and she gave the website with less content a lower quality rating.

In the follow-up interview she said that the corporate identity influences her quality assessment and if she does not know the website, it is important that the overall impression of the website is

serious She stated that the type of the sources are important for her, especially if the source comes from a federal ministry. Concerning information about the author, she said that the website looks more reliable if they provide information about the author and that it has a positive influence on the quality if the author has a specialization in the field. She reported that advertisement does not generally have a negative impact on the quality but if the advertisement interrupting the content, it is disturbing. For her, the structure of the text is important, because it should cover all aspects concerning the topic to make a good and serious impression. She also stated that the usage of medical terms in the text makes it appeal as high-quality content. But it is sometimes also good to have an easily understandable text. When asked about the HON Code, she said that she did not know that such quality seals exist.

5.5.8 Average Quality Assessment of Samples

During the eye tracking, the participants were asked to rate the quality of the websites according to the following scale:

- nicht genügend - 6
- genügend - 5
- befriedigen - 4
- gut - 3
- sehr gut - 2
- ausgezeichnet - 1

The last two participants were given two extra websites to rate because one of them was studying pharmaceutics. Therefore the websites (9) and (10) were only rated by participant 6 and participant 7. The participants graded the websites with

Website	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**Average**
(1) *HPV Impfung*	2	2	5	4	3	1	2	**2.71**
(2) *Altersschwerhörigkeit*	3	2	4	4	3	1	3	**2.86**
(3) *Behandlung bei ADHS*	3	2	4	4	4	3	2	**3.14**
(4) *Blutbild*	4.5	4	3	1	5	5	3	**3.00**
(5) *Reizdarm*	4.5	3	4	4	3	3	3	**2.86**
(6) *Allergie*	3	5	6	5	4	4	4	**4.43**
(7) *Migräne*	4.5	6	4	5	4	3	2	**3.43**
(8) *Hautpilz*	2	2	5	3	4	2	2	**2.86**
(9) *Parkemed*	-	-	-	-	-	3	2	**2.5**
(10) *Aspirin*	-	-	-	-	-	3	2	**2.5**
Average	**3.31**	**3.25**	**4.38**	**3.75**	**2.50**	**2.80**	**2.50**	

Table 5.1: Quality Grading during Eye Tracking

Website (1) got an average rating of 2.71 which was the best rating excluding the two extra websites. The second website received 2.86 in average which is nearly the same as the first website even though it contained advertisements. The website (3) contained a very prominent author picture but still got little worse average rating of 3.14. The governmental website (4) got an average rating of 3.00. Website (5) received 2.86 in average even though it did not prominently show author and sources. The sixth website which only had little text that was placed on the bottom of the page got the worst quality rating of 4.43. Website (8) received an average rating of 2.87.

The two additional websites got an average rating of 2.5 but this might be based on the two participants. The two participants gave a higher average rating over the whole website sample than most of the other participants.

The best grading "ausgezeichnet" was only given three times. Twice by participant 6 for samples of the website `www.netdoktor.at`. The worst rating "nicht genügend" was given two times, once by participant 2 for the website (7) and by participant 3 for website (6).

Participant 3 gave the worst quality rating in average. Participant 4 was also very sceptical but once rated a website "ausgezeichnet". Participant 5 and participant 7 both gave an average rating of 2.5 over all websites.

CHAPTER 6

Prototyping

After the analysis of the interviews, the following characteristics are considered to have an impact on the quality evaluation of the users. For each of those aspects at least one hypothesis was formulated. For those hypotheses prototypes were designed to test them.

1. corporate identity and trustworthiness
2. navigation
3. pictures vs. text
4. provided sources
5. author information
6. publishing date
7. advertisement
8. spelling mistakes and grammatical errors
9. structure of the text
10. usage of technical terms
11. quality seals

21 people participated in the prototype tests. Their average age was 39.90 years. 9 of the participants were female and 12 male. In the beginning they were asked a few questions concerning their age, family situation, profession and place of residence.

	sex	age	family status	children	profession	residence	chron. illness
1	m	24	single	no	student	urban	no
2	m	25	single	no	intern	urban	no
3	m	25	single	no	IT manager	urban	no
4	f	25	single	no	student	rural	no
5	f	30	married	yes	elementary teacher	rural	no
6	f	33	single	no	self-employed	rural	no
7	m	39	married	no	self-employed	urban	no
8	f	52	married	yes	kindergartner	urban	no
9	m	54	married	yes	logistics employee	urban	no
10	f	78	widowed	yes	retiree	urban	no
11	m	69	married	yes	professor	urban	no
12	m	28	single	yes	IT support	rural	no
13	f	30	single	yes	parental leave	rural	no
14	f	31	married	yes	chemist	urban	no
15	m	33	married	yes	software developer	urban	yes
16	m	47	divorced	yes	principal	urban	no
17	m	42	married	no	industrial employee	urban	no
18	f	36	married	no	clerk	urban	no
19	m	31	single	no	journalist	urban	no
20	m	55	married	yes	policeman	urban	yes
21	f	51	married	yes	nurse	urban	yes

Table 6.1: Participants for Prototype Testing

Afterwards the participants were asked to estimate their medical knowledge, their ability to use computers and whether they are looking up medical information on the Internet. The scale for the medical knowledge was

- viel - much
- mittel - medium
- wenig - little
- keines - none

The participants were asked to rate their medical knowledge compared to a doctor. The second question concerned their usage of computers. They should tell how safe and confident they feel when working with a computer

- sehr sicher - very confident
- sicher - confident
- wenig sicher - little confident

- unsicher - unconfident

The third question was about whether the participants use the Internet as a source of health information.

- regelmäßig - regularly
- manchmal - sometimes
- kaum - hardly
- nie - never

Their answers can be seen in detail in the following table.

	medical knowledge	**usage of computers**	**usage of Internet for medical Information**
1	medium	very confident	regularly
2	little	very confident	sometimes
3	little	very confident	hardly
4	medium	very confident	sometimes
5	little	confident	regularly
6	medium	confident	sometimes
7	medium	confident	hardly
8	medium	little confident	sometimes
9	medium	little confident	hardly
10	none	confident	sometimes
11	medium	little confident	never
12	little	very confident	hardly
13	medium	very confident	sometimes
14	much	confident	regularly
15	much	very confident	regularly
16	little	very confident	hardly
17	medium to little	confident	sometimes
18	medium to little	confident	sometimes
19	medium	very confident	hardly
20	little	confident	sometimes
21	medium	confident	regularly

Table 6.2: Participants for Prototype Testing

Afterwards they were told to look at the prototypes and to answer the question

"Welcher dieser Seiten würden Sie am ehersten vertrauen?"

Then they were handed the prototypes and no further influence was performed beside asking for an explanation if their choice was unclear.

6.1 Corporate Identity and Trustworthiness

Especially in health related topics, trust seems to be a very crucial issue. Studies show that users tend to give a higher credibility to information from a computer than from any other media source [18]. During the interview most participants mentioned that for them the trustworthiness depends on the popularity and the corporate identity of a website.

6.1.1 Test 1 - Popularity & Brand

Users tend to rate the quality of a familiar website higher than unknown websites. This behavior was seen in the quality evaluation during the eye tracking. The content on the website `www.netdoktor.at`, which is one of the biggest health websites in Austria, was rated 2.814 in average, which is higher compared to the five other pages with an average of 3.244.

Hypothesis 1: "Users have a higher quality impression of websites they know."

To test this hypothesis the first prototypes were designed. For the prototypes used in Test 1 an unknown website `www.medizinfo.de` was selected for the disease generalized anxiety disorder.

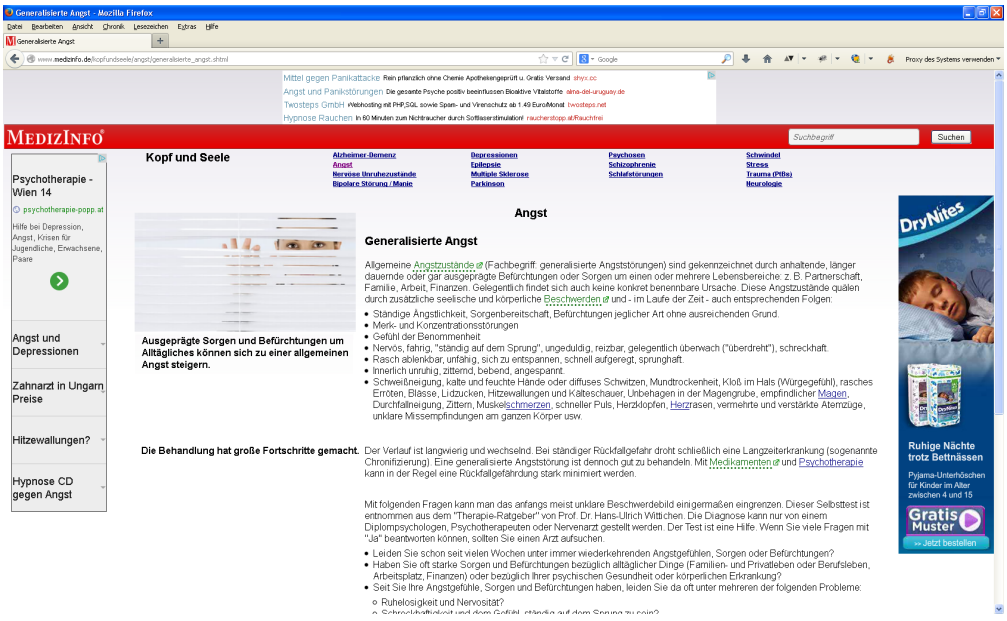

Figure 6.1: Prototype 1C - unknown brand

To test whether the hypothesis holds, a more popular website `www.apotheken-umschau.de` was searched for the same topic.

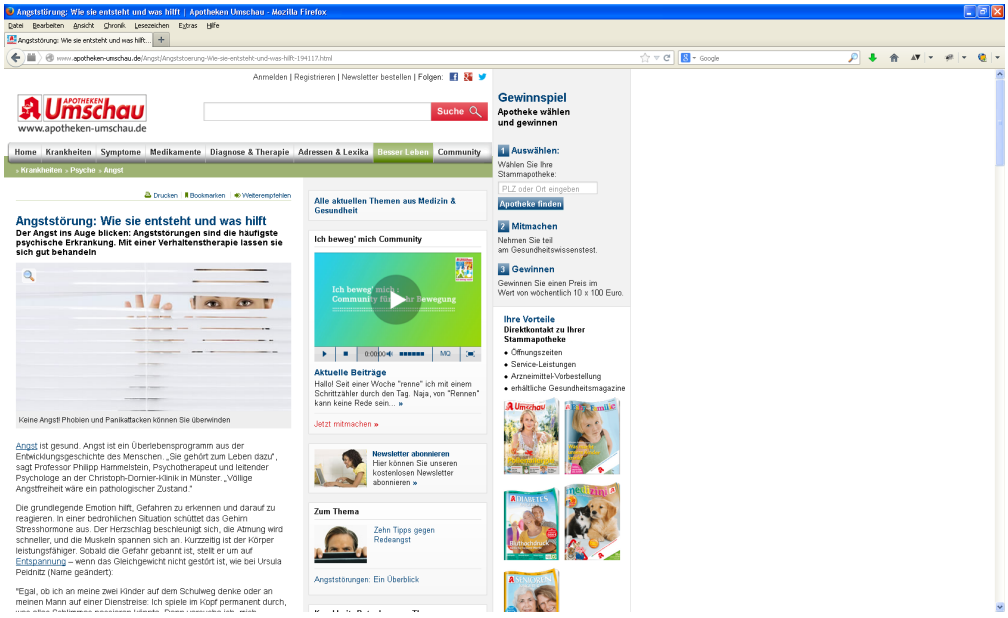

Figure 6.2: Prototype 1A - little known brand

The third prototype was from the well known health website `www.netdoktor.at` about the same topic.

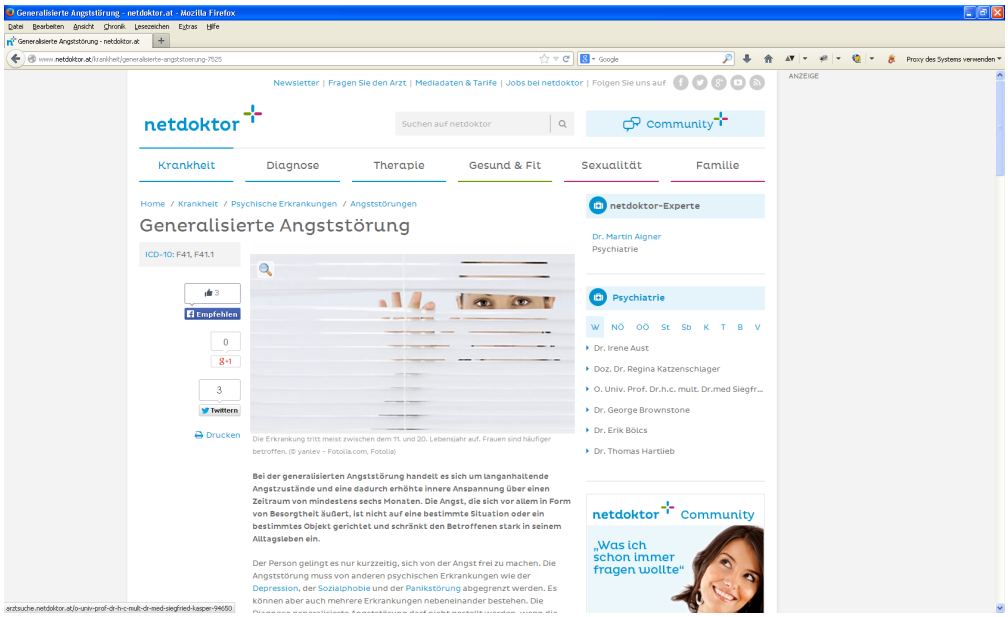

Figure 6.3: Prototype 1B - well known brand

To remove the effect of pictures, the same picture was placed in all three prototypes.

Results of Test 1

Participant 1, a student who is working as a paramedic and through that has a high medical knowledge said that he preferred the prototype B because it shows an ICD 10 code. The ICD 10 code is the international classification of diseases. Many other participants, including 2, 5, 6, 14, mentioned that B looks more scientific and serious than the other prototypes and they therefore would trust this website the most. Participant 7 chose prototype B and said *"weil es wirklich nur wie das Layout da ist ... das ist mir viel zu breit, da weiß ich nicht wo ist der Fokus, das ist mir zu weit links gerückt und B ist genau in der Mitte, das ist für mich einfach angenehm"*. Participant 20 explicitly said that he knows the website from prototype B and would be most likely to trust this website *"netdoktor wäre die Seite wo ich mir am ehersten was durchlesen würde weils recht seriös aussieht, nicht überladen und von den Inhalten her ist mir die als recht kompetent bekannt"*.

Participant 11, a 69 year old professor took a very long time to study each website. Contrary to most of the other participants, he peferred prototype C because *"es hat die vernünftigste Information ... allerdings gebe ich zu, es wird nicht zitiert von wo sie die Information haben. Das müsste man weiter nachsehen, aber wenn jemand über Angst was wissen will und viellleicht auch, welche Behandlungsmöglichkeiten vorhanden sind, dann würde ich sagen ist 1C das Beste."* Beside this, he stated that in prototype A the advertisement for a lottery is disturbing *"weil es schon so aussieht als wollen die etwas verscheuern und mit dem Gewinnspiel Leute anlocken ... dass sie Reklame machen ist mir klar, aber dass sie gleich Gewinnspiele haben"*. It is quite interesting that he makes a clear distinction between advertisement and lottery.

The following table shows the number of participants who selected each prototype during the test.

Test 1	**A**	**B**	**C**	**indifferent**
Absolute	2	14	4	1
Percentage	9.524 %	66.667 %	19.048 %	4.762 %

Table 6.3: Results of Test 1

Overall 66,667 % of the participants, choose the prototype 1B which was the well known brand. During this test, users actually found the websites they knew more trustworthy than the other less known brands.

6.1.2 Test 2 - Social Signals

Another aspect for trust could be the recommendation of other users. In the case of medical content, those recommendations could be seen as the shares and likes a text gets over social media. Some websites display those social signals next to the content. To test whether

Hypothesis 2: "The recommendation of other users has a positive influence on the quality evaluation."

The prototypes for Test 2 showed a different amount of social signals next to the content. In the prototype 2A the social signals plugin was removed. The website for 2B showed only a few likes and 2C showed a higher amount of likes for the text.

Figure 6.4: Prototypes for Test 2

Results of Test 2

The only one that noticed a difference, was Participant 19 and he said *"der Unterschied ist auf den ersten Blick ja kaum zu erkennen ... ich vertrau natürlich dem mit den meisten Empfehlungen"*

Participant 18 asked for a hint what the difference between the prototypes is. After she was told she stated *"ach auf das schau ich gar nicht. Ich schau da nur inhaltlich."*

The total amount of participants who selected which prototype can be seen in the following table.

Test 2	A	B	C	indifferent
Absolute	0	0	1	20
Percentage	0 %	0 %	4.762 %	95.238 %

Table 6.4: Results of Test 2

The majority of the participants, 95,239 %, did not notice any difference in the text and were indifferent. This shows that either users do not notice the social signals and that they do not care about it.

6.1.3 Test 3 - Governmental domain

Another aspect some participants mentioned in the interviews, was the reputation of the website. It would be logical to suggest that websites operated by the government `www.gesundheit.gv.at` have a higher quality impression than other websites, but the experiment showed that

some participants even rated this sample lower than non-governmental websites. The concrete hypothesis derived from this observation was

Hypothesis 3: "Users do not rate governmental websites higher than other websites they trust."

To find out whether this statement is true, Test 3 was designed. The first prototype used was from a governmental website `www.gesundheit.gv.at`.

Figure 6.5: Prototype 3A - governmental website

For the second prototype the content was copied into the design of `www.netdoktor.at`.

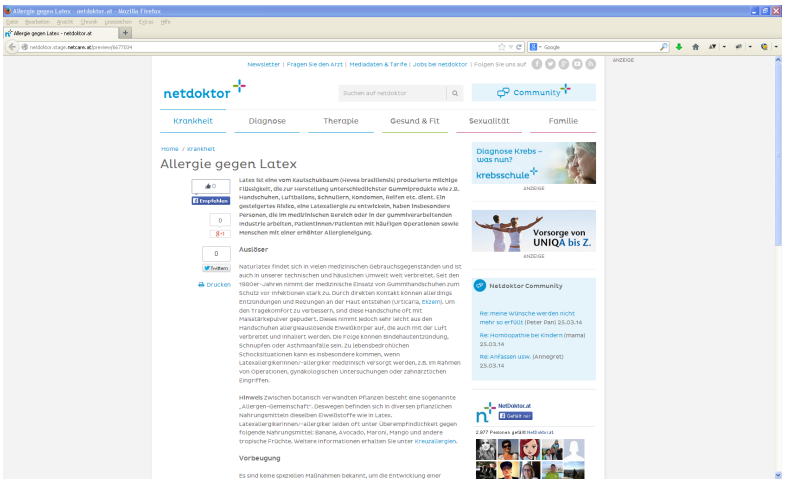

Figure 6.6: Prototype 3B - non-governmental website

Results of Test 3

Some of the participants, preferred prototype A because of the design and not because of the governmental domain. Participant 2 said *"stärkeren Farben kommt es professioneller rüber und die Information ist abgegrenzt"* and Participant 7 explained his choice for prototype A *"schaut irgendwie strukturierter aus und dadurch irgendwie professioneller"*.

Participant 11 stated that *"A ist leichter zu lesen ... wenn man das so ansieht gibt es eine Auflistung von Allergien gegen Latex, was es alles gibt ... Auslöser und so weiter. Also wenn ich weiter mich informieren will, dann hat der mehr Informationen auf der Seite stehen"*.

Contrary to this particpiant 3, who works as an IT Manager, stated that he would trust B more because *"A wirkt wie aus den 90er Jahren und wenn man kein Geld ins Design steckt, wieso sollte ich dem vertrauen"*. Also Participant 19 preferred prototype B *"da ist eindeutig 3B, was einerseits am aufgeräumten Layout und der Typgographie liegt"*.

The choices of all participants can be seen as absolute numbers and percentage in the table.

Test 3	A	B	indifferent
Absolute	14	6	1
Percentage	66.667 %	28.571 %	4.762 %

Table 6.5: Results of Test 3

Among all participants, 66.667 % picked prototype A and explained their choice with many different reasons but no one choose this website because of the governmental domain.

6.2 Navigation

During the interviews, the majority of the users said that the design of a website is very important. Many also stated that the quality assessment is based on their instinct.

6.2.1 Test 4 - Type of navigation

Since statements like this are extremely difficult to test, the hypothesis for the navigation element was formulated, because most participants rated websites with a horizontal navigation with only a few elements better than those with a large vertical navigation.

Hypothesis 4: "A modern design, including a horizontal and simple navigation, has a positive influence for the quality evaluation."

In test 4 the same content was used as a prototype from the old `www.netdoktor.at` design with a vertical navigation.

Figure 6.7: Prototype 4A - vertical navigation with many links

For second prototype the new design with a smaller horizontal navigation was used to find out whether this hypothesis holds.

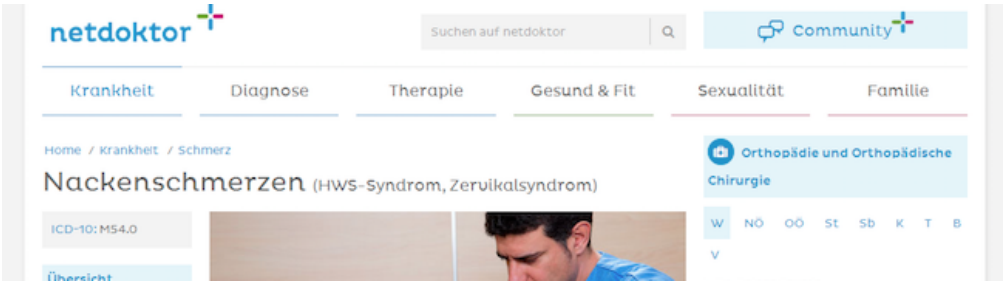

Figure 6.8: Prototype 4B - horizontal navigation with less links

Results of Test 4

Against the expectation of the hypothesis, half of the participants chose prototype A. Participant 11 explained *"hier hab ich viele Möglichkeiten angegeben um mich weiter zu informieren"*. Also Participant 14 preferred prototype A and stated that it is *"übersichtlicher, man kann mehr auswählen"*.

Participant 20 also picked prototype A and said *"da kommt mir das wegen den Links ein bisschen übersichtlicher vor"*. Especially the last statement of Participant 20 is very interesting because for him, the website with a lot more navigation elements was clearer than the prototype with

only six main points.

The other half of the participant preferred the prototype B. They mainly argued that it seems more professional and serious. Participant 7 explained that he would choose B because *"A schaut mir so eher aus wie ein Warenkorb und so irgendwie"*.

The following table shows the choices of the participants in absolute an relative numbers.

Test 4	**A**	**B**	**indifferent**
Absolute	10	10	1
Percentage	47.619%	47.619%	4.762%

Table 6.6: Results of Test 4

Overall 47.619 % choose prototype A and the same amount of participants picked B. Only one participant was indifferent.

6.3 Usage of Pictures

Pictures seem to play an important role in the first impression a user has from a website and therefore they tend to have a high potential in influencing the quality assessment of users.

6.3.1 Test 5 - Pictures vs. text

Some participants mentioned that the design should not be obtrusive. During the quality evaluation participants tend to rate the websites lower that have many pictures and less text. The pictures should not distract from the actual content. This was especially the case for website 6, which received an average quality rating of 4.430 compared to the overall average of 3.029. For the evaluation of the statement

Hypothesis 5: "Websites which provide more text and less pictures are rated with a higher quality."

Test 5 was developed. The prototypes for this Test showed content with pictures. The second prototype included same content but without pictures.

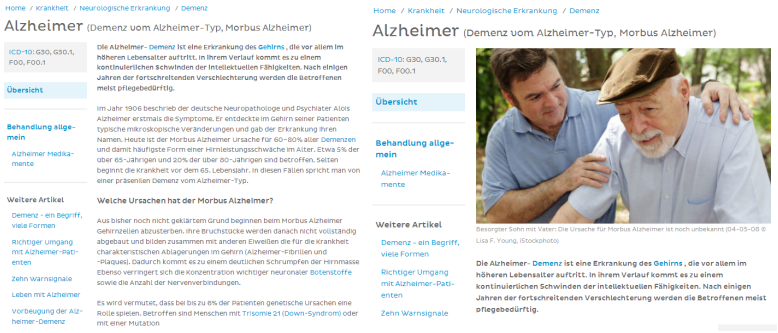

Figure 6.9: Prototypes for Test 5

Results of Test 5

Many of the participants who preferred prototype A without a picture said their decision is based on the more plain and simple design. Participant 19 explained his choice for prototype A *"... die Darstellung ohne das Stockfoto wirkt vertrauenswürdiger"*. Another Participant 15 said that he picked the website without the picture because *"da brauch ich kein Foto von einem alten Mann"*.

Participant 2 chose prototype B and said *"kommt viel freundlicher rüber"*.

Participant 6 was indifferent and stated that *"vertrauenswürdig finde ich sie beide aber B spricht mich mehr an, weil das Bild dabei ist. Das Andere ist nur Text"*.

The absolute and relative numbers of participants preferring each prototype can be seen in the following table.

Test 5	A	B	indifferent
Absolute	6	7	8
Percentage	28.571 %	33.333 %	38.095 %

Table 6.7: Results of Test 5

28,571 % of the participants chose prototype A, without a picture, and 33.333 % preferred the prototype B with a picture. The other 38.095 % were indifferent.

6.3.2 Test 6 - Type of the picture

On the other hand, websites that showed infographics such as website 7, got an average quality rating of 3.430. Therefore the hypothesis

Hypothesis 6: "Pictures which add value to the text, such as infographics, cause a higher quality impression then websites which use stock photography."

lead to Test 6. In Test 6 were three prototypes designed. The first prototype with an infographic. The second prototype showed a photography of a surgery. And in third prototype a stock photography was placed.

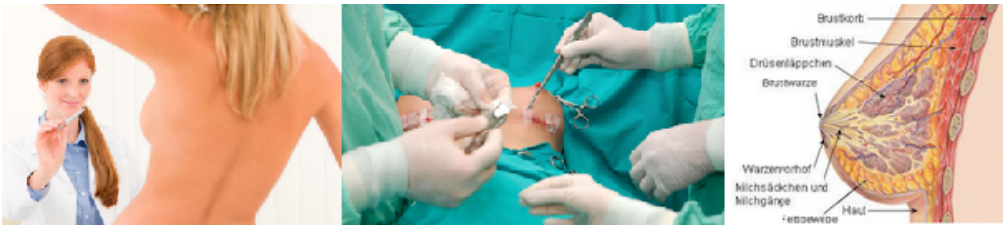

Figure 6.10: Prototypes for Test 6

Results of Test 6

In this test, the total of answers is 22, but still only 21 participants were tested. The higher number of answers results from the fact that Participant 6, was indifferent between the two answers B and C. Since she was not willing to decide for one prototype both answers were counted.

Test 6	**A**	**B**	**C**	**indifferent**
Absolute	2	5	13	2
Percentage	9.091 %	22.727 %	59.091%	9.091%

Table 6.8: Results of Test 6

Participant 6 stated *"also 6A gefällt mir gar nicht ... diese nackte Frau finde ich unseriös, nicht ernsthaft medizinisch ... bei den anderen ist es egal"*.

Five participants chose prototype B with an operation scene. Participant 2 explained *"weil man eine Operation sieht und ich ihnen dann glaub, dass die's wissen"*

Participant 15 picked prototype C and stated *"naja ein OP-Bild muss wirklich nicht sein .. da ist 6C medizinisch einfach wertvoller"*. Also Participant 4 trusted the prototype C. She said *"weils wie in einem medizinischen Fachbuch aussieht"*. Participant 13 explained her choice with *"in dem Fall 6C wegen der Grafik ... die Bilder sind nämlich das Logo für den Text"*.

Only two participants preferred the prototype A. One of them, Participant 16 justified his choice with *"naja wahrscheinlich weil der Busen hübscher ist als der ... es ist freundlicher ... die Brust im Mittelpunkt hat ziemlich angezogen"*.

The majority of the participants 59.091 % preferred the prototype C with a infographic. 22.727 % would trust the prototype B and each 9.091 % chose prototype A or were indifferent.

6.4 Provided Sources

Since sources provide the origin of the information, they are seen as an important aspect in quality evaluation of users concerning medical context. Not only the influence of the displayed sources was tested, but also the type of sources.

6.4.1 Test 7 - Sources

Concerning the sources of the information, users said that it is important for them that the websites provide sources. This was confirmed during the eye tracking, where most users looked at the sources if they were placed under the text but did not explicitly search for them.

This observation lead to the hypothesis that

Hypothesis 7: "A content that provides information about the sources, is rated a higher quality than a website without sources."

which was evaluated in Test 7. In Test 7 the two prototypes showed content with sources and content without sources.

Figure 6.11: Prototypes for Test 7

Results of Test 7

9 out of 21 participants, were indifferent between the prototypes. Many of them did not notice any difference and if they saw it, some did not care, like Participant 10 who said *"da ist eine Zeile mehr geschrieben ... wenn ich sowas am Computer hab, geh ich gleich weiter, weil sie eh gleich sind"*.

The majority, 38.095 % of the participants, preferred the prototype which showed sources. Participant 15 stated *"gleicher Text, nur stehen da Quellen dabei, Quellen schaden nie"*.

But still, 19.048 % of the participants chose the prototype without sources. Participant 16 explained his choice *"das ist kürzer und die Quellenangaben interessieren mich nicht"*.

The following table shows the number of participants who selected prototype A or B or were indifferent.

Test 7	A	B	indifferent
Absolute	8	4	9
Percentage	38.095 %	19.048 %	42.857 %

Table 6.9: Results of Test 7

In most tests, participants picked the prototype which showed information about the sources. Still 42.857 % did not care about the sources which does not correspond to the outcome of the interviews and eye tracking.

6.4.2 Test 8 - Type of Sources

When asked about the type of sources, most users made clear that sources from an institution or federal ministry improve the quality impression. For the statement that

Hypothesis 8: "Reliable sources lead to a higher quality impression than dubious ones."

Test 8 was designed. One prototype of Test 8 included sources such as medical literature and a link to the professional association of pediatricians. The second prototype showed two links to an online forum.

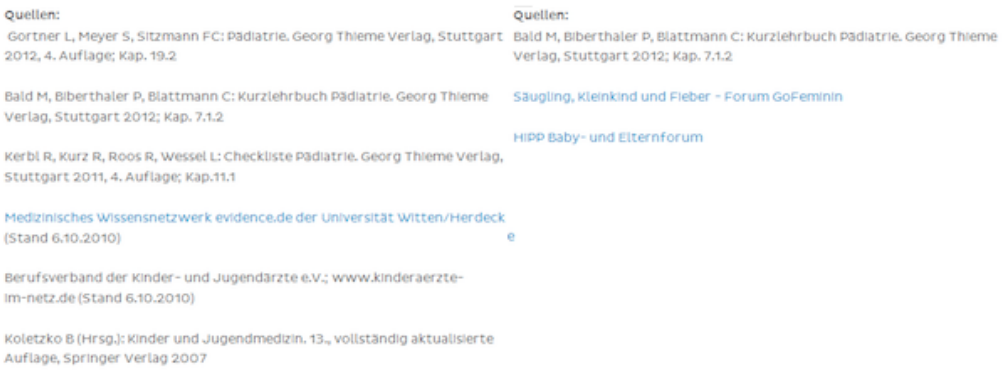

Figure 6.12: Prototypes for Test 8

Results of Test 8

6 out of the 21 participants were indifferent between the prototypes. Participant 10 said *"das ist schwierig ... ja das ist mir egal, da müsste ich beides lesen damit ich dann vielleicht einen kleinen Unterschied finde"*.

The absolute and relative amount of participants and their choices are shown in the table.

Test 8	A	B	indifferent
Absolute	13	2	6
Percentage	61.905 %	9.524 %	28.571 %

Table 6.10: Results of Test 8

61.905 % of the participants, chose prototype A which showed reputable sources. But some of those participants did not base their decision on the reputation of the sources. Instead Participant 19 said *"spontaner Eindruck nach der rechten Sidebar"*. But some participants also explained their choice based on the sources. Participant 2 said *"weil Quellen da sind, B hat weniger Quellen"*. And Participant 4 stated that *"wegen der Quellen ... weil mehr Quellen dabei sind"*.

The only two participants which chose prototype B did not give an explanation.

6.5 Author Information

Concerning the influence of author information, several sub aspects were tested. At first the influence of the displayed author information. Those aspects were the influence of pictures, the specialization and the academic grade of the author.

6.5.1 Test 9 - Author Information

Author information seems to influence the quality rating of the participants. Websites where the author information was visible, were often rated higher than others and also participants said that the information about the author is an important sign of quality. It seems that

Hypothesis 9: "If the author of the content is visible, the content is associated with a higher quality."

This hypothesis was checked in Test 9 where one prototype included author information. The second prototype did not show the author.

Figure 6.13: Prototypes for Test 9

Results of Test 9

The number of participants who choose prototype A or B or were indifferent are presented in the following table.

Test 9	A	B	indifferent
Absolute	8	3	10
Percentage	38.095 %	14.286%	47.619 %

Table 6.11: Results of Test 9

About half of the participants did not notice a difference on the prototypes or were not influenced by the information about the author. Participant 18 noticed the author but stated *"hier ist der netdoktor Experte mit Foto aufgelistet, aber ob der da draufsteht oder nicht ist mir ehrlich gesagt egal"*.

Participant 1 with a medical background was indifferent but he said that he would not trust any of the prototypes because *"weil Angina nicht Herzenge heißt"*.

Other participants did prefere the prototype with the author information. For example Participant 19 said *"9A - ich kann auf den ersten Blick den Experten und sein Gesicht erkennen"* and Participant 14 explained her choice with *"und eigentlich nur weil da ein Experte dabei steht"*. Participant 11 said *"9A fällt mir auf. Sie haben da den Experten mit Bild angegeben, so würde ich sagen, dieser Text wirkt vertrauenserweckender ... da ist nicht gesagt dass er richtig ist, aber er wirkt vertrauenserweckend weil da sehe ich den Mann dort und auch seinen Titel oben stehen ..."*.

Participant 16 picked the prototype without author information because *"ich glaub es ist weniger ... nicht so überladen"*.

6.5.2 Test 10 - Picture of the Author

During the eye tracking, the majority of the participants looked at the author information if it included a picture. This observation lead to the hypothesis that

Hypothesis 10: "The picture of the author influences the quality impression."

To evaluate this statement, Test 10 was created. It included a prototype with a portrait picture of the author. The second prototype with a doctor wearing a white coat. The third prototype did not show a picture of an author.

Figure 6.14: Prototypes for Test 10

Results of Test 10

The following table shows the absolute number of participants for each prototype.

Test 10	A	B	C	indifferent
Absolute	4	9	2	6
Percentage	19.048 %	42.857 %	9.524 %	28.571 %

Table 6.12: Results of Test 10

The majority of the participants preferred the prototype with the picture that showed a doctor in a white coat. Participant 3 explained *"weil da kein Hollywood Schönling ist"*. Participant 4 said *"weil der professioneller rüberkommt, A sieht aus wie ein Schönheitschirurg"* and Participant 7 stated *"das ist auch minimal. Wenn ich einem den Vorzug gebe, dann 10B und eigentlich liegt es nur daran dass der da mehr nach einem Arzt aussieht als der da oben"*.

Participant 11 explained his choice with *" ... sonst sind sie ja wirklich ganz ähnlich, nur dass zweimal der Arzt erscheint und einmal nicht und jetzt ist natürlich die Frage welche Bilder soll man beim Arzt hineinstellen? ... Wer ist für mich vertrauenserweckender? Ich würde sagen der 10B mit weißem Kittel und Stethoskop schaut wie ein Arzt aus ... ich würde nicht sagen das der Andere ein schlechterer Arzt ist vielleicht ist er sogar besser ... aber man geht ja auch auf den optischen Eindruck ... wenn ich mir jetzt aussuche zu welchem Arzt würde ich gehen ... würde ich eher zum 10B gehen als zum 10A ..."*.

Participant 15 said *"ah da ist nur ein schönerer, jüngerer ... was hilft mir ein Bruce Willis wenn er nicht viel Ahnung hat"*.

Participant 10 who picked the prototype with the portrait picture explained the choice with *"da ist mir A lieber ... weil ich den Arzt besser sehe"* and Participant 19 also preferred the portrait because *"der größere Bildausschnitt beim Expertenfoto"*.

6.5.3 Test 11 - Field of the Author

In the interviews, most of the participants stated that if the specialization of the author matched the topic of the content, it improves the quality impression. To Test whether the hypothesis

Hypothesis 11: "If the author is seen as a specialist in the field the quality evaluation is higher."

is true, the author information in one prototype was manipulated. Test 11 included one prototype with a matching specialization to the topic covered in the content. The other prototype showed the wrong specialization.

Figure 6.15: Prototypes for Test 11

Results of Test 11

The absolute number of the choices of the participants can be seen in the following table.

Test 11	A	B	indifferent
Absolute	3	0	18
Percentage	14.286 %	0 %	85.714 %

Table 6.13: Results of Test 11

In this test, most participants were indifferent because they did not notice the difference. Most of them were more focused on the other elements of the design and did not read the information about the author.

The ones who did notice, preferred the author with a matching specialization. Participant 2 said *"weil es um Herzenge geht und mir da der Kardiologe lieber ist"* and Participant 11 stated *"... also beim Bild ist da einmal ein Kardiologe, was natürlich für Angina Pectoris passt ... aber das zweite Mal ein Haut- und Geschlechtskrankheiten ... würde ich wohl nicht zu ihm gehen wenn ich Herzschmerzen habe"*.

6.5.4 Test 12 - Academic Grad of Author

Beside the specialization, also the academic grade of the author could influence the quality rating. Even though there was no clear outcome of the interviews or eye tracking concerning this issue, the following hypothesis was formulated to be tested with prototypes in Test 12:

Hypothesis 12: "If the author has a academic grade the quality is rated higher."

In the first prototype, the displayed expert was an university professor. The second prototype showed the same author with a doctor degree.

Figure 6.16: Prototypes for Test 12

Results of Test 12

Like in Test 11, most participants did not notice a difference because they did not notice the additional information about the author and the picture was the same for both prototypes.

Participant 11 saw the difference but still was indifferent and he stated *"... wahrscheinlich wenn er seinen ganzen Titel hin gibt, werden mehr Leute zu ihm strömen ... mir wäre es egal ... ich weiß, wer aller Universitätsprofessor ist ... wenn dort stehen würde Dozent oder Assistent würde ich zu dem gehen weil der zumindest bei einer Operation mehr Praxis hat ... das würde eher den Ausschlag geben, warum ich zu einem Untergeordneten gehen würde ... aber ich bin überzeugt, dass der Titel eine große Rolle spielt, man braucht ja nur im 9. Bezirk durch die Straßen gehen, dann steht für jeden Arzt so ein Titel drinnen ..."*.

Also Participant 15 explained *"nur weil der Uni-Prof heißt, heißt nur dass er an der Uni Wissen weitergibt das vielleicht schon alt ist, die haben vielleicht sogar weniger Praxis, da helfen die Titel nicht wirklich was"*.

Participant 2 preferred the prototype with an author with a higher academic grade and said *"weil es ein Uni-Prof ist"* and Participant 3 also chose prototype A because *"der hat mehr Titel"*. Participant 19 also prefered the author with a longer title and stated *"hier fällt mir auf das der Titel länger ist, dem Uni-Prof vertraue ich mehr"*.

The choices of the participants can be seen in the following table.

Test 12	**A**	**B**	**indifferent**
Absolute	3	0	18
Percentage	14.286 %	0 %	85.714 %

Table 6.14: Results of Test 12

6.6 Publishing Date

The publishing date gives the user information about the up-to-dateness of the content. This might be an important aspect in quality evaluation especially in medical context.

6.6.1 Test 13 - Publishing Date

The publishing date seems to influence the quality evaluation, especially if the users have knowledge about the topic. But in most cases of the sample used in the eye tracking, the date was not placed very prominent on the websites. This lead to the hypothesis that

Hypothesis 13: "Websites, which show a publishing date, have a higher quality rating than those, which do not show a publishing date."

In test 13 this was evaluated with two prototypes. One prototype did not display a publishing date and the other prototype showed March 2014 as a publishing date.

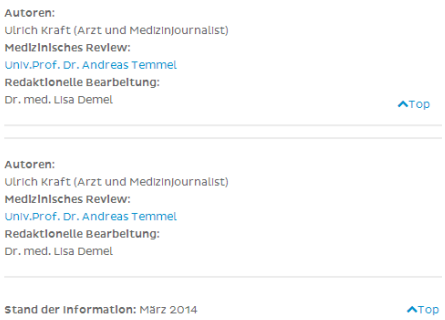

Figure 6.17: Prototypes for Test 13

Results for Test 13

The table shows the absolute and relative number of participants and their choices in Test 13.

Test 13	A	B	indifferent
Absolute	1	7	13
Percentage	4.762 %	33.333 %	61.905 %

Table 6.15: Results of Test 13

Most participants in this case did not notice a difference in the prototypes. Participant 11 did not see a difference in the beginning and was therefore indifferent but afterwards he requested an advice. When the publishing date was pointed out to him, he stated *"mhm ja das ist natürlich schon interessant wann das hineingestellt wurde "*.

Only one participant chose the prototype without a publishing date but did not state why.

The participants that saw the publishing date on one prototype also referred to it when explaining their choice. Participant 7 said *"wenn ein bisschen, dann 13B weil ich gleich gesehen hab was der Letztstand der Information ist"*.

6.6.2 Test 14 - Freshness of Content

If users looked for the publishing date during the eye tracking, it was important for them that the content was up to date. One participant even degraded the quality after checking the publishing date. The hypothesis that

Hypothesis 14: "Content with a publishing date close to today is evaluated a higher quality than an old date."

was derived from that observation. It was checked in Test 14 where one publishing date was from 2014 and the other prototype was from 2005.

Figure 6.18: Prototypes for Test 14

Results for Test 14

The absolute number of participants choosing each prototype can be seen in the following table.

Test 14	A	B	indifferent
Absolute	6	2	13
Percentage	28.571 %	9.524 %	61.905 %

Table 6.16: Results of Test 14

As in the test before, most participants were indifferent between the prototypes because they did not notice the different publishing dates.

Participant 1 did see the different dates but said *"bei der Erkrankung ist mir das Datum egal ... nur interessant bei Zahlen"*. Participant 11 also recognized the difference but was not influenced by the publishing dates, he explained *"... die Ausdrucksweise ändert sich da sollte man schon moderner und angepasst sein ... aber ich würde sagen bei Rachenentzündungen ist das ziemlich gleich weil die haben sich nicht anders entzündet seit 2005 "*.

Those participants who did notice the difference also referred to it when they said they would trust prototype A more.

6.7 Advertisement

Most websites do show advertisement, this is also true for websites with medical context. Different hypotheses were formulated and prototypes designed to test under which conditions and to which extend advertisement influences the quality assesment.

6.7.1 Test 15 - Advertisement

Nearly all participants made clear that advertisement is leading to a worse quality impression of the website. This findings lead to the hypothesis that

Hypothesis 15: "Advertisement leads to a worse quality impression."

This hypothesis was evaluated with Test 15 where prototypes were designed with

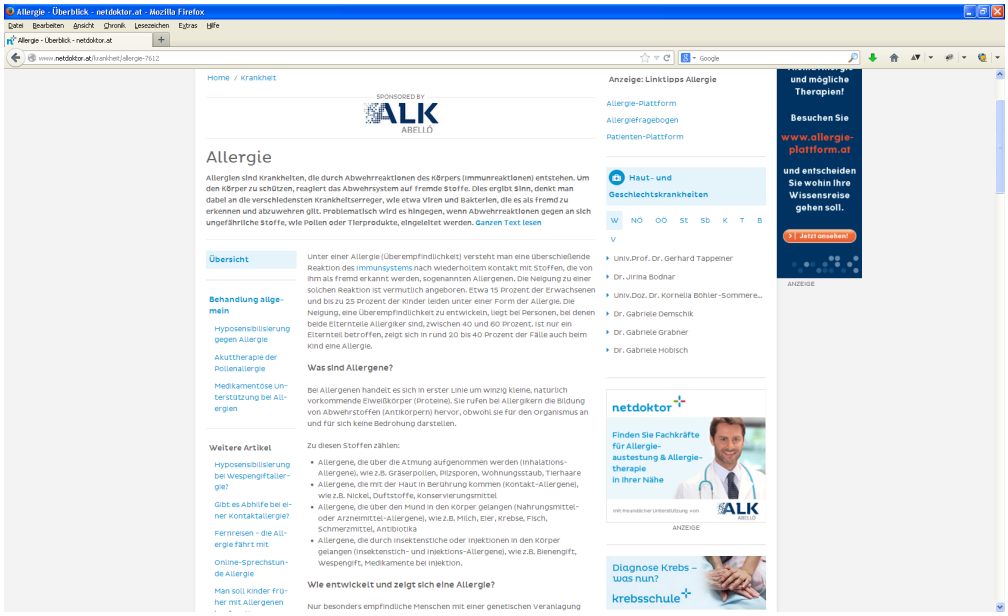

Figure 6.19: Prototype 15A - with advertisement

and without advertisement.

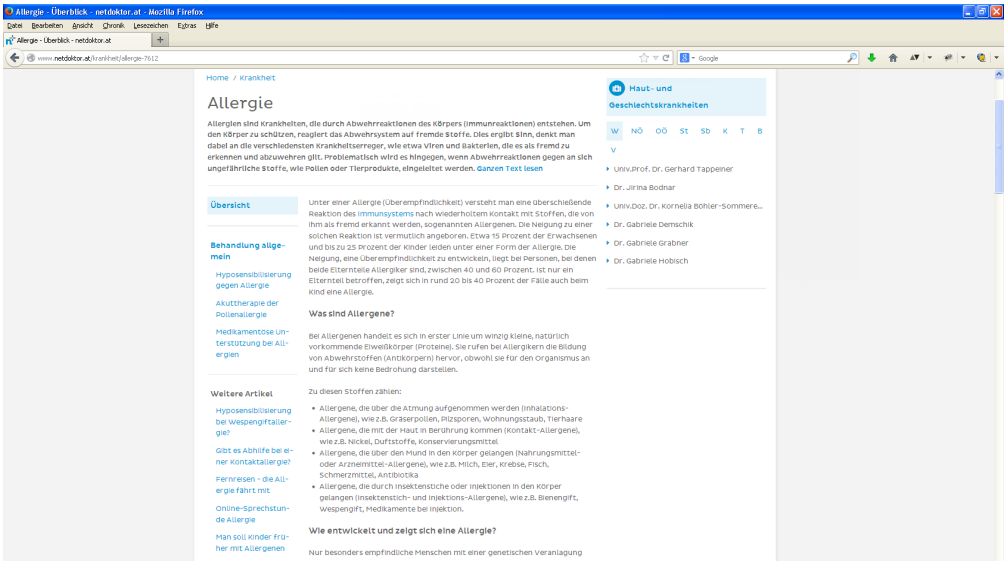

Figure 6.20: Prototype 15B - without advertisement

Results of Test 15

The table shows the absolute and relative number of participant's choices for each prototype.

Test 15	A	B	indifferent
Absolute	5	10	6
Percentage	23.810 %	47.619 %	28.751 %

Table 6.17: Results of Test 15

Participant 4 was indifferent, she said *"... eigentlich würd ich B nehmen, weil das nicht soviel Werbung ist ... aber trotzdem find ich das gut mit den Fachkräfte finden ... eigentlich egal"*. Participant 15 stated *"... sympatischer finde ich die ohne die Krebs-Anzeige ... man muss nicht immer mit grauslichen Krankheiten konfrontiert sein"*.

Several other participants also did not choose one prototype, but most of them did not explain their choices.

Most of the participants preferred prototoype B without advertisement and also referred to this as the main reason for their decision. Participant 14 said *"15A ist überladen und ich mag keine Werbungen ... das wäre so, als würden sie von jemanden gesponsert sein und mir nicht einfach die Wahrheit sagen wollen"*. Participant 11 also chose the prototype without advertisement and he said *"... also die Anzeige ist für mich zu wenig hervorgehoben, dass es wirklich eine Anzeige ist, man würde annehmen es gehört da dazu und ich würde das also ungeschaut anklicken "*.

Participant 7 stated *"also das ist jetzt interessant wenn ich nicht gelesen hätte 'sponsored by' ... am Anfang gedacht es ist ein Logo, da hätte es mir besser gefallen aber wenn ich sehe 'sponsored by' dann ... da wirkt das ein bisschen seriöser aber ob deshalb das Vertrauen größer ist "*.

Some participants picked the prototype which contained advertisement. Participant 13 explained *"auch wenn es Ablenkung ist, aber es ist angenehm fürs Auge wenn Bilder auf der Seite sind, also 15A"* and also Participant 10 preferred the prototype with advertisement, and said *"da könnte sein, dass mir das besser gefällt ... ja das A gefällt mir besser ... irgendwie ansprecheneder von der Optik her"*

6.7.2 Test 16 - Placement of Advertisement

Some participants even mentioned that if advertisement breaks the content, their quality impression is very low. This statement could not be tested during the eye tracking, since there were no adverts placed in the content. Therefore the following hypothesis was formulated:

Hypothesis 16: "The quality rating is less for websites where advertisement breaks the content."

Test 16 included one prototype were the advertisement was placed on the right side and on top.

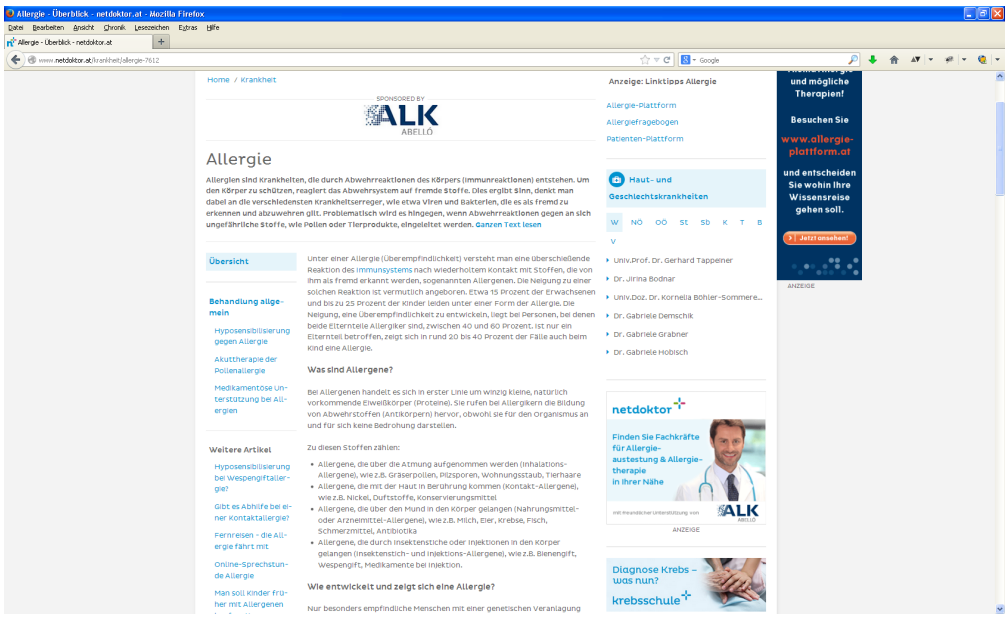

Figure 6.21: Prototype 16A - advertisement placed on top

In the other prototype the advertisement was placed in the content.

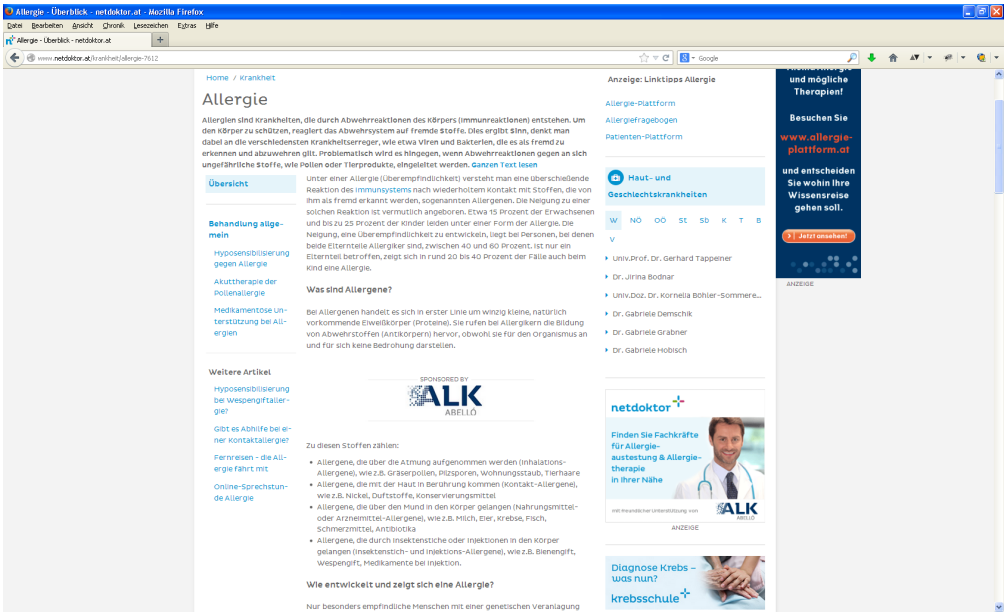

Figure 6.22: Prototype 16B - advertisement placed in content

Results of Test 16

The results for Test 16 were clear. 14 out of 21 participants did prefere the prototype where the advertisement was shown on top. This can also be seen in the table with the absolute numbers of participants for each prototype.

Test 16	A	B	indifferent
Absolute	14	1	6
Percentage	66.667 %	4.762 %	28.571 %

Table 6.18: Results of Test 16

Participant 2 stated *"weil der Sponsor nicht mitten im Text steht"*. Also Participant 7 explained his choich with *"so mittendrinnen stört mich das, wenn der Sponsor mitten im Text ist"*. Participant 15 also picked the prototype with advertisement on top and stated *"das schaut viel strukturierter aus dadurch dass der Banner oben ist und dann der Artikel kommt und da zerreißt er den Artikel, das sieht unprofessionell aus"*.

Only one, Participant 19, preferred the prototype B because *"... die Seite nicht mit dem Sponsorship überschrieben ist"*.

The other participants who were indifferent mainly did not explain their choice.

6.7.3 Test 17 - Topic of the Advertisement

During the quality evaluation, most users did not rate websites with advertisement for medical products or topics lower than other websites. But they assessed websites with advertisement that did not fit the topic with a lower quality. This finding lead to the hypothesis that

Hypothesis 17: "Advertisement related to the topic is not considered as bad as general advertising."

To check whether this hypothesis holds, Test 17 was developed. The prototypes had different topics of advertisement. The first prototype showed an ebay advertisement.

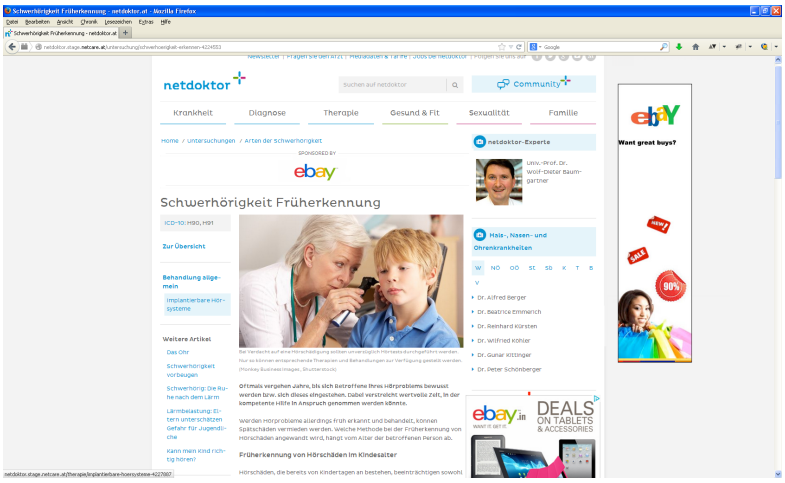

Figure 6.23: Prototype 17A - ebay advertisement

The second prototype was branded with Olixia eyedrops as a health related topic.

Figure 6.24: Prototype 17B - health related product advertisement

The third prototype showed a Hartlauer advertisement, which is connected with the topic of the content.

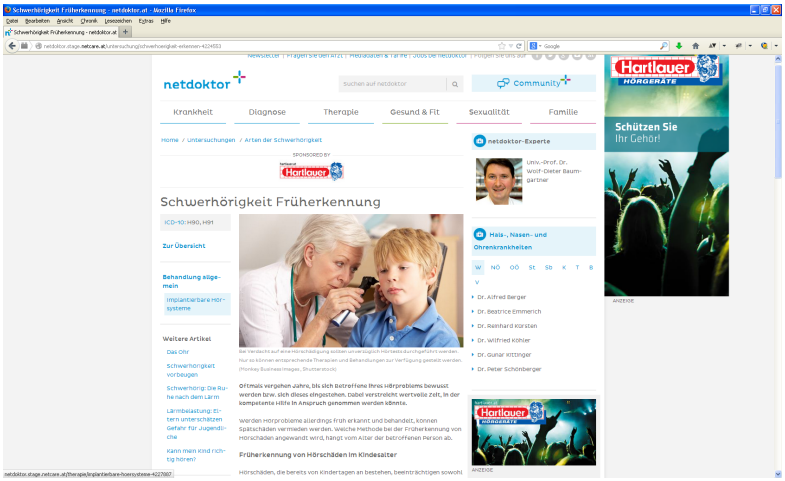

Figure 6.25: Prototype 17C - advertisement matching the topic

Results of Test 17

In this test, one participant was not willing to decide between two prototypes, therefore the absolute number of votes is 22, because in the case of Participant 7, both prototypes B and C were counted. The absolute an relative numbers can be seen in the following table.

Test 17	A	B	C	indifferent
Absolute	0	17	3	2
Percentage	0 %	77.273 %	13.636 %	9.091 %

Table 6.19: Results of Test 17

He said *"ebay auf der netdoktor ... na der Hartlauer auch ... wobei es geht um Hörgeräte ... ich weiß, dass die Hörgeräte machen aber mir gefällt es nicht ... ebay geht gar nicht, die anderen Sachen sind mit Bezug ... vom optischen her würde mir B mehr zusagen, ist weniger auffällig, da würde ich mich mehr auf den Text konzentrieren"*.

The majority of participants chose the prototype B with an advertisement for eye drops. As many others, Participant 1 explained his choice for prototype B with the better fitting design of the advertisement in the websites design. He said *"eigentlich egal wofür man Werbung macht aber B passt ins Design"*. Also Participant 6 explained her choice with the more decent colors of the advertisement *"weil die Werbung da am dezenesten ist, das andere ist mir so extrem bunt - so eindeutig erkennbare bunte Werbung mag ich nicht"*.

Some other participants stated that B looks more medical. Participant 4 said *"ich würd eher das nehmen weil der Sponsor etwas mit Medizin zu tun hat oder vielleicht mit dem Thema zusammenpasst, das hier behandelt wird"*. Participant 18 stated that she would prefer advertisement with a medical context and therefore picked prototype B.

Participant 11 explained his choice for prototype B with the better matching of the subject of the content, which is acctually true for Hartlauer and prototype C. He asked for information what Olixia is and then stated *"... also würde ich das am ehersten akzeptieren wenn die als Sponsor erscheinen ... was Hartlauer da macht ... grad bei Schwerhörigkeit ... ich weiß er macht Reklame für seine Hörgeräte .. gefällt mir nicht so sehr und ebay überhaupt nicht ... ich finde man müsste schon die Sponsoren zum Thema gehörig und nicht dass ich irgendwo wen krieg, der was gezahlt hat"*.

As one of the few participants which chose prototype C, Participant 13 explained *"die Werbung lenkt ab ... aber wenn ich mich schon für Werbung entscheide ... Schwerhörige Früherkennung ... Hartlauer ... das hat nichts mit Ohren zu tun"* and asked what Olixia is. After being told that the product are eye drops, she decided that she would trust the prototype C more. Also Participant 10 preferred the prototype C and stated *"die Werbung vom ebay brauch ich nicht, da ist die Hartlauer, Olixia das ist ja so Ohrentropfen .. nein Augentropfen .. die hab ich schonmal gehabt, die mag ich nicht ... aber gut, da kann die Seite ja nichts dafür ... aber der Hartlauer macht glaube ich Gehörproben ... also C ... ich muss ja was haben davon ... ich brauch ja keine Augentropfen wenn ich schlecht höre"*.

6.8 Spelling mistakes and grammatical errors

Especially in content where the quality is important, like in medical context, one can assume that mistakes like typos, grammatical errors or also spelling mistakes will lead to a bad impression.

6.8.1 Test 18 - Spelling Misakes

In the follow-up interview, all participants said that spelling mistakes lead to a bad quality impression but very few participants actually read the text on the websites. It seems clear that if participants would focus more on reading then

Hypothesis 18: "Spelling mistakes and other errors decline the quality."

To evaluate this statement, Test 18 was created. The first prototype did not contain any errors.

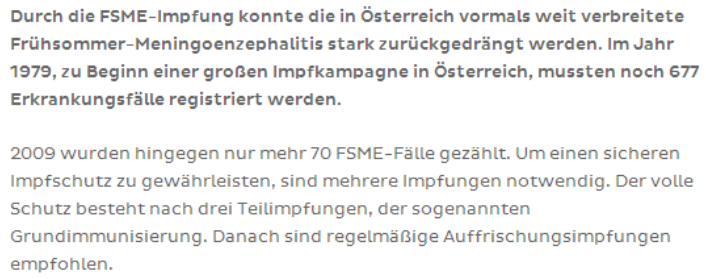

Figure 6.26: Prototype 18A - no errors

In prototype 18B small typos and spelling errors were add to the prototype.

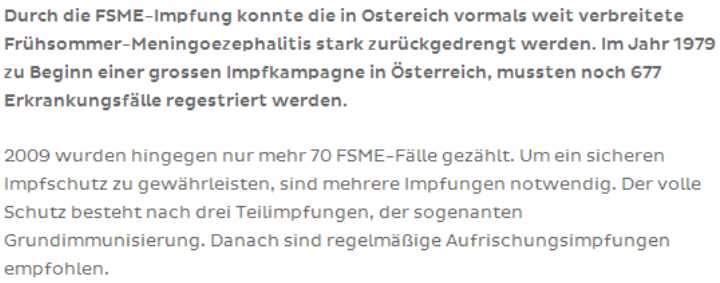

Figure 6.27: Prototype 18B - typos and spelling mistakes

Results of Test 18

The following table shows the absolute and relative numbers of the choices of the participants.

Test 18	A	B	indifferent
Absolute	9	6	6
Percentage	42.857 %	28.571 %	28.571%

Table 6.20: Results of Test 18

During Test 18, not one of the participants noticed the spelling mistakes. Even after telling some participants to read the first paragraph, they did not see any errors. After reading through the text and an extra hint to the mistakes Participant 10 said *"Buchstaben lese ich nicht, ich lese nur ganze Wörter ... Tippfehler les ich nicht"*.

The reasons for the choices the participants made varied a lot and will not be explained in detail because none is related to the actual purpose of this test.

6.9 Structure of the Text

A well structured text makes the content easy to read. Participants stated that this has a positive influence on their quality evaluation. The influence of structure and headlines were tested with seperate prototypes.

6.9.1 Test 19 - Structure of the Text

The structure of the text was considered important by most of the participants. They stated that a good structure is directly influencing their quality assessment. Therefore the hypothesis

Hypothesis 19: "A clear segmentation of the content leads to a higher quality impression."

was formulated. Test 19 included three prototypes. The first prototype had two levels of hierarchy. The second prototype did not have any structure in the content at all. The third prototype was showing a one level structure.

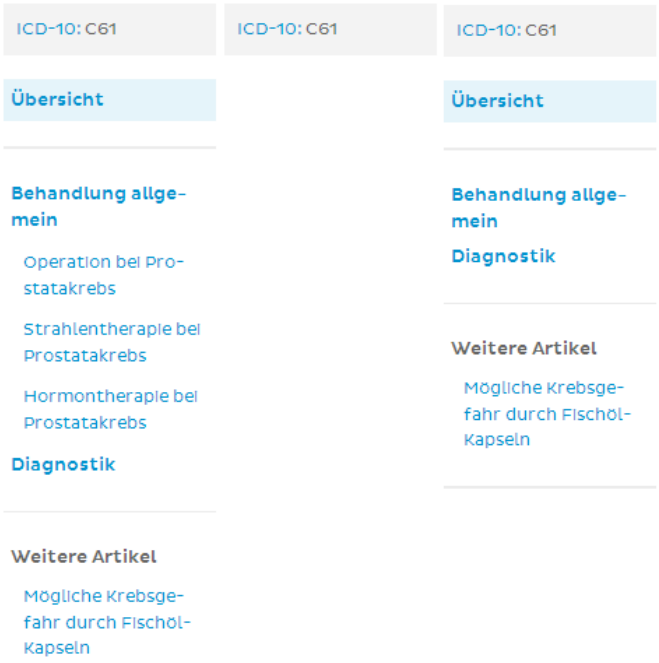

Figure 6.28: Prototypes for Test 19

Results of Test 19

During Test 19, Participant 17 was indifferent between prototype A and C and therefore both were counted and the overall number of votes is 22. The numbers can be seen in following table.

Test 19	A	B	C	indifferent
Absolute	14	0	1	7
Percentage	63.636 %	0 %	4.545 %	31.818 %

Table 6.21: Results of Test 19

Participant 17 explained *"B auf keinen Fall aber A und C gleich, weil die für mich relativ ähnlich sind und zusätzlich die Möglichkeit haben, dass man den Beitrag oder Artikel dazu nehmen kann, sonst sind sie optisch relativ gleich die beiden Seiten"*.

Beside that most participants picked prototype A. Participant 3 said *"weil es detailliert ist, wirkt besser wenn ich mich orientieren kann, wo ich bin"*. And also Participant 7 stated *"mir taugen A und C mehr weil von der Navigation bisschen übersichtlich , das fehlt mir da komplett, da ist schon relativ viel Behandlung, allgemein Diagnostik ... da finde ich fast A besser weils strukturierter ist"*.

Participant 11 explained his choice very detailed *"... 19A hat mehr Links allerdings da stehen bei der Seite auch weitere Artikel und wenn ich über Prostatakrebs lese und dann mögliche Krebsgefahr durch Fischkapseln ... was soll das"*. To get a more precice answer, he was asked to rate the prototypes again while ignoring this section. He then stated *"... dann würde mir trotzdem A besser gefallen weil es mehr Links hat ... ob die Links alle vernünftig sind .. weil da hab ich Behandlung allgemein und da auch ... hier haben sie die Unterlinks angegeben, das heißt ich kann es gleich anklicken, wenn ich wollte ... also 19A weil ein bisschen mehr Informationen"*.

Some participants chose prototype A because they thought the information is not available on the others. Participant 15 said *"weils da was gibt und dort nicht ... mehr Information ... schön gegliedert"*.

Those participants that were indifferent between all prototypes mostly did not see a difference. Participant 10 even said *"das Wichtigste in einer Minute, das haben die alle ... die Optik ist eigentlich gleich ... ist mir egal"*.

6.9.2 Test 20 - Headlines

During the eye tracking many of the users scrolled a lot and only look at the headline provided. This observation caused the hypothesis that

Hypothesis 20: "A good structure of the text and usage of headlines enhances the quality."

This was evaluated in Test 20 with different intensity of using paragraphs and headlines. The first prototype did not show any headlines or breaks. Different Headlines and lists were used in the second prototype. In the third prototype only one type of headlines was used.

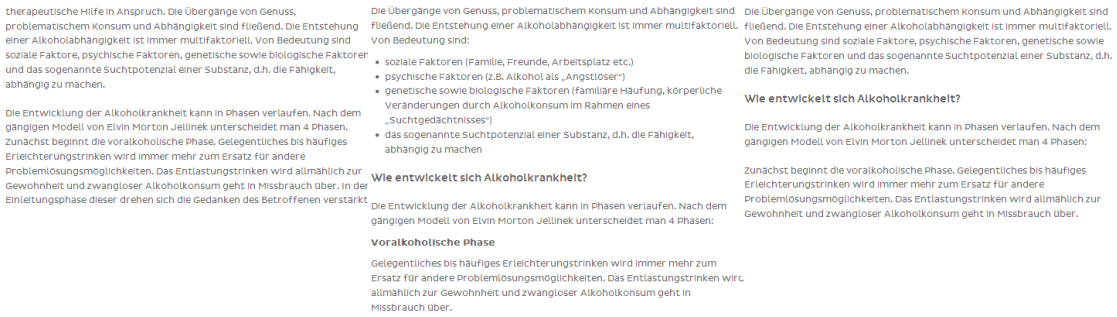

Figure 6.29: Prototypes for Test 20

Results of Test 20

The following table shows the absolute and relative number of choices of the participants during Test 20. The majority of participants chose prototype B with a different headlines and lists. Most

Test 20	A	B	C	indifferent
Absolute	0	13	1	7
Percentage	0 %	61.905 %	4.762 %	33.333 %

Table 6.22: Results of Test 20

referred to this aspect as the reason for their choice. Participant 3 said *"leichter zu lesen durch die Aufzählungspunkte"* and also Participant 7 stated *"da ist viel Text, da geht A gar nicht weil keine Überschriften, Absätze, Sonstiges, ich hab es nicht gelesen aber da gefällt mir B mehr, weil super strukturiert schon beim ersten Hinschauen"*.

The one participant that picked prototype C did not explain her choice. Out of those participants who were indifferent, only one explained why. Participant 4 said *"also von der Übersicht ist B besser aber wenn es ums 'vertrauenswürdig' geht würde ich alle drei nehmen"*.

6.10 Usage of Technical Terms

Especially in medical context, technical terms might be used to create a feeling of knowledge and high quality. But it is questionable whether the usage of technical terms really influences the quality assessment of the users.

6.10.1 Test 21 - Technical Terms

Concerning the influence of technical terms most participants stated that the usage of medical terms has a little influence on the quality. But they also mentioned that if the text includes medical terms, they should be explained and not used too extensive. This statement lead to the hypothesis that

Hypothesis 21: "The usage of technical terms provides the impression of higher quality."

In Test 21 one prototype was designed with the word "Grippe" during the whole text. In the other prototype it was substituted with the medical term "Influenza".

Figure 6.30: Prototypes for Test 21

Results of Test 21

The absolute number of participants who choose which prototype are shown in the following table.

Test 21	A	B	indifferent
Absolute	9	5	7
Percentage	42.857 %	23.810 %	33.333 %

Table 6.23: Results of Test 21

Most participants picked the prototype without a technical term and some of them referred that the non-technical term is easier to understand. Participant 3 said *"weil es verständlicher wirkt"* and Participant 11 explained *"... das Einzige was ich herausfinde ist die Überschrift ... das eine ist Grippe und das andere Influenza ... und Grippe kennt jeder, unter Influenza werden sich viele Leute nichts vorstellen ... auch wenn ich ins Internet gehe, würde ich nicht Influenza eintippen sondern Grippe"*. Also Participant 17 chose prototype A without a technical term an stated *"weil es jetzt für die Allgemeinheit auf Deutsch leichter zu verstehen ist als mit dem Fachbegriff"*.

Five participants picked the prototype with the technical term. Participant 2 said *"weil lateinisches Wort und das kommt professioneller rüber wenn es um was Medizinisches geht"*. Participant 7 explained his choice with *"... ah Influenza und Grippe weil ich ja nicht aktiv gesucht habe - jetzt nur welchen Eindruck hat es optisch - bei dem ruhigeren rund herum fühle ich mich weniger abgelenkt - und ich glaube Influenza ist gängig genug"*.

Out of the participants who were indifferent, only one explained why. Participant 15 said *"ist mit komplett egal, Grippe ist umgangsprachlich, nur weil da Influenza steht, aber das Wort ist grauslich, Influenza wirkt so negativ"*.

6.11 Quality Seals

All participants said that they did not know any quality seals for medical information. Since those quality seals are often not seen by the users, the influence could be doubtful. During the eye tracking, only one participant took a short look at the quality seal placed at the bottom of a website.

6.11.1 Test 22 - Quality Seals

The question is, whether quality seals would affect the quality evaluation if they were placed more prominent. The hypothesis

Hypothesis 22: "Quality seals improve the impression of a website if they are placed prominent."

was formulated to evaluate this. The prototypes the Test 22 concerning this statement were designed with a high focus on the quality seals. The first prototype included the HON Code. The second prototype did not show any quality seals and in the third prototype, different quality seals were included. Those quality seals did not have any specific medical context.

Figure 6.31: Prototypes for Test 22

Results of Test 22

In this test, Participant 10 and Participant 18 were not willing to decide for one prototype, therefore both choices for prototype A and B are counted. The absolute and relative numbers can be seen in the following table.

Test 22	A	B	C	indifferent
Absolute	2	5	5	11
Percentage	8.696 %	21.739 %	21.739 %	47.826 %

Table 6.24: Results of Test 22

Participant 10 explained *"das stört mich im Blick ... die Siegel ... das GS stört mich im Blick ... C nicht aber A und B ist egal"*.

Five participants picked prototype C which showed many quality seals. They also explained their choice based on the quality seals. Participant 2 said *"weil die meisten Zertifikate drauf sind"* and Participant 4 explained that for her the quality seals implicated a higher level of security. Participant 5 stated *"... schaut aus, als wären das irgendwelche Awards"*.

From the participants who were indifferent, many did not explain their decision or related to something else then the quality seals. Participant 15 said *"schon wieder Diagnose Krebs ... ich sag egal, weil bei allen diese Facebook Gesichter sind und die haben auf einer netdoktor Seite nichts zu suchen ... ich informier mich zwar nur, aber irgendwelche Avatare, finde ich, haben nichts zu suchen"*.

One, Participant 7, was not sure whether the quality seals make the website more trustworthy. He stated *"also das ist total überladen bei allen ... da ist das ein Gütesiegel ... also wenn ich weiß, dass es ein Gütesiegel für die Seite steht und ist vertrauenserweckend, aber ich weiß nicht ob es das ist, also kann ich es nicht sagen"*.

CHAPTER 7

Results

Quality is a very essential aspect in health related topics. Everybody can contribute to the Internet and users should not only rely on the ranking of search engines since studies show that search engines are not always perfect in finding the best quality websites [32, 113] and companies also know how they can influence the organic search rankings to a certain degree. Still the average health seeker relies on the medical information she finds online [92]. Beside this, studies also show that caregivers are very likely to search for questions on the Internet.

Most online health information seekers rate information they read on a computer screen a higher credibility than other media forms [18] but users also change the aspects which are important for them when it comes to deciding whether to trust a website or not. In 2005 the major factors beside the ease of use were the information about the source and the preparation by an expert [100].

7.1 Influence of Popularity & Brand

During the interviews in the empirical part many participants mentioned that they tend to trust a website which they are already familiar with. This behavior was also seen during the eye tracking. Content on a popular website was rated higher in average than others. In Test 1, three prototypes each from different brands covering the same topic were selected. Most participants selected the well known brand, prototype 1B. Some of them also stated that they know the website and therefore chose it, but some also explained their choice with the more professional looking design. Hypothesis 1 that users prefer websites and brands they already know, should be investigated in more detail by adapting the design of the websites to eliminate the influence. Beside this, it would be interesting to focus on the influence of the design of the website for different users because mainly the younger participants explained their choice with the design.

Many websites today use social media to reach more users and users also interact with websites among social media by sharing or liking content. Those interactions might also be seen

as a certain expression of trust by a user. The influence of social signals on quality assessment was evaluated in Test 2 with prototypes showing different amounts of social signals. Almost all participants did not notice a difference at all. This shows that the users are not influenced by recommendations of other users and therefore Hypothesis 2 can be seen as false. This might be based on the average age of the participants of 39.9 years and could be tested further with younger participants.

Another aspect that has the potential to influence the trust of users is the publisher or source of the content. A ministry of governmental instance is one of the highest authorities concerning trust. The reputation based on the domain was evaluated in Test 3 with a governmental domain. It was expected that there is no influence by it on the quality assessment of the users. This behavior was also seen in the eye tracking, where participants rated the governmental website lower than others. During the prototype test most participants actually chose the governmental domain, but none of them did notice that the website was operated by the health ministry.

Beside governmental domain also quality seals can provide the impression of an authority. Quality seals like the HON Code are certifying medical and health related content if they meet their quality standards. During the interviews in the empirical part, no participant knew the HON Code and only one participant actually took a short look at it during the eye tracking where it was placed on several of the sample websites. When participants were explicitly asked for the influence of quality seals on their quality evaulation, most said that they would assess websites that show such a seal a higher quality. The prototype test could not prove Hypothesis 22 that users have a higher quality impression of websites where a quality seal is placed prominent. Half of the users were indifferent, and the others did split equally between picking prototype B with no quality seals and prototype C with many quality seals. Still some of the participants who picked prototype C explained that their choice was based on the quality seals because they make the impression that the content ist trustworthy. As in the previous interviews, very few people knew the HON Code. In this test only two participants picked prototype A with the quality seal that really exists for health related content. This shows that quality seals would be a good starting point to ensure high quality but normal users do not recognize them which is a huge problem.

7.2 Influence of Design

It is known that users rely a lot on the design when it comes to quality evaluation of a website. Beside a professional design, users also look for sources, but they do not check the disclaimer or site notice [32]. This helps users to detect sales websites and more generally websites with poor quality very quickly but in medical context, sometimes the design does not meet the same quality standards as the content and it therefore might happen that users reject a website with high-quality content because of poor design [101]. Also the participants stated in the interivews that the design is an important aspect for their quality evaluation and some even said that they do rely on their gut feeling when they decide whether to trust a website or not. To evaluate how the

design influences the quality assessment, different tests were designed covering different aspects.

The first aspect of the design which was tested, was the navigation since participants rated websites with a simple and horizontal navigation higher in average than those with a vertical navigation which consisted of many elements during eye tracking. The two prototypes in Test 4 therefore showed the same content on the same website with two designs that also had a different navigation. Hypothesis 4 that a simple navigation with less elements influences the quality assessment of users in a positive way was not confirmed by the prototype test. Each prototype was chosen by about half of the participants. This shows that the influence of the navigation on quality assessment will have to be further investigated to get more significant results. Another issue concerning navigation which was tested, was the influence of the segmentation of the content. Most of the participants mentioned that a well-structured text directly influences their quality evaluation. The Hypothesis 19 that a clear segmentation of the content leads to a higher quality impression can be seen as true. In Test 19, most participants picked prototype A and explained their preference with the better overview they have due to the the navigation and that they can see where they currently are and what other content is available. Especially the last aspect seems to be important to users when it comes to quality assessment of medical content.

The second aspect concerning the design relates to the first impression. The first impression of a website is influencing the quality assessment of the users a lot [100] and pictures play a huge role in this first impression. During the empirical research, several participants mentioned that the design should not be loaded with pictures which might distract from the text. Hypothesis 5 that websites with more text are rated a higher quality, seem to be true to some point, but the tests also show that the usage of pictures does not influence the quality assessement to a high extent. Another factor concerning pictures is the value they add to the content and therefore prototypes were designed to test whether a website's quality rating is higher with an infographic rather than with a stockphoto. During Test 6 only two participants preferred the prototype with the stockphoto but the majority of the participants chose the prototype with an infographic and also stated that they prefer it because the picture adds information. This underlines Hypothesis 6 that a website is rated a higher quality if the picture adds value.

The third aspect that influences the design and especially the impression the user gets from a website is the structure of the text. Participants used to scroll a lot during eye tracking and often focused on headlines. This behavior led to Hypothesis 20 that the usage of headlines to get a good structure into the text which makes it easier to read also improves the quality assessment. During Test 20, most participants said that due to the headlines and lists, the content is much easier to read and picked the prototype which used different headlines. Only one participant distinguished between overview and trustworthiness. This showed that the hypothesis concerning the influence of structure on quality assessment is true.

Overall it can be said that many aspects need to be considered when it comes to the influence of design on the quality assessment. If pictures are used, they should add information to the content but if they do not, publishers should be careful not to overload the website with stock-

photos. Beside pictures, the text should be easy to read by using headlines and maybe also lists. Concerning the navigation it should be designed to show the user where he currently is and also which other content is available to improve the quality impression.

7.3 Influences of Sources and Date

Healthcare professionals are aware of the necessity of sources and most of them also receive their information from evidence-based sources of high quality. Derived from this, the first guidelines for high quality of literature for patients suggest that patient information should contain a list of sources. Beside the sources, those guidelines also require to show the date of the document issue [16, 61]. Also the EQIP scale addresses the need for identification data such as sources and date of revision [16]. Now-a-days many third party quality evaluations still consider the sources and the publishing date an important aspect. The HON Code demands the citation of the sources and a clear displayed date of last revision [108] and also the AFGIS criteria include the sources [41]. Beside the third party instruments, the participants said that they see sources as an important quality indicator. During eye tracking, participants confirmed this by looking at sources when they were displayed under the actual content but they did not search for sources.

In Test 7 concerning the influence of sources, still 8 out of 21 participants said they would trust the prototype with the sources and they also explained their choice because of the sources. But still 4 participants preferred the prototype without sources and some even said that the sources are not interesting for them. There seems to be a tendency that sources influence the quality assessment of users. But the Hypothesis 7 that sources do have a positive influence on quality evaluation should be tested with a larger sample to provide a more reliable result.

Another aspect of sources is their reputation. In the interviews participants stated that they would rate a website with a higher quality if the sources are trustworthy, like an institution or federal ministry. During Test prototype A shows six sources and prototype B only refers to three. Because of the different numbers of the sources the influence of the reputation of the sources would have to be further tested.

Since the date is also part of the criteria of third party evaluations, participants were also asked about this issue during the interviews and most of them said that they would not look for it, but if they see it, it might influence their quality assessment if the content is rather old. Afterwards in the eye tracking session, one user even changed her quality rating after seeing the publishing date. During the prototype tests the majority of the participants was not affected by the publishing date on the prototype. Nearly all participants noticing the publishing date said they would trust the prototype more with a publishing date. Maybe a larger sample would be needed to get significant results to show whether the hypothesis that a publishing date influences the quality rating in a positive way is true.

Also Test 13 and Test 14 concerning the freshness of the content and it's influence on the quality rating did not show the expected results. Most of the participants were indifferent between

the prototypes because they did not notice the difference. Out of those who noticed, some participants said that in the case of an illness it is not such an important issue for them.

7.4 Influence of Author Information

Not only for users the author information is influencing their quality assessment [101], also search engines relate to this information when they need to decide which content is of high quality [45]. The fact that the author of a text is also an expert in this field seems to be a huge indicator for quality assessment. Beside search engines the information about the author is also important in third party quality evaluation. The HON Code even requests to indicate the qualifications of the authors [108].

The influence of the author on quality evaluation was also mentioned by most of the participants in the interviews during the empirical research. Based on that, the assumption was made that whether author information is displayed or not, has a huge influence on the quality assesment of users. Test 9 showed that this holds only true for 38,095 % of the participants which was propably because most participants did not notice a difference. Those participants who did choose the prototype with the author information in most cases also explained their choice with the existing author information. Therefore it can be assumed that the displayed author information has a positive influence on the quality assessment.

Since participants often looked at the picture of the author during eye tracking, this issue was also researched. In Test 10 the majority of the participants picked the prototype with the author in the white coat and also explained their choice based on this issue. Most participants said that the white coat makes the picture a lot more professional and trustworthy. Still some participants preferred the prototype with the portrait picture because it offers a better view of the face of the author. Hypothesis 10 about the influence of the picture on the quality impression can be seen as true but still it is questionable in which direction the type of the picture influences the users.

The other aspects, the specialization and academic grade of the author, was also tested in Test 11 and Test 12. Concerning the field of the author, which was mentioned as an important aspect during the interviews. After the eye tracking the overwhelming majority of the participants did not notice the difference in Test 11. Therefore it is questionable whether this information really influences the quality assessment of users. Also the academic title of the author was declared as an important aspect during the interviews, but this was not confirmed by the prototype testing. The participants either did not notice or had different explanations for being indifferent during Test 12.

7.5 Influence of Advertisement

Most of the third party evaulation tools and guidelines concerning quality assessment include that a website has to show a clear distinction between content and advertisement [41] and that a

website needs to have a financial disclosure [108].

Concerning advertisement, the participants made very clear that a website which shows advertisement, gets a worse quality rating from them. As the Hypothesis 15 that advertisement leads to a worse quality impression was tested with prototypes in Test 15 nearly half of the users actually did choose the prototype without advertisement. Most of the participants who were indifferent or did even choose the prototype with advertisement, all saw an additional value in the advertisement. When asked about the placement of adverts in Test 16, it seems that if advertisement breaks the content, it is even worse for users. During the testing with the prototypes, the majority said they would prefer the logo of the sponsor on top of the text because it does not disturb them as much as the other one. So the Hypothesis 16 in this case seems to be true.

In the quality evaluation during the eye tracking, most websites that showed advertisement of medical products, did not receive a lower quality rating than other webites, but websites with general advertisement did. In the interviews participants often stated that they would be more willing to accept advertisement when it is related to the topic of the content. Test 17 was intended to prove that users are more willing to accept advertisement for a product which has a relation to the content, but it showed that the design and medical context in general are way more important. Prototype C showed an advertisement for a company that offers hearing tests and hearing aid devices which was related to the topic of the website, but this prototype was not picked by the participants during Test 17. They preferred the prototype B with advertisement of eye drops, either because it had a medical background or because they favored the design of the advert.

Overall it seems that the design, layout and placement of the advertisement have a larger influence on the quality assessment and that if the advertisement is unobtrusive, it does not influence the quality rating in a negative way.

7.6 Influence of Words

Due to the fact that quality and trust are very important in medical context, most participants said that if they visit a website and find spelling mistakes, the quality impression is low. Contrary to this, participants did not read much during the eye tracking session. So even though participants explicitly stated during the inteviews that spelling mistakes or other errors lead to a very bad impression, they did not notice them during Test 18. This might be because most participants did not actually read the text on the prototypes.

The assumption that users do not really read the content, is also emphasized by the fact that the average prototype test took only 11 minutes and 57 seconds. Only one participant took the time to read through nearly all the content and his test took over one hour (69 minutes and 3 seconds). Maybe other tests like scenario testing would be a possibility to find out under which circumstances users notice mistakes. Another possibility would be to include more obvious errors in

the text or even the headline.

Beside spelling mistakes and errors, the influence of technical terms on the quality assessment was also evaluated. Users have already suggested in the interviews that the usage of technical terms only has a little influence on their quality assessment. This was also true for the participants during Test 21.

CHAPTER 8

Conclusion

The aim of this thesis was to find out whether users are able to distinguish high quality content from poor content in medical context and on which criteria they relate during their quality assessment.

A recent study in Austria showed that 35 % of the population has once used the Internet to search for medical information [54]. Other studies even say that over half of the European population at least once consulted the Internet concerning health-related topics [66]. This shows which huge influence the Internet has in health and medicine. Also during the empirical research, most users stated that they use the Internet to find health related information. When the participants were asked how they judge the trustworthiness of information most of them said they trust the ranking of the search engine and rely on their gut feelings.

To investigate the subconscious criteria of users in their quality assessment prototypes were created to isolate different aspects. The prototypes were shown to 21 participants who had to decide which of those websites they would trust.

Due to those results of the practical part it is very questionable whether users are aware of how to distinguish high quality medical content from poor quality websites. Users do, in some aspects like sources or author information, use the same aspects which are suggested in guidelines and third party evaluations, but they are also influenced to a very high amount by other aspects such as design or pictures. This involves the danger that a user is mislead to websites which do have a nice design but do not offer a high quality content and it is also possible that users do not stay on the websites that have high quality content because they have a wrong first impression.

For further research it would be interesting to test the influence of the single factors with a larger sample of participants to find out for which criteria the awareness of the users needs to be more enhanced.

Bibliography

[1] G Ademiluyi, CE Rees, and CE Sheard. Evaluating the reliability and validity of three tools to assess the quality of health information on the internet. *Patient Educ Couns*, 50(2):151–155, 2003.

[2] A Agarwal. Web 3.0 concepts explained in plain english. http://www.labnol.org, Accessed: 2014-05-27.

[3] D Albarracin and GT Kumkale. Affect as information in persuasion: A model of affect identification and discounting. *Journal of Personality and Social Psychology*, 84(3):453–469, 2003.

[4] L Baker, TH Wagner, S Singer, and MK Bundorf. Use of the internet and e-mail for health care information: Results from a national survey. *JAMA*, 289(18):2400–2406, 2003.

[5] W Barfield and T Furness. *Virtual environments and advanced interface design*. Oxford University Press, 1995.

[6] A Beisecker. Aging and the desire for information and input in medical decisions: Patient consumerism in medical encounters. *Gerontologist*, 28(3):330–335, 1988.

[7] CG Blanchard, MS Labrecque, and JC Ruckdeschel. Information and decision-making preferences of hospitalized adult cancer patients. *Soc Sci Med*, 27(11):1139–1145, 1988.

[8] DL Borzekowski and VI Rickert. Adolescent cybersufing for health information: a new resource that crosses the barriers. *Arch. Pediatr. Adolsec. Med.*, 155(7):813–817, 2001.

[9] K Boulos and S Wheeler. The emerging web 2.0 social software: an enabling suite of sociable technologies in health and health care education. *Health Info Libr J*, 24(1):2–23, 2007.

[10] C Brandt, H Ellegaard, M Joensen, FV Kallan, AD Sorknaes, and L Tougaard. Effect of diagnosis of smoker's lung. *Lancet*, 349(9047):253, 1997.

[11] M Brodie, RE Flournoy, DE Altmanand, RJ Blendon, JM Benson, and MD Rosenbaum. Health information, the internet, and the digital divide. *Health Affairs*, 19(6):255–265, 2000.

[12] M Brodie, N Kjellson, T Hoff, and M Parker. Perceptions of latinos, african americans, and whites on media as a health information source. *Howard Journal of Communications*, 10(3):147–167, 1999.

[13] DS Brody, SM Miller, and CE Lerman. Patient perception of involvement in medical care. relationship to illness attitudes and outcomes. *J Gen Intern Med*, 4(6):506–511, 1989.

[14] CL Bylund, JA Gueguen, TA D'Agostino, RS Imes, and E Sonet. Cancer patients' decisions about discussing internet information with their doctors. *Psychooncology*, 18(11):1139–1146, 2009.

[15] D Charnock, S Shepperd, G Needham, and R Gann. Discern: an instrument for judging the quality of written consumer health information on treatment choices. *J Epidemiol Community Health*, 53(2):105–111, 1999.

[16] AI Charvet-Berard, P Chopard, and TV Perneger. Measuring quality of patient information documents with an expanded eqip scale. *Patient Educ Couns*, 70(3):407–411, 2008.

[17] KA Clauson, HH Polen, MN Boulos, and JH Dzenowagis. Scope, completeness, and accuracy of drug information in wikipedia. *Ann Pharamcother*, 42(12):1814–1821, 2008.

[18] RJ Cline and KM Haynes. Consumer health information seeking on the internet: the state of the art. *Health Educ Res.*, 16(6):671–692, 2001.

[19] C Cohen and B Crabtree. Qualitative research guidelines project, 2006. http://www.qualres.org/, Accessed: 2014-05-28.

[20] Alexa: The Web Information Company. The top 500 sites on the web. http://www.alexa.com/topsites, Accessed: 2014-05-27.

[21] G Cormode and B Krishnamurthy. Key differences between web 1.0 and web 2.0. *First Monday*, 13(6), 2008.

[22] S Cotten and S Gupta. Characteristics of online and offline health information seekers and factors that discriminate between them. *Soc Sci Med*, 59(9):1795–1806, 2004.

[23] MG del Carmen and S Joffe. Informed consent for medical treatment and research: a review. *Oncologist*, 10(8):636–641, 2005.

[24] H Deubel and WX Schneider. Saccade target selection and object recognition: Evidence for a common attentional mechanism. *Vison Res.*, 36(12):1827–1837, 1994.

[25] L Devgan, N Powe, B Blakey, and M Makary. Wiki-surgery? internal validity of wikipedia as a medical and surgical reference. *Journal of the American College of Surgeons*, 205(3):76–77, 2007.

[26] T Duchowski. *Eye Tracking Methodology: Theory and Practice*. Springer, 2003.

[27] FN Egger. Trust me, i'm an online vendor: Towards a model of trust for e-commerce system design. In *CHI '00 Extended Abstracts on Human Factors in Computing Systems*, CHI EA '00, pages 101–102, New York, NY, USA, 2000. ACM.

[28] FN Egger. Affective design of e-commerce user interfaces: How to maximise perceived trustworthiness. In *Proc. Intl. Conf. Affective Human Factors Design*, pages 317–324, 2001.

[29] TR Eng and DH Gustafson. Wired for health and well-being: The emergence of interactive health communication. *Science Panel on Interactive Communication and Health*, 1999. http://www.health.gov/scipich, Accessed: 2014-05-27.

[30] G Eysenbach. eeurope 2002: Quality criteria for health related websites. *JMR*, 4(3):15, 2002.

[31] G Eysenbach and TL Diepgen. Towards quality management of medical information on the internet: evaluation, labelling, and filtering of information. *BMJ*, 317(7171):1496–1500, 1998.

[32] G Eysenbach and Ch Kohler. How do consumers search for and appraise health information on the world wide web? qualitative study using focus groups, usability tests, and in-depth interviews. *BMJ*, 324(7337):573–577, 2002.

[33] RR Faden and TL Beauchamp. *A history and theory of informed consent.* Oxford University Press, 1986.

[34] A Fagerlin, D Rovner, S Stabelford, C Jentoft, JT Wei, and M Holmes-Rovner. Patient education materials about the treatment of early-stage prostate cancer: a critical review. *Ann Intern Med*, 140(9):721–728, 2004.

[35] LJ Fallowfield, A Hall, and GP MAguire. Psychological outcomes of different treatment policies in women with early breast cancer outside a clinical trial. *BMJ*, 301(6752):575–580, 1990.

[36] S Fox. Health online 2013, 2013. http://www.pewinternet.org, Accessed: 2014-05-28.

[37] S Fox and D Fallows. Internet health resources, 2003. http://www.pewinternet.org, Accessed: 2014-05-28.

[38] S Fox and L Rainie. The online health care revolution, 2000. http://www.pewinternet.org, Accessed: 2014-05-27.

[39] S Fox and L Rainie. Vital decisions how internet users decide what information to trust when they or their loved ones are sick, 2002. http://www.pewinternet.org, Accessed: 2014-06-21.

[40] B Gann and S Buckland. *Dissemination of information on treatment outcomes by consumer health information services*. Help for Health Trust, 1994.

[41] Aktionsforum Gesundheitsinformationssyste. afgis standards. http://www.afgis.de, Accessed: 2014-05-27.

[42] D Giustini. How web 2.0 is changing medicine. *BMJ*, 333(7582):1283–1284, 2006.

[43] D Giustini. Web 3.0 and medicine. *BMJ*, 335:1273, 2007.

[44] W Godolphin, A Towle, and R McKendry. Evaluation of the quality of patient information to support informed shared decision-making. *Health Expect*, 4(4):235–242, 2001.

[45] Google. Webmaster blog. http://googlewebmastercentral.blogspot.co.at/, Accessed: 2014-05-27.

[46] M Gould, J Munfakh, K Lubell, M Kleinman, and S Parker. Seeking help from the internet during adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41(10):1182 – 1189, 2002.

[47] NJ Gray, JD Klein, JA Cantrill, and PR Noyce. Adolescent girls use of the internet for health information: issues beyond access. *Journal of Medical Systems*, 26(6):545–553, 2002.

[48] S Greenfield, S Kaplan, and JE Ware. Expanding patient involvement in care. *Ann Intern Med*, 102(4):520–528, 1985.

[49] Gale Group. Cheskin research and studio archetype deliver ecommerce trust study. In *Business Wire*, 1999.

[50] M Hardey. The story of my illness: Personal accounts of illness on the internet. *Health*, 6(1):31–46, 2002.

[51] JM Heilman, E Kemmann, M Bonert, A Chatterjee, B Ragar, GM Beards, DJ Iberri, M Harvey, B Thomas, W Stomp, MF Martone, DJ Lodge, A Vondracek, JF de Wolff, C Liber, SC Grover, TJ Vickers, B Mesko, and MR Laurent. Wikipedia: a key tool for global public health promotion. *J Med Internet Res*, 13(1):14, 2011.

[52] B Hughes, I Joshi, H Lemonde, and J Wareham. Junior physician's use of web 2.0 for information seeking and medical education: a qualitative study. *Int J Med Inform*, 78(10):645–655, 2009.

[53] B Hughes, J Wareham, and I Joshi. Doctors' online information needs, cognitive search strategies, and judgments of information quality and cognitive authority: How predictive judgments introduce bias into cognitive search models. *Journal of the American Society for Information Science and Technology*, 61(3):433–452, 2010.

[54] IMAS Institute. Gesundheitsfragen im virtuellen raum. http://www.imas.at, Accessed: 2014-05-27.

[55] R Jacob and K Karn. Eye tracking in human-computer interaction and usability research: Ready to deliver the promises. *The Mind's eye: Cognitive The Mind's Eye: Cognitive and Applied Aspects of Eye Movement Research*, pages 574–605, 2003.

[56] AR Jadad and A Gagliardi. Rating health information on the internet: navigating to knowledge or to babel? *JAMA*, 279(8):611–614, 1998.

[57] H Kakai, G Maskarinec, DM Shumay, Y Tatsumura, and K Tasaki. Ethnic differences in choices of health information by cancer patients using complementary and alternative medicine: An exploratory study with correspondence analysis. *Soc Sci Med*, 56(4):851–862, 2003.

[58] SH Kaplan, S Greenfield, and JE Ware. Assessing the effects of physician-patient interactions on the outcomes of chronic disease. *Med Care*, 27(3):110–127, 1989.

[59] F Kee. Patients' prerogatives and perceptions of benefit. *BMJ*, 312(7036):958–960, 1996.

[60] A Keen. Web 1.0 + web 2.0 = web 3.0. http://www.ajkeen.com/2008/04/25/web-10-web-20-w/, Accessed: 2014-05-27.

[61] T Kenny, RG Wilson, IN Purves, Sr J Clark, LD Newton, DP Newton, and DV Moseley. A pil for every ill? patient information leaflets pils: a review of past, present and future use. *Fam Pract*, 15(5):471–479, 1998.

[62] P Kim, TR Eng, MJ Deering, and A Maxfield. Review of published criteria for evaluating health-related websites. *Br Med J*, 170(6):329–332, 1999.

[63] M Klee. Five paper prototyping tips, 2000. http://www.uie.com, Accessed: 2014-05-27.

[64] N Kommers and L Rainie. Use of the internet at major life moments, 2002. http://www.pewinternet.org, Accessed: 2014-05-27.

[65] R Kraut, M Patterson, V Lundmark, S Kiesler, T Mukopadhyay, and W Scherlis. Internet paradox. a social technology that reduces social involvement and psychological well-being. *Am. Psychol.*, 53(9):1017–1031, 1998.

[66] PE Kummervold, CE Chronaki, B Lausen, HU Prokosch, J Rasmussen, S Santana, A Staniszewski, and SC Wangberg. ehealth trends in europe 2005-2007: a population-based survey. *J Med Internet Res*, 10(4):42, 2008.

[67] PE Kummervold, D Gammon, S Bergvik, JK Johnsen, T Hasvold, and JH Rosenvinge. Social support in a wired world use of online mental health forums in norway. *Nord J Psychiatry*, 56(1):59–65, 2002.

[68] MR Laurent and TJ Vickers. Seeking health information online: does wikipedia matter? *J Am Med Inform Assoc*, 16(4):471–479, 2009.

[69] HP Maat and L Lentz. Improving the usability of patient information leaflets. *Patient Educ Couns*, 80(1):113–119, 2010.

[70] PC Mag. Definition of prototyping. http://www.pcmag.com/encyclopedia/, Accessed: 2014-05-28.

[71] K Masters. For what purpose and reasons do doctors use the internet: a systematic review. *Int J Med Inform*, 77(1):4–16, 2008.

[72] R McLean, BH Richards, and JI Wardman. The effect of web 2.0 on the future of medical practice and education: Darwikinian evolution or folksonomic revolution? *Med J Aust.*, 187(3):174–177, 2007.

[73] M McMullan. Patients using the internet to obtain health information: how this affects the patient-health professional relationship. *Patient Educ Couns*, 63(1-2):24–28, 2006.

[74] WikiProject Medicine. Popular pages, 2010. http://en.wikipedia.org/wiki/Wikipedia:MED1500, Accessed: 2014-05-27.

[75] P Meredith, M Emberton, and C Wood. Comparison of patients' needs for information on prostate surgery with printed materials provided by surgeons. *Quality in Health Care*, 4(1):18–23, 1995.

[76] P Meredith, M Emberton, and C Wood. New directions in information for patients. *BMJ*, 311(6996):4–5, 1995.

[77] V Minichiello, S Rahman, T Dune, J Scott, and G Dowsett. E-health: potential benefits and challenges in providing and accessing sexual health services. *BMC Public Health*, 13:790, 2013.

[78] B Moult, LS Franck, and H Brady. Ensuring quality information for patients: development and preliminary validation of a new instrument to improve the quality of written health care information. *Health Expect*, 7(2):165–175, 2004.

[79] netdoktor.at GmbH. Mediadaten. www.netdoktor.at, Accessed: 2014-05-27.

[80] N Newton. *The use of semi-structured interviews in qualitative research: strengths and weaknesses*. PhD thesis, University of Bristol, 2010.

[81] S Nordfeldt, T Angarne-Lindberg, M Nordwall, and B Krevers. Parents of adolescents with type 1 diabetes–their views on information and communication needs and internet use. a qualitative study. *PLoS One*, 8(4):e62096, 2013.

[82] Return On Now. Search engine market share 2013. http://returnonnow.com/internet-marketing-resources/2013-search-engine-market-share-by-country/, Accessed: 2014-05-27.

[83] American College of Physicians. Communicating with patients electronically, 2008. http://www.acponline.org, Accessed: 2014-05-27.

[84] B Pan, H Hembrooke, G Gay, G Granka, M Feusner, and J Newman. The determinants of web page viewing behavior: An eye-tracking study. In *Proceedings of the 2004 Symposium on Eye Tracking Research & Applications*, pages 147–154, 2004.

[85] C Pandolfini, P Impicciatore, and M Bonati. Parents on the web: risks for quality management of cough in children. *Pediatrics*, 105(1):1, 2000.

[86] JB Pelz, R Canosa, and J Babcock. Extended tasks elicit complex eye movement patterns. In *Proceedings of the 2000 Symposium on Eye Tracking Research & Applications*, pages 37–43, 2000.

[87] MP Pender, KE Lasserre, C Del Mar, L Kruesi, and S Anuradha. Is wikipedia unsuitable as a clinical information resource for medical students? *Medical Teacher*, 31(12):1095–1096, 2009.

[88] M Peyrot. The dawn youth webtalk study: methods, findings, and implications. *Pediatr. Diabetes*, 10(13):37–45, 2009.

[89] MS Rajagopalan, V Khanna, M Stott, Y Leiter, TN Showalter, A Dicker, and YR Lawrence. Accuracy of cancer information on the internet: a comparison of a wiki with a professionally maintained database. *Journal of Clinical Oncology*, 7(5):319–323, 2010.

[90] M Raschke, T Blascheck, and M Burch. *Handbook of Human Centric Visualization*. Springer, 2014.

[91] K Rayner and MS Castelhano. Eye movements and cognitive processes in reading, visual search, and scene perception. In *Eye Movement Research Mechanisms, Processes, and Applications*, pages 3–22, 1995.

[92] RE Rice. Influences, usage, and outcomes of internet health information searching: multivariate results from the pew surveys. *Int J Med Inform*, 75(1):8–28, 2006.

[93] MA Richards, AJ Ramirez, and LF Degner. Offering choice of treatment to patients with cancers. *European Journal of Cancer*, 31(1):112–116, 1995.

[94] V Rideout. How young people use the internet for health information. *Public Health Rep*, 116(6):627, 2001.

[95] L Rozmovits and S Ziebland. What do patients with prostate or breast cancer want from an internet site? a qualitative study of information needs. *Patient Educ Couns*, 53(1):57–64, 2004.

[96] P Scullard, C Peacock, and P Davies. Googling children's health: reliability of medical advice on the internet. *Arch Dis Child*, 95(8):580–582, 2010.

[97] R Sefelin, M Tscheligi, and V Giller. Paper prototyping - what is it good for? a comparison of paper- and computer-based low-fidelity prototyping. In *CHI '03 Extended Abstracts on Human Factors in Computing Systems*, pages 778–779, 2003.

[98] P Shackley and M Ryan. What is the role of the consumer in health care? *Journal of Social Policy*, 23(4):517–541, 1994.

[99] E Sillence, P Briggs, P Harris, and L Fishwick. A framework for understanding trust factors in web-based health advice. *Int. J. Human-Computer Studies*, 64(8):697–713, 2006.

[100] E Sillence, P Briggs, P Harris, and L Fishwick. Going online for health advice: Changes in usage and trust practices over the last five years. *Interacting with Computers*, 19(3):397–406, 2007.

[101] E Sillence, P Briggs, PR Harris, and L Fishwick. How do patients evaluate and make use of online health information? *Soc Sci Med*, 64(9):1853–1862, 2007.

[102] A Singhal. More guidance on building high quality. http://googlewebmastercentral.blogspot.co.at, Accessed: 2014-05-27.

[103] J Standford, ER Tauber, BJ Fogg, and L Marable. Experts vs. online consumers: A comparative credibility study of health and finance web sites. *Journal of Communication*, 42:73–93, 2002.

[104] PL Steinberg, S Wason, JM Stern, L Deters, B Kowal, and J Seigne. Youtube as source of prostate cancer information. *Urology*, 75(3):619–622, 2010.

[105] SurgWiki. http://surgwiki.com/. Accessed: 2014-05-27.

[106] James Surowiecki. *The Wisdom of Crowds*. Doubleday; Anchor, 2005.

[107] RW Tardy and CL Hale. Getting plugged in: A network analysis of health information seeking among stay at home moms. *Communication Monographs*, 65(4):336–357, 1998.

[108] Health On the Net (HON) Foundation. Criteria for hon certificate. http://www.healthonnet.org/HONcode/Conduct.html, Accessed: 2014-05-27.

[109] Health On the Net (HON) Foundation. Hon code. https://www.hon.ch/Global/, Accessed: 2014-05-27.

[110] Health On the Net (HON) Foundation. Analysis of 9th hon survey of health and medical internet users, 2010. http://www.hon.ch/Survey/Survey2005/res.html, Accessed: 2014-05-27.

[111] DW Turner. Qualitative interview design: A practical guide for novice investigators. *The Qualitative Report*, 15(3):754–760, 2010.

[112] RA Virzi, JL Sokolov, and D Karis. Usability problem identification using both low- and high-fidelity prototypes. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 236–243, 1996.

[113] L Wang, J Wang, M Wang, Y Li, Y Liang, and D Xu. Using internet search engines to obtain medical information: a comparative study. *J Med Internet Res*, 14(3):74, 2012.

[114] P White, H Smith, F Webley, and A Frew. A survey of the quality of information leaflets on hayfever available from general practices and community pharmacies. *Clin Exp Allergy*, 34(9):1438–1443, 2004.

[115] Wikipedia. Statistics. http://en.wikipedia.org/wiki/Wikipedia:Statistics, Accessed: 2014-05-27.

[116] MA Winker, A Flanagin, B Chi-Lum, J White, K Andrews, RL Kennett, CD DeAngelis, and RA Musaccio. Guidelines for medical and health information sites on the internet. *JAMA*, 283(12):1600–1606, 2000.

[117] ML Ybarra and M Suman. Help seeking behavior and the internet: a national survey. *Int J Med Inform*, 75(1):29–41, 2006.

[118] S Ziebland. The importance of being expert: the quest for cancer information on the internet. *Soc Sci Med*, 59(9):1783–1793, 2004.