# Improving the First Impression of an Online Scientific Publishing Service: A Usability Test

Victoria-Anne Schweigert and Andreas Geyer-Schulz

**Abstract** A study of the Human-Oriented Technology Lab at Carleton University shows that users form an opinion (first impression) regarding a new website in 50 milliseconds (Lindgaard et al (2006)). Furthermore, the Halo effect causes that the first impression will be transferred on the whole organization. For this reason, it is very important to optimize a website before one starts with marketing activities. There is no thing as a second first impression. In this contribution, we analyse the website of a new scientific journal. The usability test covers 2 areas: The layout and the functionality of the website on a variety of devices (mobile devices (Android, iOS), Macs, PCs with different browsers).

Victoria-Anne Schweigert
Information Services and Electronic Markets,
Karlsruhe Institute of Technology (KIT) Kaiserstraße 12, D-76131 Karlsruhe, Germany,
✉ v.schweigert@kit.edu

Andreas Geyer-Schulz
Information Services and Electronic Markets,
Karlsruhe Institute of Technology (KIT) Kaiserstraße 12, D-76131 Karlsruhe, Germany
✉ andreas.geyer-schulz@kit.edu

# 1 Introduction

We create a usability test to check the layout and the functionality test of a scientific journal. On the basis of different psychological effects users form an opinion in only 50 ms regarding a new online service and this first impression is very difficult to change. We want to find out how to offer a good first impression for the user of a scientific journal and how we can improve the marketing and customer relationship management (CRM) activities for such a scientific product. In this article, we will introduce our test environment, the website scientific journal Archives of Data Science, Series A and the usability test, consisting of the layout and functionality test. The objective of both tests is to improve the website, in order to create a successful marketing program, for implementing CRM strategies and to offer a better user experience.

# 2 Archives of Data Science, Series A

The journal Archives of Data Science, Series A publishes papers of short to medium length in the emerging field of data science. It covers regular research articles from the field of data science and special issues on conferences, workshops and joint activities of the German Classification Society / Gesellschaft für Klassifikation (GfKl e.V.) and its cooperating partners and organizations. Every submitted paper is reviewed by at least two reviewers. Fully reviewed and accepted papers will be published in an online-first version that is freely available and already quotable.

# 3 Psychological Effects Relevant for the Design of Online Scientific Publishing Services

We want to develop a good and efficient marketing and CRM strategy for the journal Archives of Data Science, Series A. For this reason, we have studied different aspects which influence the success of a marketing campaign for this scientific product.

## 3.1 First Impression

The study "Attention web designers: You have 50 milliseconds to make a good first impression!" of Lindgaard et al (2006) considered in three different studies the effects of the first impression of a website. Lindgaard and her colleagues conducted those studies to determine, how quickly people form an opinion about the visual appeal of a web page (Lindgaard et al (2006)).

In the first study, the users twice rated the visual appeal of homepages presented for 500 ms each. In this time users form a first opinion and notice a bit of content information about the website.

In the second study the users also rated the visual appeal of homepages presented for 500 ms each, but they also rated each webpage on seven specific design dimensions (simple - complex; interesting - boring; clear - confusing; well designed - poorly designed; good use of colour - bad use of colour; good layout - bad layout; imaginative - unimaginative) (Lindgaard et al (2006)).

The third study was almost a replication of the first study. The only difference was that instead of 500 ms the users saw the homepage only for 50 ms. The time was too short to notice content information about the website, but users formed already an opinion regarding the website. This opinion was the same as after the first test.

Lindgaard and her coauthors (Lindgaard et al (2006)) came to the result, that users form an opinion in only 50 ms. This first impression will be formed very often unconsciously. This judgment is already so solid, that it will remain in long-term memory. For this reason, "web designers" (or the website) have 50 ms to make a good first impression.

But why is this first impression so important? Lindgaard and her coauthors explain this by the Mere Exposure and the Halo effect and the strong impact of these effects on a marketing strategy.

## 3.2 Halo effect

The Halo effect is a psychological effect. Initially, it was considered by Frederic L. Wells in 1907 (Wells (1907)). The term was introduced by Edward Thorndike in 1920 (Thorndike (1920)) who conducted a study during the first world war.

Thorndike asked commanding officers to evaluate their subordinates (soldiers) according to different aspects, like physical qualities (e.g. condition, neatness, energy) and their mental, emotional, and social qualities (e.g. intellect, leadership, responsibility). The result was that if one of the soldier's qualities was rated highly, the other qualities were also rated highly. For example, this caused that more attractive soldiers (good body posture, beautiful face) got more positive marks in the different categories than less attractive soldiers. In general, chiefs assumed that a pretty soldier has for example a better shooting accuracy, is tidier and better in his job than a less attractive soldier (Rosenzweig (2008)). In the end, the commanding officers evaluated "super soldiers" with good marks in every category or average soldiers with average marks in every category. Thorndike characterized this transfer of one category to another one as the Halo error. The Halo effect is defined as the unconscious transfer of an opinion regarding one category to another one (Thorndike (1920), Schweizer (2005)).

In the marketing research literature, the long-term effect of a first impression is referred to as Halo effect. This effect describes the unconscious transfer of features or feelings concerning one product to another one or rather of one feature of the product to the whole product. The first impression of a product or a service influences the later perception/opinion of the product and the Halo effect carries over that first impression to the evaluation of other attributes of the product or service.

### 3.3 Mere Exposure effect

The Mere Exposure effect is a psychological effect. The first mention of this effect was in 1876 by Gustav Fechner (Fechner (1876)). In 1910 Edward B. Titchener (Titchener (1910)) also documented a comparable effect and described this effect as a "glow of warmth" felt in the presence of something that is familiar.

The term Mere Exposure effect was coined by Robert Zajonc. In the beginning of his research, in the year 1968, Zajonc considered the usage of different words in a language (Zajonc (1968)). In his paper "Attitudinal Effects of Mere Exposure" (Zajonc (1968)) he described that overall positive words received more usage than their negative counterparts. The best-known research about the Mere Exposure effect is Zajonc's study in the year 1980. In this study, he found out that the more often a person is seen by someone, the more likeable that person

appears to be (Zajonc (1980)). The Mere Exposure effect is also described as familiarity principle (Liao et al (2011), Clark (2015), Scott and White (2016)).

The Mere Exposure effect shows that repeated perception of a stimulus which is initially evaluated as neutral leads to a more positive assessment. A good example is a new song. Often people form a neutral opinion regarding a new song after the first contact (hearing the song). But after several additional contacts (hearing the song several times (often unconsciously)) they start to like it. In combination with the Halo effect it is probable, that this person also starts to hear other songs of the same artist.

A negative first judgment (negative first impression) is very critical, because if somebody forms a negative opinion, there is no longer a Mere Exposure effect. For this reason, the effect cannot turn a negative judgment to a positive one. Normally, a negative judgment gets more negative after considering the product several times, because the user becomes - after a bad first impression - very critical and, as a consequence, his or her negative attitude is reinforced.

## 3.4 Effect for the Journal

According to the Halo effect the first impression (first contact with the journal) influences the opinion of the clients (e.g. authors, readers, reviewers, editors) concerning the whole journal. So, it is important to offer a good first impression for the clients of the journal. Also, the Mere Exposure effect shows, how important that first judgment is: The journal can inspire users after a neutral or good first impression, but maybe loose them if they form a negative judgment during the first visit, because the users are very critical during the next visits. Because of the Halo effect, this critical and dissatisfied judgment is transferred by the user unconsciously to the whole journal. At this point, the importance that a good first impression has should be obvious.

In this contribution, we demonstrate in the following that systematic usability tests of the user interface of online publishing services followed by user interface revisions are an adequate method to reduce these psychological effects. However, we did not assess these psychological effects before and after the improvements of the user interface by user surveys. A differential study of these effects before and after the user interface revisions or in the form of an A/B-test of different variants of the user interface is left for further research.

# 4 The Usability Test

To improve the first impression of an Online Publishing Service, we designed a specific usability test as a set of hierarchically structured set of test cases completely covering all navigation paths of the services. The rationale for aiming at complete coverage is that the set of test cases should be free of assumptions about the implementation of design elements and functionality. This requirement is due to the distributed and increasingly more heterogeneous computing environment on mobile devices. On the top level, the test consists of two parts, the layout test and the functionality test.

$$UsabilityTest = \{LayoutTest, FunctionalityTest\}$$

Figure 1 shows the structure of both parts in the testing environment. Our testing environment was the website of the journal Archives of Data Science, Series A (ArchivesOfDataScience.org) and the services in the related OJS (Open Journal System). The test cases can be reused for Archives of Data Science, Series B, because the sites have the same structure. Future journal variations (e.g. Series C on long survey articles) will already start with an improved user interface.
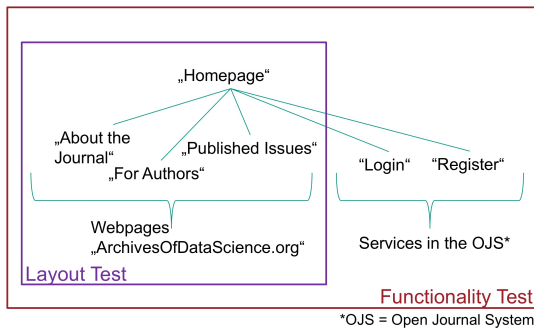


**Figure 1:** Structure of the usability test including the parts layout and functionality test in the testing environment: website ArchivesOfData-Science.org and its services in OJS.

The functionality test has been conducted over the complete testing environment (website and OJS). The layout test has been created only for the website, because the layout of the OJS has already been tested by its developers.

## 4.1 The Layout Test

The design of the website and the printed version is inspired by Mondrian's Work. Piet Mondrian (1872-1944) has been a member of the artist group De Stijl (Schweighöfer (2017)). The design of the cover and the website of the Journal Archives of Data Science, Series A is based on his work "Composition II in Red, Blue, and Yellow" from 1930 (Piet-Mondrian-org (2011)). Mondrian's design is used as a construction blueprint for the whole family of journals: The design is reusable by permuting the colours. The effect of stable structure combined with a colour scheme should give the journal family a strong brand and each family member a unique identity.

We want to offer a good first impression to enhance the success of our future marketing campaigns for the journals. We designed the layout (website and printed version) of the journal according to web design rules. Therefore, we presume, that the individual content elements are well-designed.

But is also the layout good on different devices? A problem could occur because the website was designed for a standard PC display, but today clients use a wide range of devices (e.g. smartphones and tablets) (Koch and Frees (2016), Spill (2017), Verband Internet Reisevertrieb (2017)).

So, we considered the following question: Is the website correctly displayed on the user's device? We created a layout test to consider the display of the site ArchivesOfDataScience.org on different devices to support marketing campaigns and offer a good first impression.

For the layout test the following five step process was used:

1. Selection of the most frequently used devices

2. Test Case Construction

3. Execution and Documentation of the Test

4. Evaluation of the Results

5. Redesign of the Website

### 4.1.1 Selection of the most frequently used devices

The devices should be chosen according the most used hardware, operating systems and browsers. The operating system distribution worldwide in May 2017 (StatCounter (2017a)) is shown in the following list:

- 75.48 % Win (included 35.03 % Win 7; 8.88 % Win 8; 27.02 % Win 10; 0.73 % Win Vista; 3.82 % Win XP)

- 10.59 % Mac OS

- 6.34 % iOS

- 3.32 % Android

- 1.5 % Linux



**Figure 2:** Browser distribution in Germany in June 2017 (Solvium and hochzehn - Browser-Statistik (2017)).

Figure 2 shows the browser distribution in Germany in June 2017 (Solvium and hochzehn - Browser-Statistik (2017)). World-wide the browsers Chrome, Firefox and Safari (incl. mobile version) have a share of 87,09 % (StatCounter (2017b)).

The study (Business Wire (2017)) shows the distribution of smartphone devices in Q1 2017 world-wide: 23,3 % Samsung devices, 14,7 % Apple iPhones, 10 % Huawei and 52 % other devices (e.g. Oppo, Xiaomi, Vivo). It is

important that the other devices are not very common in the European market. In Germany, the market share of Samsung and Apple exceeds 65 % (Schmidt (2017)).

According to these statistics the devices are chosen. Table 1 shows our selected devices. All smart devices have been tested in two different modes, in the landscape and the portrait format.

**Table 1:** Most frequently used devices.

| Hardware (Device & Brand) | Operating System | Browser | Format |
|---|---|---|---|
| *Standard Devices (PC, Laptops)* | | | |
| MacBook Pro; Apple | macOS Sierra | Safari 10.0.1 | Standard |
| MacBook Pro; Apple | macOS Sierra | Firefox 55.0.3 | Standard |
| MacBook Pro; Apple | macOS Sierra | Chrome 62.0.3202.62 | Standard |
| PC; Dell | Windows 8.1 Pro | Firefox 55.0.3 | Standard |
| PC; Dell | Windows 8.1 Pro | Chrome 62.0.3202.89 | Standard |
| PC; Dell | Linux Fedora 25 | Firefox 55.0 for Fedora | Standard |
| *Smart Devices (Smartphones, Tablets)* | | | |
| Fire Tablet; Amazon | Fire OS 5 (Android) | Silkbrowser | Landscape format |
| Fire Tablet; Amazon | Fire OS 5 (Android) | Silkbrowser | Portrait format |
| iPad Air 2; Apple | iOS 10.3.3 | Safari | Landscape format |
| iPad Air 2; Apple | iOS 10.3.3 | Safari | Portrait format |
| iPhone 7; Apple | iOS 10.1 | Safari | Landscape format |
| iPhone 7; Apple | iOS 10.1 | Safari | Portrait format |
| A5; Samsung | Android 7.0 | Chrome | Landscape format |
| A5; Samsung | Android 7.0 | Chrome | Portrait format |

For example, we used only an iPhone 7 (current model during the test (model 2016)) to check the user experience for iOS, because the operating system and the browsers are the same as on an iPhone 6 and 6S (model 2014, model 2015). As

representative for the operating system Android on a Smartphone we chose the
Samsung A5, because Samsung is the most used smartphone brand worldwide.
Further tests on other phones like an iOS, iPhone 5S / iPhone SE or an Android,
One-plus-one have shown that we do not need more devices, because the failures
are identical for the combination of operating system and browsers. We used the
standard browsers of the operating systems and as cross-reference Firefox on the
MacBook. Additionally, we tested Chrome for macOS and Windows, because
during the test it was the most frequently used browser worldwide (StatCounter
(2017b)).

### 4.1.2  Test Case Construction

We developed test cases for every layout element (e.g. text block, button), based
on several state-of-the-art usability testing papers (e.g. Dumas and Fox (2008),
Lindgaard and Chattratichart (2007), Bee and Khalid (2003)) complemented
with practical experiences from expert interviews with testers in the industry
and previous usability tests at the institute (Schierle (2015), Frank (2011), Ball
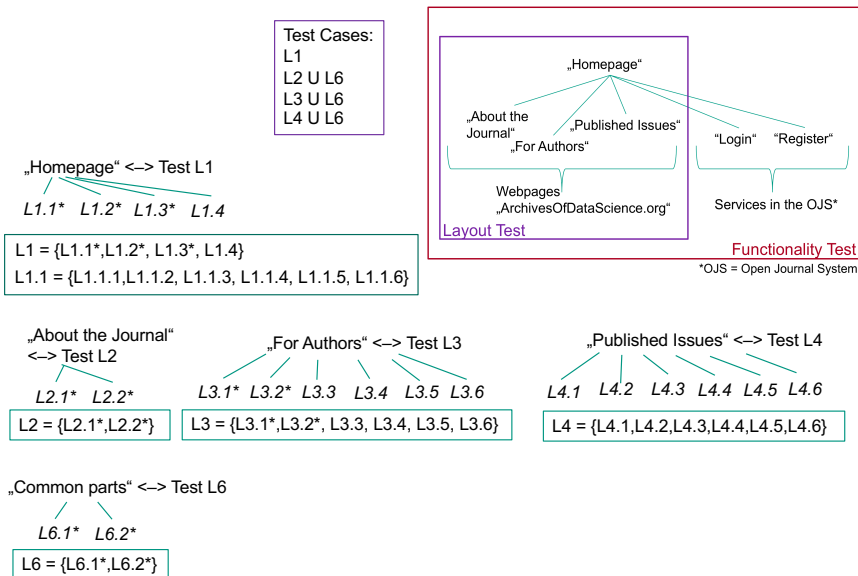et al (2017b), Ball et al (2017a)).



**Figure 3:** Test setup of the layout and functionality test on website ArchivesOfDataScience.org.

The test setup is shown in figure 3. The figure introduces the test cases in combination with the elements of the test environment (the website ArchivesOf-DataScience.org).

For example, the test cases L1.x are tests on the homepage. Test case L1.1 tested if all buttons are readable, that means that there are no overlapping buttons. This case includes 6 items, one for each button on the homepage. The items should be tested together, because they influence each other. For this reason, it is not possible to split this case in separate cases. The structural breakdown of the test case L1 Test Landing Page "Homepage" is presented in table 2.

**Table 2:** Test Case L1 – Landing Page.

| Code | Task | Item (Code) |
|------|------|-------------|
| L1 | Test Landing Page "Home-page" | |
| L1.1 | Buttons are legible | About the Journal (L1.1.1); For Authors (L.1.1.2); Online-First (L.1.1.3); Published (L.1.1.4), Login (L.1.1.5), Register (L.1.1.6) |
| L1.2 | Buttons are clickable | About the Journal (L1.2.1); For Authors (L.1.2.2); Online-First (L.1.2.3); Published (L.1.2.4), Login (L.1.2.5), Register (L.1.2.6) |
| L1.3 | Texts/Buttons readable (without overlaps) | About the Journal (L1.3.1); For Authors (L.1.3.2); Online-First (L.1.3.3); Published (L.1.3.4), Login (L.1.3.5), Register (L.1.3.6); Archives of Data Science (L.1.3.7); Series A (L.1.3.8); New here? (L.1.3.9); Browse your articles (L.1.3.10), Submit your work (L.1.3.11), Reviewer or editor (L.1.3.12), Imprint (L.1.3.13), Copyright + ISSN (L.1.3.14) |
| L1.4 | Overall impression | / |

The set of test cases L6 tests common parts of the pages "About the Journal", "For Authors" and "Published Issues". For this reason, the set of test cases L6 is always tested in combination with another set of test cases: L4 ∪ L6, for example, are the cases that are tested on the page "Published Issues" in union with the test of common parts (see figure 4). For this reason, we developed the following sets of test cases: $L1$, $L2 \cup L6$, $L3 \cup L6$, $L4 \cup L6$.
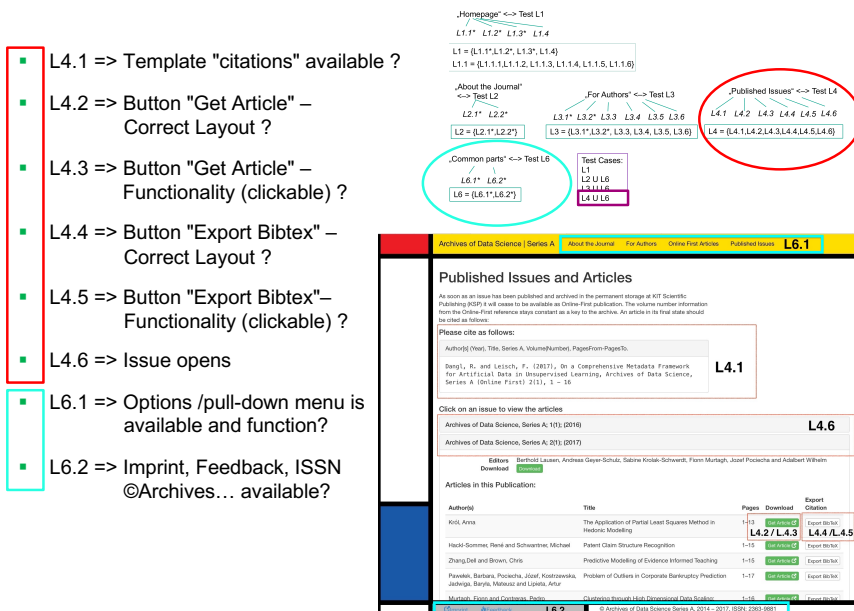
**Figure 4:** The combined test cases L4 U L6 - Question and Structure.

Table 3 and 4 show the structural breakdown of the test cases for all web pages tested (L2 - L6).

**Table 3:** Test Case L2 – Webpages.

| Code | Task | Item (Code) |
|------|------|-------------|
| L2 | Test Webpage "About the Journal" | |
| L2.1 | Formatted text (right) | Concept (L2.1.1), Peer Review Police (L2.1.2), Copyright (L2.1.3), Editorial Board (L2.1.4); Contact Details (L2.1.5) |
| L2.2 | Concept, Peer Review Police, Copyright, Editorial Board and Contact Details available | Concept (L2.2.1), Peer Review Police (L2.2.2), Copyright (L2.2.3), Editorial Board (L2.2.4); Contact Details (L2.2.5) |

**Table 4:** Test Case L3 - L6 – Webpages.

| Code | Task | Item (Code) |
| --- | --- | --- |
| L3 | Test Webpage "For Authors" | |
| L3.1 | Formatted text (right) | Guidelines (L.3.1.1), Contact details (L.3.1.2), Additional Resources (L.3.1.3), Current & Past Conferences (L.3.1.4) |
| L3.2 | Guidelines, Contact details, Additional Resources, Current & Past Conferences available | Guidelines (L.3.2.1), Contact details (L.3.2.2), Additional Resources (L.3.2.3), Current & Past Conferences (L.3.2.4) |
| L3.3 | Button "Download LaTeX Template" - Correct Layout | / |
| L3.4 | Button "Download LaTeX Template" - Functionality (clickable) | / |
| L3.5 | Button "Go to submission tool" - Correct Layout | / |
| L3.6 | Button "Go to submission tool" - Functionality (clickable) | / |
| L4 | Test Webpage "Published Issues" | |
| L4.1 | Template "citations" available | / |
| L4.2 | Button "Get Article" - Correct Layout | / |
| L4.3 | Button "Get Article" - Functionality (clickable) | / |
| L4.4 | Button "Export Bibtex" - Correct Layout | / |
| L4.5 | Button "Export Bibtex" - Functionality (clickable) | / |
| L4.6 | Issue opens | |
| L6 | Test Webpage "Common parts" | |
| L6.1 | Options/pull-down menu is available and function | Options/pull-down menu available (L.6.1.1), Options/pull-down menu function (L6.2.1) |
| L6.2 | Imprint, Feedback, ISSN, ©Archives of Data Science, Series A / 2014 - 2017 available | Imprint (L6.2.1), Feedback (L.6.2.2), ©Archives of Data Science, Series A / 2014 - 2017 (L.6.2.3), ISSN (L6.2.4) |

### 4.1.3 Test Execution and Documentation

For the devices presented in table 1 in section 4.1.1, we tested usability according to the following procedure:

- A tester visits the pages L1-L6 sequentially and documents the results for each test case in tables 2, 3 and 4 in a predefined spreadsheet.

- If a set of test cases is passed without a single usability problem, the tester is allowed to skip answering atomic test cases and he or she confirms that this set of test cases has no usability problems with a single "ok".

This test protocol shortens the test. The positive effect is that it also reduces the effort of the tester in filling the test spreadsheet and it increases the attention of the tester. The test documentation forms the specifications of the layout and software changes necessary to improve the usability of the website.

### 4.1.4 Evaluation of Results

We show all results for the devices of table 1 in table 5. For standard devices, we have only small problems on macOS Sierra (MacBook, all browsers). For example, there is a failure F1 in L1.3.6 by using the Browser Safari on a MacBook (the failure only occurs with reduced window width (F1**)). We detected some small problems, like slight overlaps on the homepage (failure F1) , but no impairments in functionality on Windows and Linux PCs. The results of our cross-reference test (using the browser Firefox on Linux, Windows and macOS Sierra) shows that there are identical failures for the Windows and Linux PC, but no failures in macOS Sierra.

A bit more complicated are the test results of the smart devices: Only the test on the device iOS, Portrait Format (iPad) was without failures. On all other tablets, we experienced problems. In the iOS, landscape format and Android, landscape format (Apple iPad, Amazon Fire Tablet) we found slight overlaps on the homepage, but no impairment in functionality. Also, the labelling of the button "Go to submission tool" overlaps depending on the width of the screen (failure F3). For the portrait format with the OS Android we discovered also the problem, that the button "Go to submission tool" overlaps (F3) depending on the width of the screen and additional the ISSN (L6.2.4) was not displayed (failure F4).

**Table 5:** Results of the Usability Test.

| | MacB, Safari | MacB, Firef. | MacB, Chrome | PC (Win), Firef. | PC (Win), Chrome | PC (Linux), Firef. | Fire Tab., Silk, L | Fire Tab., Silk, P | iPad, Safari, L | iPad, Safari, P | iPhone, Safari, L | iPhone, Safari, P | A5, Chrome, L | A5, Chrome, P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L1.1 | ok | ok | ok | ok | ok | ok | ok | L1.1.* (F2) | L1.1.* (F2) | ok | L1.1.* (F2) | L1.1.* (F2) | L1.1.* (F2) | L1.1.* (F2) |
| L1.2 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | L.1.2.6 (F2) | ok |
| L1.3 | L1.3.6 (F1**) | ok | L1.3.6 (F1) | L1.3* (F1) | L1.3* (F1) | L1.3* (F1) | ok | L1.3* (F2) | L.1.3.6/ L.1.3.16 (F2) | ok | L.1.3.2/ L.1.3.5/ L.1.3.6 (F1), L.1.3.1/ L.1.3.3 (F2) | L.1.3.2/ L.1.3.5/ L.1.3.6 (F2) | L.1.3.6/ L6.2.4 (F2) | ok |
| L1.4 | F1** | good | good | F1 | F1 | F1 | good | F2 | F1 | good | F2 | F2 | F2 | F2 |
| L2.1 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L2.2 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L3.1 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L3.2 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L3.3 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | F3 | F3 | ok |
| L3.4 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L3.5 | ok | ok | ok | ok | F3** | ok | F3 | F3 | F3 | ok | ok | F3 | F3 | F3 |
| L3.6 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L4.1 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L4.2 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L4.3 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L4.4 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L4.5 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L4.6 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok |
| L6.1 | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | ok | F4 | ok |
| L6.2 | ok | L6.2* (F4) | ok | ok | ok | ok | L6.2.4 (F4) | ok | ok | ok | L6.2.4 (F4) | L6.2.3/ L6.2.4 (F4) | L6.2.4 (F4) | L6.2.4 (F4) |

F1= element / item is readable and function, but it is not correctly displayed (wrong position, slight overlap); F2= element (item) overlaps, not readable / no functionality; F3= button/ text is not correctly displayed; F4= item is missing; *= all items; **= only occurs with reduced window width
L=landscape format, P=portrait format, MacB=MacBook, Firef.=Firefox, Win=Windows, Fire Tab.=Fire Tablet

Several problems have been discovered on the tested smartphones. iOS devices have major problems on the homepage and the ISSN (L6.2.4, F4) is not displayed in landscape and in portrait format. In addition, there are problems with the pull-down menu in the portrait format. All other elements on the sites "About the Journal", "For Authors" and "Published Issues" are correctly displayed.

The worst result we experienced on the Android device Samsung A5. There we have a wide range of different problems. This constitutes a real problem, because this is the device most often used worldwide.

### 4.1.5 Website Improvements

The evaluation of results is based on a discussion of the severity of errors and a priority list for fixing the problems discovered. Based on the results and the detected faults, we decide to improve the homepage first. It is obvious that the main problems of a bad first impression are the failures on the homepage. The failures on the sites "About the Journal", "For Authors" and "Published Issues" are mainly very small failures and are often only visible if one searches for them. We categorized the failures in accordance with the degree of severity. After the test, we started to redesign the homepage and developed a new system, that looks similar to the old design, but without the described failures.

## 4.2 The Functionality Test

The journal website has the following user groups: readers, authors, reviewers, editors and journal management. The user group reader is already covered by the layout test described in 4.1. For the setup of test cases, we followed the same approach as in section 4.1. Due to the complexity of the OJS process we developed the functionality test for authors whose test cases we show in table 6.

The most severe problem has been related to the use case A1 "Read Guidelines". A1 led to the discovery that the guidelines for authors were hidden in the wrong webpage in the wrong format and the directions given were inconsistent. The problem is also due the fact that the guidelines and the instructions where to find and how to download them are distributed to the OJS and the webpages of the layout test. This problem has already been fixed.

**Table 6:** Test Case Author (Code A), Use Case A1 - A9 (Task + Expected Results for group authors).

| Code | Use Case | Expected Results |
| --- | --- | --- |
| A1 | Read guidelines | Guidelines can be found and read |
| A2 | Download LaTeX template | LaTeX template was downloaded |
| A3 | Go to the submission tool (OJS) | Author found submission tool (link) and used it |
| A4 | Create a new account in OJS | New account was created |
| A5 | Change data in your account | Data was changed |
| A6 | Login | Author is logged in |
| A7 | Start a new submission and submit a document | Author submitted document |
| A8 | Delete submission | Submission was deleted |
| A9 | Find a support contact | Contact data has been found |

## 5 Outlook

We categorized the failures in accordance with the degree of severity and started to redesign the journal website to reprogram and fix the problems. After every improvement, we replicate the layout test, to be sure that the described problems are remedied. The cycle will repeat until the adjustments are finished. Furthermore, we want to update to a newer version of the OJS. Subsequently, we will extend the functionality test, especially for the user groups of reviewers and editors, because we want to extend the features of the site for this groups by updating to a new OJS Version. We started with these adjustments in September 2017 and changed especially the display on mobile devices. After the revision, the user interface recognizes all tested versions of mobile devices as well as upward compatible versions and uses the specifically tailored interface variant.

Figure 5 shows the role of usability tests in the industrial software development process. Usability test are tests in context of use and, from a data science perspective, the right feedback cycle should be supported by a standardized data collection and analysis process which is synchronized with the user interface. Process automation of this kind supports reliable replication of usability tests over the lifetime of the software service. Implementation techniques and first

examples of such usability test processes are shown in Akers et al (2012). An implementation of such a process is planned.
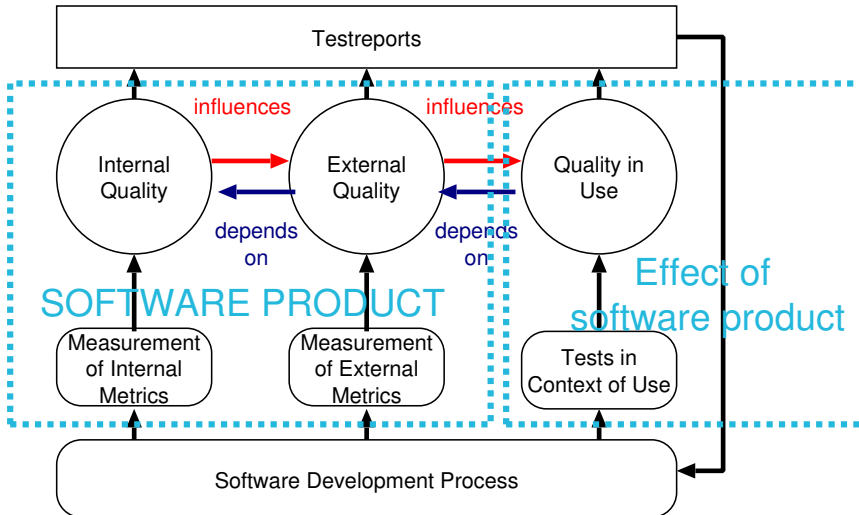


**Figure 5:** ISO/IEC 9126 The Industry Software Improvement Process (ISO/IEC (2004), Geyer-Schulz (2014)).

Identity management for online scientific publishing services is still an open issue and, therefore, not at the centre of this contribution. Several standardization efforts in this area exist, for example the Open Researcher Contributor Identification Initiative (ORCID) whose standard name identifier fulfills the ISO 27729 norm (ISO (2012)). The promise of identity management is a reduction of transaction costs, because of

1. single sign-on (SSO) for all participants in the scientific publishing process which minimizes the login-processes and the user data management cost for all participating service providers;

2. unique author identification, which is still an open problem for library management. This addresses name changes of authors as well as non-unique transliteration schemes of authors names.

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