

# Usability Compliance Audit for Technology Intelligence Services

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**Abstract.** Usability has become a central aspect of the success of applications in the mobile environment. However most usability engineering theories are rather cost intensive and involve the work of usability experts. This paper presents an approach for a “discount usability” check in the means of a usability compliance audit. Being composed of various international usability guidelines, policies and legislation as well as specific development tools for the iOS and Android platform, we have created an audit of 189 general usability recommendations as well as 39 statements focusing on usability issues within the tablet environment. The audit model has been tested at the example of the technology intelligence service application InSciTe (Intelligence in Science and Technology), designed by KISTI (Korea Institute of Science and Technology Information). The results of the audit, conducted by researchers within the development team, show first insights into areas of usability compliance as well as areas in need for improvement. Although the model has a limited scope and needs further development, it can be seen as a starting point to employ usability testing means within the development lifecycle of tablet application projects.

**Keywords:** Discount usability, auditing, usability compliance audit.

## 1 Introduction

Usability has become an increasingly important aspect within the HCI research field. There exists a variety of theories and methodologies to test and ensure the usability compliance of different kinds of applications. However as the definition and scope of usability as well as standard measures to evaluate interfaces and to detect errors

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incorporate diverse fields of research, there is no such thing as a perfect approach. Throughout the last years, a variety of methodologies has evolved to primarily conduct usability testing as a means of exposing usability issues of mobile applications. As these methods however are cost and time intensive and require the involvement of specialists in the field of mobile HCI as well as facilities and testing equipments, there is the need for a “discount” usability evaluation method to discover issues and give first insights into areas of improvement.

This paper discusses the possibility of focusing on usability inspection methodologies by setting up a usability compliance audit that can be carried out with limited resources and without the need of specialists trained in the field of HCI. The goal is to outline a methodology for easy usability measurement that can assure a basis for understanding usability metrics, which promote usability measurement practices and can be carried out by researchers without background in usability engineering, serving as a guidance and foundation for communicating with software developers. The research has been conducted as a model for the tablet application InSciTe Adaptive, an intelligent system in KISTI.

After an introduction to literature sources, section 3 will outline the scope of the test as well as its realization and results, before sections 4 and 5 will focus on results and discussion of the model. The last chapter will give a conclusion as well as giving suggestions for further research to broaden the field of in-house “discount” usability techniques.

## 2 Literature Review

The proposed methodology has been set up by combining a variety of international guidelines, legislation standards and policies within the usability field of HCI. To cover the additional specifications of applications in the mobile and thus tablet environment, the list has been complemented with propositions of the main mobile environments.

The WCAG 2.0 is an authoritative principle of the W3C with strategies, instructions and implementation means for usable and accessible web interfaces. The four principles perceivable, operable, understandable, and robust follow 61 success criteria and techniques to test the interface against its conformance [1].

Other recommendations of the W3C, specifically referring to mobile devices, are the Mobile Web Best Practices and Mobile Web Application Best Practices. These practices address the specific usage environment of mobile applications, its delivery context as well as “How to do” sections, and groups its statements into application data, security and privacy, user awareness and control, conservative use of resources, user experience, and handling variations in the delivery context [2][3].

A further source of guidance and standards is the International Organization for Standardization. Within the Ergonomics of Human System Interaction, the ISO 9241-11

Guidance on Usability standard defines usability in terms of efficiency, effectiveness, and user satisfaction. It lays out principles of how to achieve these goals within the development lifecycle by describing the application options [4].

## 2.1 Policies and Legislations

Jakob Nielsen and the Nielsen Norman Group have published a set of 113 Design Guidelines for Homepage Usability resulting the many years of work in the usability engineering field and conducting an immense variety of research. The guidelines serve as requests and are grouped into 24 categories, such as Content Writing, Graphic Design, Search, Dates and Times, and Gathering Customer Data [5]. The Quality in Use Integrates Measurement Model (QUIM) approaches usability evaluation standards by portraying a consolidated and hierarchical model of usability measurement. It covers 10 factors which are as follows: efficiency, effectiveness, productivity, satisfaction, learnability, safety, trustfulness, accessibility, universality, and usefulness. The model calls to be a basis under which other methodologies can derive [6].

Usability issues are furthermore addressed as national requirements for ensuring the accessibility of web content within different countries all over the world. The proposed methodology has included aspects of the American and German law to eliminate barriers in information technology. The new Section 508 Standards Guide of the US Rehabilitation Act addresses legal and technical compliance of information technology of federal agencies to eliminate usage barriers for disabled users. The subchapter Software Applications and Operating Systems focuses on the accessibility of software [7].

The German equivalent, the regulation for accessible information technology, Barrierefreie Informationstechnik Verordnung (BITV 2.0) follows the WCAG 2.0 by setting two priorities to follow the four principles. Public authorities are intended to follow the attachment with guidelines to implement the standards [8].

## 2.2 Mobile Environment Specifications

The iOS Human Interface Guidelines give recommendations and implementation examples for developers and are divided into Platform Characteristics, Human Interface Principles, App Design Strategies, User Experience Guidelines and iOS Technology Usage, and UI Element Usage Guidelines. The recommendations are precise and specific; however they do not give design implementation in code [9].

The Android Developers Design recommendations provide a framework for building an application according to the Android experience to be consistent and enjoyable to use. The recommendations are split up into Style, Patterns, and Building Blocks and are to ensure to learn about Android principles and resources to implement good design decisions to enhance the user's experience [10].

### 3 Methodology Framework

The proposed model for “discount usability evaluation” is a summary of the works listed in section 2. The model is set up as a review questionnaire which can easily be checked by selecting one of the following choices: Applies, Does not apply and N/A. The audit consists of 228 statements, whereof 189 are general usability and accessibility statements and 39 statements refer to specific requirements for tablet applications within the iOS or Android platform. There are a total of 17 categories with each category of statements varying between 4 and 25 questions. The difference is based according to the scope and importance of each category.

#### 3.1 Preparation and Realization

The audit has been transported to a free online survey platform to enable easy sharing, data collection and analysis means. The used platform is Obsurvey ([www.obsurvey.com](http://www.obsurvey.com)), which gives the option to set up a questionnaire without limitation in the amount of questions and portrays a variety of functionalities for data preparation and exporting. The audit furthermore collects different results from those researchers testing the application on an Apple iPad, and those testing on the Android Platform. The following figure (Fig.1) gives an example of the layout.

**InSciTe Adaptive Compliance Audit (2012-12)**

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**User Control**

The following questions refer to aspects that ensure user control within the application.

**The user is informed about memory impact for installing and using the application.**  
(E.g. size of app, amount of free memory consumed and left, app data usage amount.)

Complies  
 Does not comply  
 N/A

**The user is informed about automatic network usage.**  
(E.g. opt-in vs opt-out if necessary, select privacy/security options, manage memory use, and configure automatic operations such as updates.)

Complies  
 Does not comply  
 N/A

**When Pop-Ups are used, the user is informed beforehand.**

Complies  
 Does not comply  
 N/A

**The current window is not changed without informing the user.**

Complies  
 Does not comply  
 N/A

Fig. 1. Survey Questionnaire Sample

### 3.2 Data Collection

The model has been tested by 12 researchers within the InSciTe Adaptive Service Team at KISTI. As no statement was mandatory to answer in order to distinguish which statements of the audit posed difficulties to the researcher, the following table (Table 1) lists the number of participants replying to the questions in total.

**Table 1.** Statement Answers in Total

# of Answers per Question	Amount of Questions Answered (in %)	# of Questions in Total
12	65.4	149
10	28.9	66
8	4.8	11
6	0.9	1

All researchers tested the application on an iOS Tablet. Some researchers made use of the comment option after each category. The comments can be categorized into general feedback about the layout of the audit, questions about the wording of the statements, questions about the statements' meaning, and feedback about the Obsurvey interface.

The overall correspondence were relatively low i.e. 17.5% of the statements (33 out of 189 statements) within category 1 to 15 were answered with a complete correspondence of all 12 researchers. Thus, 36.5% (69 out of 189 statements) could be attained for general usability aspects, and 33.3% (13 out of 39 statements) for the iOS related aspects. The number of statements that did not reach any agreement (e.g. three researchers answered Applies, two researchers answered Does not apply and one researcher answered N/A) reached similar numbers to the agreement excluding the N/A option. 29.7% of disagreement was measured for the general statements and 20.5% for the iOS related categories.

Hence the exclusion of the N/A option increases the percentage of the complete correspondence by 20%. However, for six categories, the percentage of statements that can be classified into total disagreement was higher than the complete correspondence, excluding N/A (by an average of 32.4%). The results for each category can be seen in the following table (Table 2). The following abbreviations are used for the field titles: NOS (Number of Statements), CC (Complete Correspondence), CD (Complete Disagreement).

The high number of disagreement demands for a narrowed validity and scope of the results to draw conclusions. Section 4 discusses how the audit can bring about first results despite the high percentage of disagreement.

## 4 Results

The audit can highlight first results of usability issues. It however is needed to limit the validity of the results as the statements are categorized by a least majority. By totaling the answers of each researcher, each statement is classified by the answer

**Table 2.** Overall Results Divided into Categories

Category	NOS	CC	CC (in %)	CC excluding N/A	CC excluding N/A (in %)	CD	CD (in %)
Layout	25	5	20	5	20	12	48
Navigation	13	2	15.4	3	23.1	5	38.5
Visual Design	21	0	0	2	9.5	12	57.1
Accessibility	14	0	0	4	28.6	3	21.4
Content Language	14	1	7.1	3	21.4	8	57.1
Task Orientation	7	1	14.3	1	14.3	4	57.1
Application Behavior	5	2	40	3	60	1	20
Personalization	4	0	0	2	50	0	0
User Control	17	4	23.5	9	52.9	3	17.7
User Input	6	2	33.3	2	33.3	1	16.7
Search	21	3	14.3	8	38.1	7	33.3
Forms and Data Entry	19	8	42.1	16	84.2	0	0
Help, System Feedback and Error Messages	11	1	9.1	4	36.4	0	0
Internationalization	6	3	50	5	83.3	0	0
Trust, Credibility and Identity	6	1	16.7	2	33.3	2	33.3
iOS Guidelines	21	1	4.8	6	28.6	4	19.1
Multi-tasking with iOS	4	0	0	0	0	1	25
iOS Gestures	14	2	14.3	7	50	3	21.4

option that has been selected the most. Statements that did not reach a least majority are not able to be added to the results and thus are excluded. In a second step, the classification is then considered in a greater context for every single category to group these into areas that need to be checked with ratings that are very low (the majority of statements is classified as Does not apply); areas that should be double checked with ratings classifying the category as *N/A* or those which cannot be classified; and areas that show first results for a compliance of usability standards and guidelines and thus can give confidence to the research team. The classification scheme is as follows.

- Highly complies (100% to 80% Complies for a section).
- Complies (79% - 60% Complies for a section).
- Partly complies (<60% Complies, but majority of answer options for a section).
- *N/A* (majority of answer options for section is *N/A*).
- No classification (there is no majority as two answer options are almost identical).
- Does not comply (the majority of answer options for a section is Does not comply).

The audit results show that the majority of the categories was positively classified: two categories were classified as being highly compliant with 80% and 100%; two categories were classified as compliant and four categories got at least partly compliant results, their positive classification outnumbering the other options by a minimum. Three categories were classified as being not applicable to the application. Their results for *N/A* were chosen more often than other answer options. However these categories should be double-checked to ensure that their validity is true.

Four categories could not be classified, as the least majority of the answer options was too similar to draw conclusions and two categories need to be evaluated in detail, as the major answer option was Does not comply. The following table (Table 3) shows the distribution within each category and the classification selection.

## 5 Discussion

The results as stated in section 4 can draw first conclusions and feedback for areas of usability improvement. Although the process of the auditing itself needs to be advanced and the number of researchers was limited, the methodology can be seen as a starting point to further develop “discount” usability methods. The audit helps to give quick and easily obtainable results for further usability testing.

Hence, the statements with negative grading should be extracted and overlooked by the research team. Some recommendations might be easy to change, whereas other recommendations will demand an expert to be involved for the correction process. For example, the statement “The double tap gesture enables zooming in or out of the touched area of the screen.” might be easily checked and corrected by someone within the research team who is familiar with iOS Gesture activation and thus can ensure a better compliance of the application to tablet platform standards.

The example statement “Constructive advice to fix an error is provided within an error message.” on the other side is less easy to adapt, as constructive advice might be something subjective, being differently perceived by users. Furthermore sources of

**Table 3.** Final Classification Scheme

<b>Category</b>	<b>Classified</b>	<b>Complies (in %)</b>	<b>Not comply (in %)</b>	<b>N/A (in %)</b>	<b>No least majority (in %)</b>
Layout	Complies	68	24	0	8
Navigation	Partly Complies	54	23	8	15
Visual Design	Complies	62	19	5	14
Access	Partly Complies	57	21	14	8
Content Language	Partly Complies	57	14	0	29
Task Orientation	Complies	72	14	0	14
Application Behavior	Highly Complies	80	0	0	20
Personalization	N/A	0	25	75	0
User Control	No classification	35	24	24	17
User Input	Highly complies	100	0	0	0
Search	No classification	38	34	14	14
Forms and Data Entry	N/A	0	0	100	0
Help, System Feedback and Error Messages	Does not comply	18	27	9	46
Internationalization	N/A	17	0	83	0
Trust, Credibility and Identity	Partly Complies	52	16	16	16
iOS Guidelines	No classification	38	24	5	33
Multi-tasking with iOS	No classification	25	0	25	50
iOS Gestures	Does not comply	29	64	0	7



error need to be identified beforehand, creating a complex correction process. Thus, subjective and rather vague statements that were negatively classified should be discussed within the research team to set up a grading and correction frame. Obsurvey has proved to be an easy to use open source tool with a variety of options for the creation and data collection process. However there are some limitations and the audit process itself still has room for improvement to be optimized and to ensure a greater scope of validity of the results.

## 6 Conclusion and Future Work

This paper presented a model for “discount usability” which enables quick and easy first insights of application’s usability issues from within the research team. A usability compliance audit for a tablet application has been constructed using the examples of different international guidelines, policies, and legislations, as well as specific mobile platform guidelines. The wording of the statements emulates the W3C guidelines and additionally gives short descriptions or examples to enable non-usability experts to classify the statements.

The collected results of 12 researchers can draw feedback for first areas of usability improvement needs, as well as reassuring areas that already partly comply with usability guidelines. However, the results can only be seen with limited scope and validity as there is room for improvement of the process of the completion as well as the wording, platform and audit itself.

Furthermore there needs to be additional research in order to evaluate the validity of the answers as some statements might demand to be answered by usability experts. The results show that, with a minimum effort, first insights into usability compliance can be collected and should then be further evaluated through the help of e.g. Usability Testing or involving usability experts. Usability compliance audits can serve as a starting point for usability discussion within the research team and be guidance for status checks. If implemented throughout the whole project process, results can be compared to indicate areas that need to be focused on and give first answers for project communication as well as to stakeholders or other third parties involved.

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