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Understanding the Quality of e-Services: Accessibility, Usability, Efficiency and Security.

Master’s Thesis (30 ECTS)

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Understanding the Quality of e-Services: Accessibility, Usability, Efficiency and Security.

Abstract:

With the fast evolution of technology during last decades today it is possible to develop and offer services (immaterial goods) through Internet, this concept is known as electronic services (e-services), its relevance due its benefits, getting results remotely, and the role they play on business, drive us to think about it in two points (A) what exactly ‘e-service’ is? and (B) how e-service could be efficiently used, accessed, and utilized? On the other hand what are the key components of e-service, regarding four dimensions: (1) Accessibil-ity, (2) Usability, (3) Efficiency, and (4) Security? This thesis presents a conceptual model in order to understand e-services key components (qualitative characteristics) regarding (1) Accessibility, (2) Usability, (3) Efficiency, and (4) Security (AUES), for this goal a systematic literature review on ‘e-service’ conceptual definition with emphasis on AUES was performed. Presented conceptual model allows understanding the quality of e-services based on AUES dimensions and their dependability, it also contributes as base reference to cover gaps for understanding both ‘e-service’ concept and quality perception. We con-ducted a series of tests in order to check how conceptual model performs with selected Estonian e-services. Results show e-services key components relevance in terms of AUES to identify conceptual model applicability, scope and limitations.

Keywords:

e-service quality, security, accessibility, usability, efficiency, key indicators Pealkiri eesti keeles

Lühikokkuvõte:

Tänu tehnoloogia kiirele arengule viimastel kümnenditel on tänaseks võimalik arendada ja pakkuda teenuseid (immateriaalseid tooteid) Interneti kaudu. Neid nimetatakse elektroonilisteks teenusteks (e-teenusteks) ning nende asjakohasus tänu eelistele, mille annavad vahemaast sõltumata saadavad tulemused, ja nende teenuste roll äritegevuses, juhivad meid kahe küsimuse juurde: (A) mida täpselt e-teenus endast kujutab ja (B) kuidas e-teenust kõige tõhusamalt kasutada, kättesaadavaks teha ja rakendada. Teisest küljest, mis on e-teenuse põhikomponendid, kui vaadata neid neljast aspektist: (1) kättesaadavus, (2) kasutatavus, (3) tõhusus, (4) turvalisus?

Käesolevas magistritöös esitatakse kontseptuaalne mudel, mis aitab mõista e-teenuse põhikomponente (kvaliteedi parameetreid) nagu (1) kättesaadavus, (2) kasutatavus, (3) tõhusus, (4) turvalisus (ehk lüh. ingl. AUES). Selleks antakse süsteemne ülevaade e-teenuse mõiste määratlemisest kirjanduses rõhuasetusega AUES-komponentidel.

Esitatud kontseptuaalne mudel aitab hinnata e-teenuste kvaliteeti nimetatud nelja parameetri (AUES) alusel ning nende parameetrite usaldusväärsust; ühtlasi aitab see soovitusliku baasina täita lünki e-teenuse mõistest aru saamisel ja selle kvaliteedi tajumisel.

Selleks et mõista, kuidas kontseptuaalne mudel töötab valitud Eesti e-teenuste puhul, viisime läbi rea katseid. Tulemused näitavad e-teenuse põhikomponentide asjakohasust AUES-est lähtuvalt, tuvastamaks kontseptuaalse mudeli rakendatavust, võimalusi ja piiranguid.

Võtmesõnad:

Kvaliteet, e-teenus, turvalisus, kättesaadavus, kasutatavus, tõhusus, põhinäitajad

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# Introduction

The fast growth of Internet has created great opportunities for businesses regarding electronic services offered via Internet (e-services), E-services are becoming increasingly important not only for determining either success or failure of electronic commerce (Yang et al., 2001), but also providing users with experience on interacting with flow of information (Santos, 2003). Since early days of Internet’s usefulness companies are continuously looking for new ways to improve services of their business units having on mind their business expansion.

Nowadays users have better access to information they need in a different-easy manner, users don’t have to wait too much or to be physically at specific venue to get results about specific services they need, indeed they can perform transactions immediately through the use of e-services.

However there is no standard understanding about concept of e-service, different entities define it on both valid and different ways according to their interests and convenience, therefore perception about provided quality is also different, this means entities interests have priority instead of users satisfaction when they use and consume e-services.

In his thesis a conceptual model is presented in order to understand e-service key components of qualitative characteristics regarding four dimensions (1) Accessibility, (2) Usability, (3) Efficiency, and (4) Security, referencing to them along this thesis work with the acronym AUES; we will also understand concept of e-service, and specifically how it could be efficiently used, accessed and utilized according with key components of AUES, it is necessary to have reference point to understand how quality depends of AUES and how is the dependability among those dimensions.

“How to assess the dependability among AUES in order to understand the quality of e-services?” is our research question. To determine a set of key e-service components regarding its UAES is the research objective.

This work contributes to the State-of-the-Art with a reference point on defining e-service concept and mainly providing a conceptual model to understand quality on four dimensions: (1) Accessibility, (2) Usability, (3) Efficiency and (4) Security (AUES).

Understanding e-service concept in standard way and its quality in terms of its AUES dimensions and their dependability through a model, gives the opportunity to combine different e-services to produce for example, new business opportunities, increase users satisfaction, and give the chance to realize improvement areas on e-services.

## Organization of thesis

This thesis work is organized in the following 7 chapters:

**Section 1** gives an introduction and shows organization of this thesis work.

**Section 2** gives the State-of-the-Art regarding e-services related areas such as Information Technology Services (IT-Services), Electronic-Services (e-services) current definitions, Quality related to e-services, Electronic-Government (e-government), Electronic-Infrastructure (e-infrastructure), and e-services providers.

**Section 3** is focused on understanding concept of e-service on four dimensions: (1) Accessibility, (2) Usability, (3) Efficiency and (4) Security represented with acronym “AUES” to understand its quality through dependability among them. // dependability on dimensions or dependability on the key components for each dimension.

**Section 4** is the part where conceptual model is presented explaining how it works and ideas behind which contributed to its design.

**Section 5** is about applying proposed conceptual model to selected Estonian e-services and getting results on how model performs on them.

**Section 6** is a discussion about results from experiencing with conceptual model on selected Estonian e-services.

**Section 7** it is not only results summary and its interpretations but also we set what we learned from the model and its limitations when it is applied it to real Estonian e-services, future work and remaining questions are also presented here.

**Appendix** contains all the definitions in order to understand all related terminology on this thesis work.

# Background

Even though the thesis needs to be submitted electronically, many of the reviewers prefer a printout for review. Correspondingly, the thesis needs to be formatted according to the principles of printed documents. For example, you should prefer fonts with serifs as these are easier to read in large paragraphs [[3](#Wil87)]. Similarly , one should keep in mind typographic cueing principles of printed text in order to make emphasising your texts effective [[4](#Fos77)]. Many of the principles are enforced by the normative and guiding documents published by the university, faculty, and the institute. You should note that typographical and layout properties affect legibility differently for printed and on-screen documents [[5](#Dil92),[6](#Ber92)].

# MS Word Editing Best Practices

Microsoft Word® is an easy-to-use text editing and formatting software. This also means that it can be easily misused. Nevertheless, one can avoid lots of problems by following some of the best practices. If you need to learn more about using Microsoft Word, please see the tutorials at <http://word.mvps.org/Tutorials/> and the users’ guide at Addbalance[[1]](#footnote-1).

## Text Formatting

Most beginner mistakes when using Microsoft Word can be tracked back to improper techniques for formatting the text. In order to ensure consistent formatting throughout the document (and make flawless application of document styles and templates possible) one should avoid mixing content with formatting. In short, all formatting should be applied using formatting styles. Changes to formatting of text, paragraphs, or headings should be made to the corresponding styles as that changes the formatting throughout the document instead of just in a single instance. Some of the common mistakes in confusing formatting with content are listed in Table 1. You can find more common mistakes at publishers’ sites [[7](#Mar12)].

## Inserting Figures, Tables, and Listings

Table 1. Common formatting mistakes.

|  |  |
| --- | --- |
| Mistake | Solution |
| Using double return to generate whitespace (e.g. as paragraph break). | Use paragraph’s spacing settings to generate whitespace. Double returns mean an empty paragraph, which paragraph styles are applied to. Thus, changing document-level styles or document style-sets will result in undesired layouts. |
| Paragraphs are formatted differently across the document. | Use paragraph styles and change them as necessary. If you make changes to an individual paragraph, you can use context menu to update the style accordingly as well. |

Even the best layout engines need as much help at layouts as possible. You can help Microsoft Word layout engine at laying out figures, tables, and listings by putting them and their captions into text areas. This ensures that the embedded objects and their captions stay together.

You should avoid positioning your embedded items at the bottom of a page. At the bottom of a page they might end up covering each-other or footnotes. Thus, it is better to position the items relative to the paragraph or aligned to the middle side (for half-width or smaller items) or top of the page (in case of large items that would disrupt the flow of text). It is best to position your embedded items after you complete writing the document as added content might cause the items to get repositioned. You can choose the paragraph you want the item to follow by moving the item’s anchor to it (enable “Show symbols” to see the anchor). You can prohibit Word (and yourself) from moving the anchor by locking it from the positioning dialog.

When inserting a graph or a diagram, you should make sure it uses the same or compatible colour scheme with your thesis. In Microsoft Visio and Microsoft Excel you can switch to the colour scheme used by your thesis via the layout/design menu. In order to avoid unwanted changes to Excel graphs, you could copy them as pictures for printing and paste the image instead of an Excel object into your thesis. Keep in mind that Excel objects in your thesis do change when you make changes in the original Excel file, images don’t.

## Using Bibliography

The most common referencing styles in computer science are ACM and IEEE styles. Unfortunately, Word does not support these on its own. Nevertheless, you can add support for these styles by writing corresponding transformation yourself [[8](#Nat09)] or by installing BibWord styles[[2]](#footnote-2) on your system.

It is possible to combine citations by moving the caret into a citation when adding another one. You should also make sure to select the language of the citation to be the language of your thesis (“English (UK)” for English and “Estonian” for Estonian) as this determines the language in which the reference is formatted in. Failure to set the correct language will cause the references to contain tying words in the wrong language (for example, “and” vs “ja” as a separator of author names).

## General Use

Microsoft Word® offers premium collaboration support, which can be utilised when preparing your thesis. At this point we would like to highlight a few features that you might want to use.

### Change Tracking

Change tracking allows you and your supervisor to keep track, what have you modified since the previous iteration. Change tracking can be enabled from the review menu. Tracked changes can be reviewed and accepted or rejected later while reviewing the document.

### Document Comparison

Document comparison allows you to compare two versions of the document. This is useful when merging supervisor’s comments and changes with your current version of the document. The comparison and merge functions are also available from the review menu.

# This Template

This template provides formatting and practice guides for your thesis. To use the template effectively, you should follow the following workflow:

1. Read the instructions in the template.
2. Adjust the front page for your thesis. Make sure you check every line in the thesis (including curriculum and institute). You can replace the placeholders by clicking on them and typing the replacement text. It is suggested that you change the values in document auto-text fields (e.g. title and author name fields) as this also changes the document metadata and updates other occurrences of the fields.
3. Keep a copy of the template for reference and replace the content (sections and appendix) of the template with your thesis’s content.
4. Verify the layout of your thesis.
5. Update and verify the fields in your thesis (especially the table of contents and the bibliography).
6. Verify the metadata of your thesis.
7. Save your thesis as pdf for submission.

You are free to make changes to the styles used by the thesis as long as they confirm to the requirements specified by the institute.

It is a good practice to include a list of terms or a glossary with your thesis. This is needed in order to clarify the terminology used in the thesis. If possible, one should include the translations of the terms as well to make sure that the thesis’s summary and reviews would use consistent terminology. In this template an example of a glossary is used.

You should use as standard terminology as possible. Standard terms and their translations can be found in IT terminology dictionary[[3]](#footnote-3). If standard term is not available, you can check how the terms are used in standards (see information security standards dictionary[[4]](#footnote-4) and software engineering standards dictionary[[5]](#footnote-5)) or in legal documents (see ESTERM dictionary[[6]](#footnote-6)). Additional dictionaries worth consulting are Tallinn Technical University’s ENTERM[[7]](#footnote-7), Estonian Language Institute’s dictionary[[8]](#footnote-8) and other even less authoritative dictionaries available from Keeleveeb[[9]](#footnote-9). For English terms and explanations not listed in IT terminology dictionary, please see Oxford dictionary[[10]](#footnote-10) for normative reference.

The template uses two types of references: citations and footmarks. Footmarks are preferred way of referring to websites (including websites of the tools you used in the thesis), the rest should be referred to as a citation. If you used a tool that request referring to it via a citation (like most R Statistics Suite[[11]](#footnote-11) packages), and the reader of your thesis would better understand your thesis by reading the citation, you should use a citation instead of a web link in a footnote.

# Conclusions

Bla bla.

# References

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| [1] | Matemaatika-informaatikateaduskonna nõukogu. (2014, jaanuar) Tartu Ülikooli matemaatika-informaatikateaduskond. [Online]. <http://www.math.ut.ee/et/oppimine/loputoode-kirjutamise-kaitsmine-juhend> |
| [2] | Council of the Faculty of Mathematics and Computer Science. (2014, January) University of Tartu Faculty of Mathematics and Computer Science. [Online]. <http://www.math.ut.ee/en/studies-2/guide-writing-and-defense-32-curricula-graduation-thesis> |
| [3] | A. J. Wilkins and M. I. Nimmo-Smith, "The clarity and comfort of printed text," *Ergonomics*, vol. 30, no. 12, pp. 1705-1720, 1987. |
| [4] | Jeremy Foster and Peter Coles, "An Experimental Study of Typographic Cueing in Printed Text," *Ergonomics*, vol. 20, no. 1, pp. 57-66, 1977. |
| [5] | Andrew Dillon, "Reading from paper versus screens: a critical review of the empirical literature," *Ergonomics*, vol. 35, no. 10, pp. 1297-1326, 1992. |
| [6] | Stephen A. Bernhardt, "Seeing the Text," *ACM SIGDOC Asterisk Journal of Computer Documentation*, vol. 16, no. 3, pp. 3-16, September 1992. |
| [7] | Kimberly Martin. (2012, November) Self-pub by Jera Publishing. [Online]. <http://www.self-pub.net/blog/common-mistakes-made-when-writing-a-book-in-microsoft-word/> |
| [8] | Nathan. (2009, April) Office Blogs. [Online]. <http://blogs.office.com/2009/04/29/bibliography-citations-102-building-custom-styles/> |

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Appendix

1. Glossary

|  |  |
| --- | --- |
| Caret  The bar (or other symbol) marking the active editing point. | Sisestusmärk  Märk, mis märgib teksti sisestamise asukohta. |
| Template  A gauge, pattern, or mold, commonly a thin plate or board, used as a guide to the form of the work to be executed. | Mall  Näidik, muster või valuvorm, mis esitab täitmisele võetava töö struktuuri. |

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1. <http://www.addbalance.com/usersguide/> [↑](#footnote-ref-1)
2. <http://bibword.codeplex.com/> [↑](#footnote-ref-2)
3. <http://www.keeleveeb.ee/dict/speciality/itstandard/> [↑](#footnote-ref-3)
4. <http://akit.cyber.ee/> [↑](#footnote-ref-4)
5. <http://stats.cyber.ee/> [↑](#footnote-ref-5)
6. <http://www.keeleveeb.ee/dict/speciality/esterm/> [↑](#footnote-ref-6)
7. <http://www.keeleveeb.ee/dict/speciality/enterm/> [↑](#footnote-ref-7)
8. <http://aare.edu.ee/dictionary.html> [↑](#footnote-ref-8)
9. <http://www.keeleveeb.ee/> [↑](#footnote-ref-9)
10. <http://www.oxforddictionaries.com/> [↑](#footnote-ref-10)
11. <http://www.r-project.org/> [↑](#footnote-ref-11)