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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 this concept 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) Accessibility, (2) Usability, (3) Efficiency, and (4) Security? This thesis presents a conceptual model in order to understand e-services key components 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 qualitative characteristics of e-services based on AUES dimensions and their dependability. We conducted 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 applicability, scope and limitations of the conceptual model.

Keywords:

e-service quality, security, accessibility, usability, efficiency, key indicators, qualitative characteristics, conceptual model

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 võimaldab mõista kvalitatiivseid omadusi e-teenuseid 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, põhinäitajaid, kvalitatiivsed omadused, kontseptuaalne mudel

Table of Contents

Chapter 1. Introduction 5

1.1 Organization of thesis 6

Chapter 2. The state-of-the-Art 7

2.1 Services 7

2.2 Quality 7

2.3 Service Quality 8

2.4 E-services 9

2.5 Quality on e-services 9

2.6 IT-Services 11

2.7 E-commerce 12

2.8 E-government 13

2.9 E-infrastructure 15

2.10 E-services Providers 15

2.11 Chapter summary 17

Chapter 3. Understanding e-service concept 18

3.1 Four dimensions for e-services (AUES) 18

3.1.1 Understanding Accessibility 18

3.1.2 Understanding Usability 18

3.1.3 Understanding Efficiency 18

3.1.4 Understanding Security 18

3.2 Chapter Summary 18

Chapter 4. Conceptual model for understanding e-services qualitative characteristics 19

4.1 Key e-service dimensional components 19

Chapter 5. Applying conceptual model on selected Estonian e-services 20

Chapter 6. Results 21

6.1 Limitations 21

Chapter 7. Conclusions and future work 22

References 23

Appendix 26

I. Glossary 26

II. License 27

# 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 topic not only for determining either success or failure on electronic commerce (Yang et al., 2001), but also on providing users with experience on interacting with flow of information (Santos, 2003). Since early days of Internet, companies are continuously looking for new ways to improve services of their business units having on mind their business expansion or increasing the number of customers.

Nowadays users have better access to information they need in a different-easy manner, they don’t have to wait too much time or to be physically at specific venue to get results about specific services they need either to use or to consume, 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 quality is also different, this means interests of stakeholders have priority instead of users satisfaction when they 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 e-services could be efficiently used, accessed and utilized according with key components of AUES, it is necessary to have reference point regarding the dependability among those dimensions.

To determine a set of key e-service components regarding its UAES is the research objective. “How qualitative characteristics of e-services can be understood?” is our research question.

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 qualitative characteristics of e-services on four dimensions: (1) Accessibility, (2) Usability, (3) Efficiency and (4) Security (AUES).

Understanding e-service concept in standard way and its qualitative characteristics in four dimensions (AUES) and their dependability through a model, gives the opportunity to combine different e-services to produce for example, new business artifacts for 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 chapters:

**Chapter 1** depicts an introduction and organization of this thesis work.

**Chapter 2** presents the State-of-the-Art considering ten (10) topics:

|  |  |
| --- | --- |
| 1. Services | 6. Information Technology Services (IT Services) |
| 2. Quality | 7. Electronic-Commerce (e-commerce) |
| 3. Quality of Service | 8. Electronic-Government (e-government) |
| 4. Electronic-Services (e-services) | 9. Electronic-Infrastructure (e-infrastructure) |
| 5. Quality of e-services | 10. E-services Providers |

**Chapter 3** is focused on understanding concept of e-service and four considered dimensions for this thesis work: (1) Accessibility, (2) Usability, (3) Efficiency and (4) Security represented with acronym “AUES”.

**Chapter 4** is the part where conceptual model is presented and the set of key e-service dimensional components are presented.

**Chapter 5** is about applying proposed conceptual model to selected Estonian e-services.

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

**Chapter 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 to real Estonian e-services, future work and remaining questions are also presented here.

**Chapter 8** contains all the references used for this thesis work

**Appendix** contains a glossary with additional definitions in order to understand related terminology on this thesis work.

# The state-of-the-Art

The State-of-the-Art used in the thesis does mention about what has been understood as e-services during recent years and what has been done related to them, ten topics were considered for this section:

* 1. Services
  2. Quality
  3. Quality of service
  4. Electronic-Services (e-services)
  5. Quality of e-services
  6. Information Technology Services (IT-Services)
  7. Electronic-Commerce (e-commerce)
  8. Electronic-Government (e-government)
  9. Electronic-Infrastructure (e-infrastructure)
  10. E-service providers

## Services

Services are intangible products such as accounting, banking, cleaning, consultancy, education, insurance, expertise, medical treatment, or transportation. Sometimes services are difficult to identify because they are closely associated with a good; such as the combination of the diagnosis with the administration of a medicine. No transfer of possesion or ownership takes plac when services are sold, and they (1) cannot be stored or transported, (2) are instantly perishable, and (3) come into existence at the time they are bought and consumed[[1]](#footnote-1).

A service is a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs or risks[[2]](#footnote-2).

## Quality

There are several definitions and meanings for the concept of “quality” as discussed by Ojasalo (2006). Reeves and Bednar (1994) argue that, no universal definition of quality exists; there are different definitions appropiate for different circumstances. When quality is defined as coformance to specifications then objective and measurable standards are established [[1](#Juk10)]. Quality has usally defined as meeting or exceeding customer expectations (Gronos, 1983; Parasuraman et al., 1985)

It is important to consider quality concept as the perception a customer has after receving the benefits or experiencing the performan of a service according to expectations perceived by the offering. The service provider can do efforts to give differentiated value through the offered service, but if the customer is not satisfied according to his perspective, then quality is considered directly as low.

## Service Quality

In the context of services, quality is often understood as subjective customer perception. Customer perceives quality as the result from how well expectations are met by experiences or performance given by the service. This is called disconfirmation (Gronroos, 1982; Parasuraman et al., 1988, Bitner, 1990, Bolton and Drew, 1991; Gummesson, 1991; Oliver, 1993). Disconfirmation paradigm suggest that when the performan is at the same level as expectations, then service quality is good or excellent. If the performance is at lower level than expectations, service quality is inferior or bad [[1](#Juk10)].

***S***ervices need to be described and understood both in terms of functional capabilities and service quality properties [[2](#kri13)]. Service quality combines several service properties as security, availability, response time, etc., and generally are seen as distinctive success factors for service providers. Quality is used in order to define contract between a service user and the service provider, this is to have a guarantee that needs are met. On the other hand service quality has been defined as a set of non-functional attributes of contextual entities considered as relevant to the service-user interaction. Service quality could be classified as Quality of Execution (QoE) and Quality of Service (QoS) which can be measured for example with execution time, and are supported typically with Service Layer Agreements (SLAs) containing more information than Quality-based Service Description in terms of supporting the service ‘is-active’ activity. On the other hand QoE do measurements in a subjective way, for example usability or reputation, both QoE and QoS give a perception to users. According to Kritikos in [[2](#kri13)], service quality can play significant role during several phases of the service life cycle. Security Quality Models are used to describe concrete properties regarding quality, and can be used by another quality document types to make use of service quality capabilities or requirements. It is worth to mention that the most common SLA components are (according to Paschke et al., 2006): contract validity period, involved parts, service definition and action guarantees. Service definitions specify the service characteristics, components and observable parameters.

## E-services

According to the Ruyter et al. (2001, p. 186) an e-service is an interactive, content-centred and internet-based customer service driven by the customer and integrated with related organisational customer support processes and technologies with the goal of strengthening the customer-service provider relationship.

Hewlett Packard Company defines e-services as “modular, nimble, electronic services that perform work, achieve tasks, or complete transactions”.

An e-service is any asset that is made available via the Internet to drive new revenue streams or create new efficiencies.

E-service is the result of automation, enhancement and integration of the business processes of the traditional services that are moving towards demand on internet.

Having e-services oriented to the customer needs will have some positive impacts on a given organization, which include the improvement of the organization performance and satisfaction on the clients [[3](#JSa03)].

## Quality on e-services

Quality on web portals is worth observing and should be evaluated taking in consideration different perspectives of quality, here quality is the perception of users and the results using a web portal. Some characteristics of quality have been studied but, there is no model aligned with the International Organization for Standarization (ISO) and International Electrotechnical Commission (IEC) standard, series 25010, also known as ISO/IEC 25010 (an evolution of ISO/IEC 9126), defines three main characteristics about quality: Usability, Safety and Flexibility [[4](#May)]

According to [[4](#May)] the main purpose of a software quality model is to specify and assess the level of quality of a product through internal measures of inherent properties of the software, and through external measures of the behavior of the systems of which the software is part.

Based on [[4](#May)] we remark eleven (11) important facts about Quality:

1. Quality is important prerequisite for success.
2. According to ISO, there are various perspectives of quality: internal, external and in use.
3. Success on accuracy on content and useful services tailored to users according to their requirements.
4. Success factor is to warranty the levels of quality on software products.
5. It is no longer sufficient to simply provide technically excellent software products.
6. ISO defines several perspectives in order to analyze the level of quality.
7. Relevant literature has not dealt with quality in use in sufficient depth.
8. When users do not feel safety it is difficult for them to achieve their goals. If they are not satisfied they may easily decide to use another different solution.
9. Assessing the quality in use allows owners to estimate how usable a product might be and the user's satisfaction.
10. To assess quality in use, it is first necessary to define a model, taking into consideration an ISO standard, for example.
11. Perception of quality in use must be measured in terms of results on using a software, not properties of the software itself.

Quality of e-services has increasingly attracted the attention of researchers after 2000, the existing research on this area is mostly focused on identifying quality dimensions of e-services without any deeper attention to the mechanism that explains quality perception [[1](#Juk10)].

According to Ateeq, Kamil and Basri in [[5](#Moh)] e-service quality can provide organization competitive advantages in the online environment.

E-service quality itself is defined as the overall consumer evaluations and opinions regarding the excellence of e-service delivery in the virtual marketplace [[3](#JSa03)]. Collier and Bienstock claimed that e-service quality refers to the perception of the user of the outcome of the service delivery along with service recovery perceptions, if service failures happened [[6](#JEC06)]. E-service quality in return can be considered as the key determinant to the success of online organizations [[7](#JHK09)] and [[8](#RVi02)]. Many online organization businesses, related to this, became unsuccessful due to poor e-service quality [[9](#GGL05)].

All in all, there is a variety of e-service quality dimensions that have positive and significant impacts of perceived quality on online users [[9](#GGL05)]

## IT-Services

An Information Technology Service (IT-Service) is a ready-to-use deliverable that is of value to the customer, allowing to do business without worrying about underlying technology or Information Technology infrastructure[[3]](#footnote-3).

A quality measurement framework focused on IT-Service concept is useful when organizations take into consideration the linked interactions between their measures and corresponding evaluation, this due the understanding of the interrelated work among a system elements is important to aware how other elements are affected [[10](#Mar14)]. This approach is not applicable when organizations consider each system element as isolated and completely separated units, being that coherency wouldn't be part of reaction to risks and changes. Proposed measurement elements could be used in order to understand improvements and quality on services in three different contexts: simple, complicated and complex.

Based on [[2](#kri13)] and [[10](#Mar14)], five (5) important facts about IT-Services are considered:

1. Quality on IT Service is highly dependent on the expectations from customers.
2. IT Service quality measurement framework is intended to understand the various dimensions of IT Service Quality.
3. When service providers attempt to standardize operations and make processes replicable the service providers often look their organizations as separated units instead of the entire system.
4. Continuous improvement on quality of services increases customer satisfaction, this is vital for companies in order to survive on the market. Nowadays quality has become important and recognized, nevertheless, what remains understudied are both its concrete conceptualization and measurements.
5. Comprehensive view of the quality of service offering on both intrinsic and extrinsic quality attributes that contributes to customer satisfaction is necessary.

## E-commerce

Definition for e-commerce has been defined as the buying and selling of products and services by businesses and consumers through an electronic medium, without using any paper documents. E-commerce is widely considered as the buying and selling of products over the Internet, but any transaction that is completed solely through electronic measures can be considered as e-commerce. E-commerce is subdivided into three categories: business to Business or B2B (for example Cisco Networks), Business to Consumer or B2C (for example Amazon), and Consumer to Consumer or C2C (for example eBay)[[4]](#footnote-4)

Online environment has the power of “fast shifting” to consumers in order to switch to a new provider with a click of a mouse. Online customers expect fast, friendly and high quality service. According to Zhao and Gutierrez (2001) users want choice, convenience, and a responsive service with special touch.

Companies need to focus on e-services supported by appropriate technology in order to maintain customers, improve operational efficiencies and boost revenues from e-commerce. In a market where there are so many players, companies need to be customer-centric. Success for a company is measured by how effectively it interacts with its customers.

Important points about e-commerce are:

1. Business to Consumer (B2C) e-commerce is still new and unproven to many customers.
2. A proactive strategy to develop and implement e-services is important requirement in B2C e-commerce.
3. Adopting new technologies to offer e-services to help, to assist customers during search process, comparison-shopping, to find quick answers, etc., and assure trust and secure transaction, lead to get more customers.
4. Applying new tools and techniques can increase e-Services quality.
5. To increase customer base in e-commerce it is important to implement and continuously review the quality of e-services.
6. It is important to identify the value of each e-service in B2C e-commerce.

## E-government

In [[5](#Moh)] is mentioned that e-government is introduced by many governments with attempt of increasing effectiveness and efficiency. For example, citizens and businesses can get information about government policies and regulations and apply for government benefits from anywhere at any time by using e-government services. Electrocnic government can be used as a tool to improve the transparency of government, leading to more accountability and less depravity. In [[11](#AAl08)] is mentioned the successful rate of e-governement projects has been estimated to be low, approximately 35% of e-government projects in developing countries are failed; almost 50% are partially failed, and only 15% are successful. Studies in e-commerce domain indicate that the lack of electronic services quality (e-serice quality) can cause the failure of projects [[3](#JSa03)] and [[12](#HLi09)].

Since the beginning of human civilization provision of services has been important, especially on how those are delivered. When users get a product they do evaluations according to several factors, style, texture, tags, etc. But when services are purchased, aspects to evaluate become intangible (Parasuraman, Zeithaml and Berry, 1985). Customer perspective about quality of service is fundamental to measure users satisfaction. One of the most recent models which allows to measure the quality of traditional services from two perspectives (Consumer and Marketer) was created as conceptual model in 1985. Parasuraman et al. improved and compacted the conceptual model from 10 dimensions (where Accessibility and Security were considered) to 7 dimensions (where none of the 4-dimensions from this thesis work were considerd). Conceptual Model for e-government services does not consider any of the 4-dimensions (AUES) although it was based on improvements of Parasuraman et al. model. During 2010 (Sá, F., et al. 2014) Alanezi, Kamil and Basri did a proposal to measure quality of e-government services, here Security was considered as part of its conception.

E-government service portals need to understand user needs more than government's perspectives or interests. This is a challenge, that's why it's important to have standardized framework that makes architecture of government service portals as clear as possible, the easier is to find information from user’s perspective the better. According to Sarantis, D., et al. (2009) standard frameworks for electronic governments service portals are still in early age; available technologies are used on advanced profitable products. Considered potential and capabilities of having an applicable, sustainable and ever-expanding framework are guidelines (of the framework), to design, development and operation of portals in central, regional and other levels of government. A general accepted definition for government portal and its characteristics definition, is still pending, therefore concept of a portal has not yet been standardized and as a result each entity which implements their own designs, set its own functionality and technical specifications and put own needs before other more important, which are from customers, citizens and businesses. There are implemented e-government services which are not well-designed or not promoted with agencies that provide them.

Based on [[12](#Dem09)] we consider seven (7) important facts about e-government:

1. Users expect quality services, the online dimension is no exception.
2. Quality of services should be analysed and accounted for, in order to maximize and to develop strategies that improve offered services, increasing the satisfaction levels of their consumers.
3. A consumer will always evaluate the service on several factors.
4. The perspective of user concerning the quality of the service is fundamental to measure satisfaction.
5. It is important to have a model to measure quality of services.
6. A one-stop-shop entry point to government information and services is a significant advancement in the maturity of e-government.
7. E-government services are not either well designed or not suitable promoted.

Difficulty to find the needed information and services, complexity to access and use of e-services, the need for a better helpregarding the e-service provided on the web site, and the content understandability are some issues that might create the need of a quality of e-government esrvice [[13](#CHa07)].

Generally, e-government service quality refers to the degree to which an e-government website could facilitate the competent delivery of efficient e-services to help citizens, businesses and agencies in achieving their governmental transactions [[14](#CWT)].

Quality of e-government services can be considered as the driving force to improve e-government efficiency and increase satisfaction on citizens [[5](#Moh)].

It is believed that the success of governmental organizations will depend on the quality of e-government services provided to citizens. Therefore, by understanding the dimensions of quality e-government services enhancing satisfactionson users and gaining user trust, government service managers and governmental organizations should be able to reduce some risks (e.g. investing valuable resources in e-service quality characteritics that may not work effectively) [[5](#Moh)]

## E-infrastructure

Interoperability in e-government has been recognized as key factor in the quest for administrations at national, local and international level to achieve the provision of one-stop services to citizens and businesses (Charalabis, Panetto, Loukis, & Mertins, 2008)

Deployment of information systems over the last 30 years has resulted in the need for opening up and connection closed applications. Such an interoperable, networked and heterogeneous structure is called information infrastructure [[15](#Owe13)]. E-infrastructures usually take place when various applications merge allowing dissimilar applications to be linked into networks. E-infraestructure design never starts in a green-field situation, this means that the central problem is how to integrate existing applications, which are locally controlled by different organizations into an interoperable distributed e-infrestructure of IT capabilities, there is no concrete way to accomplish this. Interoperability in e-government shoud enable efficient information exchange between applications from different agencies in order to provide high quality services to both, businesses and citizens. E-infraestructures are not designed by an omnipotent design and the e-infraestructre emerges from e-infraestructure growth.

Based on [[15](#Owe13)] we consider five (5) important facts about e-infrastructure:

1. Interoperability should enable efficient information exchange between applications from different agencies with help of IT-Services.
2. Interoperability is accomplished by e-infrastructure. Knowledge of how to develop e-infrastructures in the public sector is still limited.
3. The initial problem of starting-up development of e-infrastructure is bootstrapping.
4. Success in e-government requires working together across traditional boundaries to improve services significantly and to reduce operating costs.
5. Central problem is how to integrate existing applications, which are locally controlled by different organizations into an interoperable distributed e-infrastructure of Information Technology (IT) capabilities (Edwards et al., 2009). How to accomplish this is still limited.

## E-services Providers

Around trust and trustworthiness there have been several researches. A trustworthy service is considered to have as minimum a set of elements, those are: preserve and respect the privacy concern of its users, be reliable and be delivered with the top level business integrity. Continuous growth of e-services economy is a trigger for stakeholders to adopt trustworthiness as critical component on offered e-services. Eight elements fundamental for trustworthiness of e-services are identified; only two are related not directly with the 4-dimensions concerning this thesis (‘Privacy’ and ‘Third parties’, both related to Security dimension). According to Ostasius, E., & Petraviciute, Z. (2010), there should be a developed tool for the quantitative assessment of trustworthiness, having two parts, one for evaluating the e-service provider and another part to assess the e-service provider from the user's perspective.

Different maturity, complexity and rapid growth of new e-services promote assessment and comparison with each other [[16](#Egi10)]. Talking about services for the public sector, there is a model, which assist authorities to evaluate maturity and complexity level of provided e-services. Some studies with their methodologies of measuring sophistication level have ranked countries for e-government implementation; they bear basic features in common and are based on the stage models of sophistication. According to Al-Dabbous, N., et al. (2011) demand of high quality e-services means to have a complex providing system, and contrary, the higher sophistication level means the simpler e-service from the user point of view.

Based on [[16](#Egi10)] we remark fourteen (14) important points about e-services providers:

1. Assessment and comparison on new e-services takes place as the number of new e-services growth.
2. Having a model is useful on evaluating the maturity and complexity of e-services.
3. A model has to have measures on its methods.
4. On evaluating e-service, main aspects and characteristics should be identified.
5. The higher sophistication level means the higher maturity of the e-service, the higher sophistication causes the higher service level.
6. Evaluation of e-service maturity means also the evaluation of the system complexity.
7. For construction of the evaluation criteria is recommended to use Model for Service-Oriented Architecture, service categorization, and elements of the e-service model.
8. It is important to consider a quantitative assessment of the trustworthiness level of e-service provider.
9. There are eight fundamental elements affecting the level of trustworthiness of e-service: service personnel, information and communication, technology, policies and plans, service level agreements, privacy, accountability and third party.
10. Result of assessment indicate areas of weakness and strengths.
11. Measures of performance, productivity and success have to be related to the degreee of service users' trust and satisfaction with the provided services.
12. Organizations have to be aware of ethical responsibilities associated with offered services.
13. A trustworthy service must: be secure, preserve and respect the privacy concerns of its users, be reliable, and be delivered with the highest business integrity.
14. A secure service preserves and enforces the confidentiality, integrity and availability of information while in storage, or being processed or transmitted.

## Chapter summary



Figure 1. UML diagram, representing the State-of-the-Art regarding e-services.

# Understanding e-service concept

## Four dimensions for e-services (AUES)

Diversity on business has created a different kind of e-services, therefore is common to find different dimensions to understand e-services quality. On this third part we define each of the four dimensions considered for this thesis work, previous researches related to e-services in different applications as e-commerce, e-government, etc., have shown that Accessibility, Usability, Efficiency and Security as dimensions are the minimum required to perform any study on understanding quality on e-services.

E-services aim to offer to their users various electronic resources and capabilities to execute electronically various tasks and transactions. These include search for products and services, transaction with banks and government agencies, and acquisition of new knowledge and skills. They can do these on a 24-h basis from their homes or offices [[18](#ELo12)].

It is referenced on [[18](#ELo12)] that despite the high investments that have been made for setting up and running e-services, for most of them, usage is below expectations and users are not satisfied with their quality (European Commision 2008, sumak et al. 2009), so they need improvements in order to reach higher levels of maturity.

Many e-services have been developed and are currently used by individual and organizations, however their usage and quality tpically are below the expectations of users.

### Understanding Accessibility

### Understanding Usability

According to Yoo and Douth, ease of the site usage is one of the most significant elements that have influenced online satisfactions and behaviours on online users [[18](#BYo01)].

### Understanding Efficiency

Two of the most important reasons for users to do their online transactions are convenience and time saving [[19](#MKi06)]. Thus complexity to use or consume an e-service might emerge dissatisfaction and respectively decrease the trust of users leading them to search for alternatives.

### Understanding Security

## Chapter Summary

# Conceptual model for understanding e-services qualitative characteristics

## Key e-service dimensional components

# Applying conceptual model on selected Estonian e-services

# Results, Scope and Limitations

## Results

## Scope

## Limitations

# Conclusions and future work

## Conclusions

All the e-service quality evaluation methods should consider Accessibility, Usability, Efficiency and Security perspectives.

To evaluate an e-service it is necessary to combine efficiency and effectiveness evaluation dimensions and measures from several existing frameworks, adn adapt them to the particular objectives, characteristics, resources and capabilities of the particualer e-service [[18](#ELo12)].

## Future work

# References

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| [1] | Jukka Ojasalo, "E-service quality: A conceptual model," *Inernational Journal of Arts and Sciences*, vol. 3, no. 7, pp. 127-143, 2010. |
| [2] | Kyriakos kritikos et al., "A Survey on Service Quality Description," *ACM Computing Surveys*, vol. 46, no. 1, October 2013. |
| [3] | J. Santos, "E-service quality: a model of cirtual service quality dimensions," *Managing service quality*, vol. 13, no. 3, pp. 233-246, 2003. |
| [4] | Mayte Herrera, Ma Ángeles Moraga, Ismael Caballero, and Coral Calero, "Quality in use model for web portals (QiUWeP)," n.d. |
| [5] | Mohammed Ateeq, Ahmad Kamil, and Shuib Basri, "Conceptual model for measuring e-government service quality". |
| [6] | J.E. Collier and C.C. Bienstock, "Measuring service quality in e-retailling," *Journal of Service Research*, vol. 8, no. 3, p. 260, 2006. |
| [7] | M. Kim J.H. Kim and J. Kandampully, "Buying environment characteristics in the context of e-service," *European Journal of Marketing*, vol. 43, no. 9/10, pp. 1188-1204, 2009. |
| [8] | R. Vidgen and S. Barnes, "An integrative approach to the assessment of e-commerce quality," *Journal of Electronic Commerce Research*, vol. 3, no. 3, pp. 114-127, 2002. |
| [9] | G.G. Lee and H.F. Lin, "Customer perceptions of e-service quality in online shopping," *International Journal of Retail ^Distribution Management*, vol. 33, no. 2, pp. 161-176, 2005. |
| [10] | Marion Lepmets, Antoni Lluís Mesquida, Aileen Cater-Steel, Antonia Mas, and Eric Ras, "The Evaluation of the IT Service Quality Measurement Framework in Industry," *Global Journal of Flexible Systems Management*, vol. 15, no. 1, pp. 39-57, March 2014. |
| [11] | A. Al-Shehry M., "Transformation towards e-government in kingdom of Saudi Arabia: Technological and organisational perspectives," 2008. |
| [12] | Demetrios Sarantis, Christos Tsiakaliaris, Fenareti Lampathaki, and Yannis charalabidis, "A Standardization Framework for Electronic Government Service Portals," 2009. |
| [13] | C. Halaris, B. Magoutas, X. Papadomichelaki, and G. Mentzas, "Classification and synthesis of quality approaches in e-government services," *Internet Reseach*, vol. 17, no. 4, pp. 378-401, 2007. |
| [14] | C.W. Tan, I. Benbasat, and R.T. Cenfetelli, "Building citizen trust towards E-government services: Do high quality websites matter?," *The 41st Hawaii International Conference on System Sciences*, p. 217. |
| [15] | Owen Eriksson and Goldkuhl Göran, "Preconditions for public sector e-infrastructure development," *Information and Organization*, vol. 23, pp. 149-176, June 2013. |
| [16] | Egidijus Ostasius and Zivile Petraviciute, "Applying e-service model in assessment and comparison of services," pp. 443-450, 2010. |
| [17] | Zhao Huang and Morad Benyoucef, "From e-commerce to social commerce: A close look at the design features," *Electronic Commerce Research and Applications*, vol. 12, pp. 246-259, 2013. |
| [18] | Filipe Sá, Álvaro Rocha, and Manuel Pérez Cota, "Quality models of e-government online services," *IEEE International Conference on Computer and Information Technology*, 2014. |
| [19] | Naelah Al-Dabbous, Anwar Al-Yatama, and Kassem Saleh, "Assessment of the trustworthiness of e-service providers," 2011. |
| [20] | E. Loukis, K. Pazalos, and A. Salagara, "Transforming e-services evaluation data into business analytics using value models," *Electronic Commerce Research and Applications*, vol. 11, pp. 129-141, 2012. |
| [21] | Hadi Teimouri, Shirin Rafiei Samani, Soroosh Emami, and Shiva Hamidipour, "Studying the key indicator of e-service quality in success of e-commerce," 2014. |
| [22] | Iham Tariq, Ahmad Kamil, and Hamid Jebur, "Proposed conceptual model for e-service quality in Malaysian universities," 2014. |
| [23] | Tsuen-Ho Hsu, Li-Chu Hung, and Jia-Wei Tang, "A hybrid ANP evaluation model for electronic service quality," *Applied Soft Computing*, vol. 12, pp. 72-81, 2012. |
| [24] | Mohammed Ateeq, Ahmad Kamil, and Shuib Basri, "A porposed model for assessing e-government service quality: An E-S-QUAL Approach," 2012. |
| [25] | Aline Chiabai, Lorena Rocca, and Livio Chiarullo, "A service quality model for web-services evaluation in cultural heritage management," pp. 227-242, 2011. |
| [26] | Hunk-Jen Tu and Yuan-Ting Chaoo, "Toward a framework for assessing e-marketplace service quality," pp. 36-43, 2011. |
| [27] | Daniel Oberle, Alistair Barros, Uwe Kylau, and Steffen Heinzl, "A unified description language for human to automated services," *Information Systems*, vol. 38, pp. 155-181, 2013. |

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Appendix

1. Glossary

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| 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.businessdictionary.com/definition/services.html [↑](#footnote-ref-1)
2. http://its.yale.edu/news/itil-foundations-what-service [↑](#footnote-ref-2)
3. http://its.ucsc.edu/itsm/servicemgmt.html [↑](#footnote-ref-3)
4. <http://www.investorwords.com/1637/e_commerce.html> [↑](#footnote-ref-4)