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MEASURING SATISFACTION OF USAGE FOR WEB-BASED INFORMATION SYSTEM (WBIS) FOR e- SERVICES

Prasanna Pokhrel
Siva Praneeth Babu Vemulapalli

School of Computing
Blekinge Institute of Technology
Box 520
SE – 372 25 Ronneby
Sweden

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Contact Information:

Author(s): Prasanna Pokhrel

Address: Utridarevagen 1A, 37140, Karlskrona, Sweden

E-mail: prasanna.pokhrel@gmail.com

Author(s): Siva Praneeth Babu Vemulapalli

Address: Stenbocksvagen 8, 37237, Ronneby, Sweden

E-mail: spve09@student.bth.se

University advisor(s):

Sara Eriksen

School of Computing

Examiner:

Niklas Lavesson

School of Computing

School of Computing
Blekinge Institute of Technology
Box 520
SE – 372 25 Ronneby
Sweden

Internet : www.bth.se/com
Phone : +46 457 38 50 00
Fax : + 46 457 102 45

ABSTRACT

Advances in Information and Communication Technology (ICT) and the drastic growth of the Internet over the past decade have considerably changed the environment for end-users of computer systems. Therefore, it is important to review how user satisfaction is measured with information systems, especially in a web-based environment. User satisfaction has become one of the most important measures of the success or effectiveness of information systems; however, there is a need of better understanding of its structure and dimensionality in the web environment.

The objective of this research was to develop and validate an instrument for measuring user satisfaction in a web-based environment. In this research, three commercial websites were taken as representatives of Web-Based Information Systems (WBIS) for e-services. This study involved testing the validity and reliability of the end-user satisfaction over a set of heuristics, based on responses from users of three e-service websites.

This thesis explores not only the role of user satisfaction but also the role of aesthetics and other factors, which play a significant role in service oriented websites. In the past, satisfaction was thought to originate from the effectiveness and efficiency of a product and less from its aesthetic qualities. This theory is beginning to change as numerous studies have indicated the importance of visual aesthetics in web design. In service interfaces, aesthetics (the perceived visual appeal and appropriateness of an object) has shown to correlate positively with many aspects of usability and emotional satisfaction.

Keywords: Web Based Information System, e-Services, User Satisfaction,

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ABBREVIATIONS

B2B	Business to Business
B2C	Business to Consumer
BTH	Blekinge Institute of Technology
D&M	DeLone & McLean
E-SAM	E-Service Acceptance Model
ESS	E-Services System
EU	End Users
EUCS	End User Computing Satisfaction
EUE	End User Experience
EUM	End User Motivation
HCI	Human Computer Interaction
HP	Hewlett Packard
HTML	Hyper Text Markup Language
ICT	Information and Communication Technology
IS	Information System
IT	Information Technology
MVE	Migrationsverket
PC	Personal Computer
PEOU	Perceived End Of Use
PU	Perceived Usefulness
SVE	Skatteverket
TAM	Technology Acceptance Model
WBIS	Web Based Information System
WWW	World Wide Web

1 Introduction of Thesis

1.1 Introduction

This chapter tries to describe and identify the purpose of the research. It includes brief introduction of research field containing background, problems, motivation, purpose, aims and objectives, research questions, research methodology, and the probable threats of the research.

1.2 Background

It is well known fact that today most of the human beings are directly or indirectly affected by the development of the computer system. All the people are enjoying its success and new innovations. One of the innovations of the computer system is the Web Based Information System (WBIS will be describe in Chapter 2). Despite of having cultural diversity, linguistic diversity, geographical differences, working under different organizational culture, political diversity, legal difference, etc, in today's world people are trying to grow their market and share their information globally. WBIS provides easy means of platforms for all to achieve their respective goals within a short time and with the secure means of data transform. Most of the time WBIS act like mediator between clients and organizations or users and providers [1]. Organization incorporates WBIS in order to reach the various clients all around the world easily, quickly and cheaply.

Despite that computer systems have become so easily accessible throughout the world; there are still a lot of problems concerning ease of use. A lot of research has been done concerning how to measure user satisfaction. User satisfaction (clearly explained in Chapter 4) is the center concern for every product or services. In our study we have considered User as End User for the product or services. For example if the product is of high quality but could not satisfy the mass users or the end-users then it cannot consider to be a good services or products. Generally, user satisfaction can be explained as “the extent to which users believe that the information system available to them meets their information requirement” [2]. This assessment is very important to focus mainly in the Information System (IS) development, models used by organizations for WBIS. This provides a valuable contribution to the assessment.

Researchers have considered different aspects of IS being assessed as product, process, service dimension, stakeholders, and user satisfaction. WBIS are considered by many people the new generation of IS [3]. The wide spread of communication technologies exploited by WBIS, i.e. internet; make these IS more pervasive than traditional ones [4].

Because of the advances in internet and Information Technology (IT) many IS therefore delivered to the users in a bi-directional manner in a WBIS [1], enabling access through multiple channels in a dynamic and competitive environment. Considering this new environment together with the increased need for system assessment, this study aims to extract a framework to assess effectiveness of WBISs for organizations [5], which will also enable them to create a baseline for future investment decisions. A theoretical model is formulated for comparing the user's satisfaction which is directed to highlight the variables that play an important role in determining usage of websites.

WBIS are designed for a wide range of audiences with different skill sets and needs. It involves more end-users direct information consumption and interaction than the traditional IS. As such, user satisfaction is generally regarded as one of the most important measures of IS success [6]. The description on user satisfaction has grown with varying in the IS environment [7]. Early research on user satisfaction was conducted in the manual data processing environment [8], in which users interact, computer not directly with the support of an analyst or a programmer [9].

Websites operate in a web-based environment. Where, the interaction of users with web based system is same as they interact with their computers system [66]. Once the users successfully access them, they can perform their work-related or personal tasks without need to consult with computer analysts or programmers unless technical problems occur. In other words, they interact with it directly.

User satisfaction has become one of the most important indicators of WBIS success since the arrival of the internet era. WBIS satisfaction deserves its own set of measuring instrument. Instead of adopting the items measuring user satisfaction, related to different IS. It involves more users direct information consumption and interaction than traditional IS. There has been considerable research devoted to establishing a standard user satisfaction instrument since the 1980s [2, 8, 10, and 11].

E-service (explained clearly on Chapter 3) generally can be defined as the electronic application used by the citizens or by some other application [13]. After evolvement of the internet, the way of service that has been given by the organization as well as by the big business houses has changed a lot. It has totally changed the procedure of normally conducting the business. Companies are now able to sell their services by integrating number of services in the web. No matter whatever kind and whatever type of the nature of the service, their intention is to provide different kind of service that would make a citizens or a consumer access to it without any difficulties and technical hazards [14]. These concepts made the development of e-service more effective and efficient, despite knowing the fact that large numbers of technical people as well as resources is considered to maintain the service with a long run vision.

As we know the advancement in internet and IT has made many e-service turned into a dynamic and competitive environment. The services that have been provided by the respective public or private organizations are now not only focused towards making their task easier or maximizing the profit but also, they are extremely focused on how the citizens can get the simpler service without any technical difficulties.

Organization that has been providing e-services has to face numerous challenges and issues regarding the verification and validation of the service. In order to get rid of such subtle but sensitive issue e-services should be presented in an effective manner to fulfill the requirements of the users [15].

However, the ultimate goal of any organization, whether service oriented or profit oriented, is to satisfy their customers, otherwise the organization may go out of business. In this globalized world, citizens/people are major players in the business. If they are not satisfied with the services they are paying for, then sooner or later the organization will suffer. Until and unless proper design and functionalities are in place, customers will face difficulties when attempting to interact with e-services provided by organizations and industries.

So, one of the major challenges for any kind of organizations is to make different kind of services i.e. web site to make it as easier as possible for citizens/users/customers [16]. Currently, organizational websites are focused to meet customer's requirements and their expectation, which finally enhances the usability as well as the operability of the websites. Improper functions in wrong place makes the operation more complex which ultimately results the users/citizens/customers dissatisfaction and move away to other service providers who have succeeded better with their service design, or try to find other ways of accomplishing what they were aiming for.

Hence, a challenge for WBIS is to address a broad spectrum of users and find all of them to make services more efficient and easily accessible. The e-services, at the current situation have been a vital application in today's era of IT. We can even say that the globalization of the industry as well as rapid use of internet has made the citizens/users/customers feel the essence of e-services in order to reduce the time in getting the appropriate service they are willing for.

1.3 Problems

The problem for this topic was knowing users satisfaction in context with organizations providing WBIS for e-services. The underlined problems for this thesis are as follows; we have tried to cover up these problems to fulfill our main objective for thesis study.

- Data provided does not match according to users expectations.
- Organizations are finding difficult to cope with different heterogeneous group and situation.
- Users are making higher expectations over provided e-services.
- Complex services, where perceived quality depends on a number of factors.

1.4 Purpose

The purpose of this thesis is to explore how user aspects of WBIS can be measured in different ways that are relevant for informing continued design in use. WBIS that has become an emerging issue in today's context and of course the improper management in WBIS makes the end-user unable to access different web based services. We are focusing on WBIS for e-services and trying to evaluate the performance according to user's satisfaction point of view.

1.5 Aims and Objectives

Considering purpose statement, the ultimate goal and objectives of this thesis is to investigate satisfaction of the users in the use of e-services. As today, world is globalised and all the people as well as the industry are behind achieving the success without wasting much of the time. But, this may be in vain if the user of the application would not get simpler and easy access to the application for those services which they have paid for or for those in which they are a part. Taking these things in mind, we have set up few objectives to achieve our goal. They are

- ✓ To explore previous studies in IS effectiveness and user satisfaction.
- ✓ To present a novel framework for measuring satisfaction from usage of WBIS.
- ✓ To enhance the proposed framework and to appraise its analysis via websites.

- ✓ To suggest an efficient way that should be taken for the implementation of WBIS to enhance user satisfaction.

1.6 Research Approach

This section basically focuses on the approach of doing research. We will present the research questions and describe our choice of methodology.

1.6.1 Research Questions

Research Questions are the statement that would overall take the whole research in an appropriate path. According to the research question, the researchers would try to mould up their thesis in a proper way so that they can give an accurate shape to the thesis. The following research questions will be answer in our thesis. They are

1. How does WBIS play out concerning e-services?
2. Which is the most effective model of WBIS according to present context?
3. Are the end-users familiar with current WBIS implementations?
4. How can designers capture and include feedback from users as an improvement tools?

1.7 Research Methodology

According to Pattron “Research Methodology is defined as a highly intellectual human activity used in the investigation of nature and matter and deals specifically with the manner in which data is collected, analyzed and interpreted” [17]. Different research approaches exist in order to achieve some goal like experiments, surveying, conducting interviews or questionnaires with concerned stakeholders. In general term, there exist two main approaches that are quantitative and qualitative [18].

The main concern of quantitative research approach is to examine and analysis of results generated by some experiments, surveys or simulation. The qualitative research approach gathers an in-depth understanding about the behavior and the reasons for that behavior. In contrast with quantitative approach, the qualitative approach is done in natural real environment. The strategies associated with qualitative research approach are biography, narrative research, phenomenology, grounded theory and case study [18].

To answer the above research question we will be using the mixed method approach, i.e. qualitative and quantitative study in order to reach our goal which is clearly explained in Figure 1-1 Research Methodology. As WBIS is the interesting issues in today’s IS [19], and therefore to achieve our goal we will study the current WBIS which provides services of different organizations, compare them according to the ease of the users and other outcome is to make a field visit interviews related to users satisfaction, in this way we will fulfill our qualitative study. We will propose our framework relating the effective use of WBIS. We will be conducting survey as a part of our quantitative research.

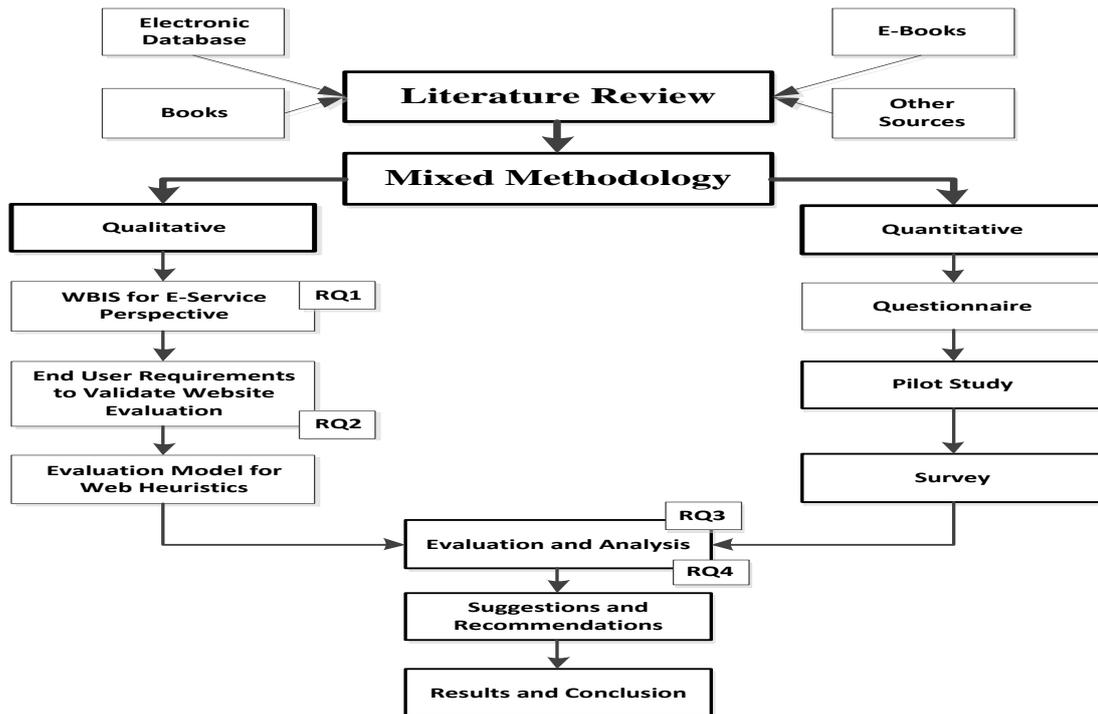


Figure 1-1: Research Methodology

1.7.1 Study of available resources/Qualitative Approach

In order to understand the overall gist of the research area, a thorough study is needed in that particular area of research on which an individual is interested in. Previously a done study on those areas is also the helpful means. For the literature review we will be accessing the accepted databases like IEEE explore and ACM digital library. Other than this Google scholar would also help us in numerous ways in finding the resources that we need. After the literature review we will be able to figure out the shortcomings in the WBIS and come to propose solution. Hence, we can say that the basic behind our thesis is to come up with some specific solution in the web based services i.e. how e-services are concerned with WBIS referring to user satisfaction.

1.7.2 Survey/Quantitative Approach

In order to validate our research, we will be conducting a survey. The survey is a widely used quantitative research which will enable an individual to get the required current data [18]. We will put some questions to the participants and their feedback will be considered in order to give appropriate result to our research.

1.7.3 Inclusion and Exclusion Criteria

To be very specific in the area we are working on, we made up a search strategy where we analyzed our research question carefully. We picked up key words so that it will be easier for us to find the relevant materials for our study. We than split our research questions in order to present or find the appropriated ideas and concept.

With the help of above mentioned concept, we then proceeded in the databases like IEEE and Google scholar to find our material. We also consulted the books to find the relevant literature and different ideas about various authors.

1.8 Validity Threats

There is always a threat to research. The most common threat we are familiar are the internal threats and the external threats. Other than this, the two more threats to research are statistical conclusion validity threats and construct validity threats [18].

1.8.1 Internal Threats

According to study internal validity threats deals with the researcher's ability to draw the correct conclusion from the collected data, which are been experimented or experienced from the particulars [18]. In our thesis the main factors for the internal threats would be inappropriate procedure insufficient technical skills of the researchers, improper participation from the respondent and of course the questions are included. In order to overcome this threat we will initially be conducting pilot survey and will be analyzing the necessary information that would best suit for completion of the thesis in an efficient manner.

1.8.2 External Threats

It is related to the generalization of the fact [20]. If the generalization of the fact is falsely stated then the overall research would be in wrong track which finally changes the moral of the whole work. In our study the external threats may be inappropriate selection of the questionnaire and as well the baseness of the respondent in providing the facts. To solve this issue we will request the respondent to give feedback according to their understanding and experiences in the related field.

1.8.3 Statistical Conclusion Validation Threat

This type of threat normally refers to the wrong conclusion drawn from the data that has been collected. As survey is done and the data are collected, so there might be the chances in predicting the results. Hence, in our case we will be sincere enough to evaluate data and come to a conclusion of the research.

1.8.4 Construct Validity Threats

The last threat is to construct validity threats which define the wrong interpretation of the definition as well as the wrong use of the variable. In our case, we will be going through the databases like IEEE and ACM very thoroughly so that we will try to avoid it as best as possible.

1.9 Thesis Outline

This section defines the overall format of the thesis as well as the chapter divided. It provides ease to the reader while going throughout the thesis report. It will also help finding the answer to the research questions which we have formed.

Chapter 2: (WBIS) Discuss problems of developing WBIS and how important is it for the current organization.

Chapter 3: (E-Service) Discuss e-services at present, how e-services help in balancing the change in an organization and how it is being friendlier to the users.

Chapter 4: (User Satisfaction) Discuss the idea on the user satisfaction evolved with changes in the IS environment.

Chapter 5: (Theories and Models) Discuss different theories from different researchers, with some of the effective models.

Chapter 6: (Evaluation Model) Details out the procedure of survey design. This chapter explains purpose of the survey design and interviews, reasons for choosing survey as a preferred type of data collection, specification of the form of data collection.

Chapter 7: (Results and Conclusion) Here evaluation of the survey, conclusion of the thesis and the directions for future work is presented.

2 Web Based Information System (WBIS)

2.1 Introduction

This chapter describes the purpose of WBIS. It includes the brief introduction, containing background, evaluation, issues, types and the organization in context.

2.2 Background

To start off with WBIS, is one of the most important user paradigms in the present day's communication system. The basic question that may arise in our mind is the usage of web based systems provides us with the best possible initiatives to deal with web. There are many such technologies that are being put to use to deal with web. WBIS is an IS flow that provides information to the users with internet web technologies.

The most very oldest type of technology that has been used under WBIS is html, where message communication is done via tags. The basic tags are used to provide request – response based application for client server communication. The technologies such as html which were the basis for information extraction and view in web, as had some drawbacks. Some of the drawbacks seen obvious in such technology are explained below, the first point is lack of extensibility, which means lack of freedom for users to define their own tags, secondly lack of freedom to define structures that can help in more process communication which enables data to be extracted and placed in the web. One more problem, that is most commonly a problem for the message or data posted in the web is lack of validation, which is lack of internal and external validation, which means the data, cannot be validated as per the client's requirements. To avoid the short comings in the above mentioned technology that is html, then came, the server side scripting technologies. This technology although had some problem, next came, the usage of component based communication, where implementing of this types of interface is independent in platform. This type of technology started getting popular with more and more durability [21].

The next question that may rise in our minds is how to evaluate the usability criteria of WBIS. Various researchers have proposed various solutions to deal with different models related to information based web solutions.

A structural assessment model has been proposed in [22], which deals with a group of strategies and mythologies to deal with informational information, also it assess the usability criteria of the WBIS based on a scale of factors. Based on the factors scale, there will be a quality assessment of web based information posted.

Ozkan has proposed a model that may be used for evaluation of information based system, by means of process assessment levels [23]. The capability levels of the model assessment will be checked to deal with the information proposed on the web. This approach tries to differentiate software from the core information process that takes place inside the system. This is a holistic approach that makes the quality based usability evaluation based on process capability levels.

DeLone & McLean (D&M), define a more practical and realistic approach to deal with the quality of usage of WBIS [24]. It deals with more efficient and practical way to test quality in information retrieval based system. These assessment models are clearly explained in Chapter 5.

2.2.1 World Wide Web & Web Browsers

From our childhood we have been using World Wide Web (WWW), for fulfilling our needs, we cannot imagine that it did not exist thirty (30) years ago [25]. For information flow, WWW and browser are the bases for online information or e-information. Using PCs we can get access to information with the help of WWW or browsers [28]. The fundamentals of gathering human knowledge and presenting them in the form of information to the required users online were the concept through WWW [29]. The WWW is the huge source for providing information in the 21st century. Being a huge database online helping to get information promptly, but the problem for many users is to find the information which they are exactly looking for [27]. So the development as well as the implementation of WBIS should be well-organized as per it meets the directed users satisfaction. Internet mainly concern on front-end and back-end. Front-end is supported by web browsers whereby back-end is done by databases [76].

Standardized user interface is provided by a web browser to different types of information [30]. The wide use of WWW has basically changed the landscape of software development. Last few years, the web has been the deployment environment for new software and applications [25]. At current situation we can see that software companies are shifting towards web-based solutions, where a web solution can provide different category of information like pictures, datas, videos, audios, etc (which will describe below in “Evolution of Web Usage”). While designing the web pages or WBIS it would be better to design WBIS keeping user’s satisfaction in mind [31].

The WWW or web page may contain information, knowledge, pictures, images, graphs, audio and video as required [32]. Recent explosion on web has made, internet base for gathering, collecting, putting information.

Cheung, Kao and Lee have purposed 5 different levels of classification of web tools ranging from 0-4, where level 4 is the most capable of learning the behavior of users and information sources [33, 27].

Taivalsoari, Mikkonen, Ingalls, Palacz, has said that in near future the vast majority of new software will be done in web instead of other kind of conventional target platform [25].

According to Sramek, Berka, Kosek, and Svatek, for the user satisfaction we have to consider some of the tasks oriented to them. The different tasks focusing to the improvement of users needs are as follows [26]:

- The page or web based information should be so managed that the relevant document should not be hidden. User could get the relevant document in one short, like search queries (retrieval).
- Penetration of new documents against stable profile to the user’s (current running profile) gives user security without leakage.
- Navigating/piloting the user’s stable profile.
- Presenting the answers to the user in such a manner that it wouldn’t be difficult for the users for retrieval of answers which should be similar as the retrieval of documents.

2.2.2 Primary Issues

Aggarwal, Wolf and Yu, have presented some issues in favor of deploy information to web pages and WWW, how can the information be provided effectively to the internet users. Taking into consideration there are some of the points we have talked below [31],

- **Web page access rate distribution:** As per the access of the page we can say that the page is frequently visited by users, where we can advertise our page or leave some information regarding our sites.
- **Fairness:** The information provided to the user should be fair, clear and to the point. If the information is unfair, unclear and not to the point the user may not get any information from there and will never refer that web site/page again.
- **Updates:** Information should be up to date, so that the user may not get confused on what are the current trends on the market and what will be the upcoming trends.
- **Page size:** The web page should be managed as per the need of the user. In some places the use of internet are low comparing it to the developed countries so the information should be maintained in such a way that it should be accessible by many as possible.
- **Content classification:** The classification of the page should be done according to the context or topic. If this is not done then the users will be having difficulties in finding what they are looking for.

2.3 Evolution of Web Usage

According to Taivalaari, Mikkonen, Ingalls, Palacz, the rapid change in the web pages has given great benefits to the users. The evolution of web can be characterized as going through three stages, where we can see the change on the entire process for it [25].

In the first stage, the web pages were simple and with little interaction capability. The use of simple forms and textual document was due to unsupportable applications. (<http://www.google.com/>)

During the second stage, the web pages became more interactive, with more of interaction capability. Different web languages helped to change the interface in such a manner that people or users were more interactive and could view information as well as animated multimedia pages. (<http://www.totoya.com/>)

In the third stage, numerous plug-INS such as Flash, Real player and Shockwaves are helping the visualization and multimedia contents. (<http://docs.google.com>)

Evolution of web usages can be briefly presented as:

- Simple forms, textual documents,
- Animated multimedia with more user interaction capability, and
- Rich visualization, user friendly and more application supportive.

2.4 Types of WBIS

There is different WBIS providing different information considering different faculty of users. Mostly we are concerning on services which are WBIS (e-services). From our study in different articles we found that whatever may be the context of the web pages/sites they all provide services to the users. So considering services as the higher

most part of the WBIS we have describing some of the important and related field of WBIS.

- **E-services:** Main purpose of different organizations, government, colleges, health sector going online is to provide services to their different customers wherever they are. The main aspect of ‘e’ is to be online or accessible at all time for customers. Here we will conclude some of the business, organizations, services and governments turning online. More detail on e-services will be provided on Chapter 3.
 - **E-government:** E-government is “the use of information technology to support government operations, engage citizens, and provide government services” [34]. The main purpose of e-government is to deliver government services to the citizens over internet [35]. In [34, 35], they have provided four different range of e-government they are e-services, e-commerce, e-democracy and e-management.
 - **E-health:** E-health is mainly concerned with providing health care services, information, and patient’s medical details via internet or any other related technologies [36].
 - **E-business:** The exchange of money, goods and services over internet is e-business. E-business is mainly related with money factor. E-business is done between different individuals or organizations, like business to consumer (B2C), business to business (B2B), business to government (B2G) etc [34, 35].
 - **E-learning:** E-learning is providing educational services to students via internet. The main players for e-services are the educational institutions (which provide information’s or services through internet) and their student.

2.5 Organization (WBIS) in context

Main concern of our thesis is to find out users satisfaction in different kinds of WBIS provided by different organization. For doing so we have chosen three different organizational web sites which we find sufficient for analyzing different user’s satisfaction and their perception about that organizational web pages. The three different web sites are from different organization giving different services to their customers.

We were motivated to choose the following WBIS because being an international student in Sweden (student of BTH) they are the most essential organization related to our purpose in Sweden. As being the student of BTH we took it as to know students satisfaction towards its library catalog. Before arriving to Sweden we have to go through Migrationsverket and also it will be necessary to increase stay here. For getting register personal number and putting address it will be necessary to be in contact with Skatteverket, all being a public service provider. Three websites that are included for a survey can be viewed in English as well as Swedish as per convenience of the participants.

Firstly, BTH Library, library owned by BTH University in order to serve their students, researchers, teachers, professors, and other staffs with e-books, e-journals, e-papers, e-database, etc via internet [37].

Secondly, Skatteverket, tax office which is a Swedish government authority, providing different services to the citizens and immigrations providing Swedish personal number and other kind of information related to taxes [38].

Lastly, Migrationsverket, migration board which is a Swedish government authority, their purpose is to provide information relate to acquiring visa for those who are willing to come to Sweden with different purposes [39].

- BTH Library (<http://www.bth.se/library/>)
- Skatteverket (Tax office of Sweden) (<http://www.skatteverket.se/>)
- Migrationsverket (Migration Board of Sweden) (<http://www.migrationsverket.se/>)

3 E-Services

3.1 Introduction

This chapter contains an overview concerning e-services. The purpose of this chapter is to describe the e-services background and giving brief introduction on e-services concerning through WBIS by taking BTH University Library as an example.

3.2 Background

The internet has been in use ever since 1960's, it was only a decade later that WWW was born as a second part of the internet. Till the beginning of 1990's, e-services were not implemented but it's regularly in use these days. It is clearly influencing in producing e-services, which has been an innovative to organizations to provide services to customers and businesses [40].

Nowadays, web is the platform which is quickly emerging, too many organizations to deliver services for their customers and users. Web is an outstanding place to do services; it is available 24/7. According to organizations point of view, web based customer services are also known as "e-services", which is one of the most emerging platform for business opportunities via internet [41]. Different types of online services are rising up to satisfy the users, and these trends are potentially increasing expectation of users to overcome user satisfaction [42]. As 'e' is nothing but electronic, which classifies e-services as electronic-services [43].

E-services are a business concept developed by Hewlett-Packard (HP). As per HP, it is given as "modular, nimble, electronic services that perform work, achieve tasks, or complete transactions." [44].

Piccinelli & Stammers (2001), both from HP, described e-services as "any asset that is made available via the internet to drive revenue streams or create new efficiencies" [45].

One of the beginning academic articles defining the term e-services was written by Tiwana and Balasubramaniam in 2001. They defined e-services "as services that are delivered over internet" [46]. In considering, internet is based applications that fulfill services needs by seamlessly bring together distributed, specialized resources to enable complex, (often real time) transactions [47].

Meng, Krithivasan, Raja, & Helal (2002), define an e-services as "Any service or practicality that be able to be accessed by a consumer or a business programmatically throughout the internet via a standard service specification and a standard communication protocol" [48].

Ruyter, Wetzels and Kleijnen (2000), defines e-services as interactive software based information systems obtained by internet. E-services have been pertained to as assets like business processes and information. Computing resources and applications are made available through internet by means of driving new revenue streams and creating efficiencies [49].

Luarn & Lin (2003) wrote a broader conceptualization of e-services as "e –services are interactive content-centered and internet-based customer service, driven by customer

and integrated with related organizational customer support processes and technologies with the goal of strengthening the customer service provider relationship” [50].

When we tried to find out a definition for e-service, we have found definitions of different variation, which are inter-related to each other, but to some extent unusual in their scale and approaching it with different viewpoints. Among all prescribed definitions of e-services, Tiwana & Balasubramaniam (2001) “services that are delivered over internet” is straightforward and simple definition among them, but in customer’s point of view simple definitions are not enough to understand, so they need detailed description according to the scope and purpose of the organizations to express their information. Among all different definitions of e-service do agreed that the internet and web is the basic standard used presently to make the assets available to different users/customers.

The basic understanding of services is, whether the product is material or immaterial. For example, the repair work of a plumber is material in nature, but it is a service [43]. In fact information services (like data, knowledge services and many types of organizational services with respect to their production) will evolve all sorts of services and goods with abide their interactions with services. In this section we discuss briefly about the internet, web and services. Presently, electronic media increasingly dominates which is discussed in next section as what are e-services.

3.3 What are e-services?

As e-services turn out to be more and more accepted and widely spread, the web is also quickly varying. The common usage of the word e-services is originally developed by an IT company, HP [43].

E-services are interactive software-based information systems obtained through internet which is also known as “WBIS for e-services”. They have been concerned as “assets information, business processes, computing resources, applications made available through the internet as a means of driving new revenue streams and creating efficiencies”[51].

E-services are crucial in Business to Consumer (B2C), Businesses to Businesses (B2B) and convenient to create interaction to their customers [51]. It provides distinctive opportunities for organizations to offer new service design strategies to interact with the customers [49]. It is an interactive medium in providing the services between organization and users.

Organizations use e-services to advertise, recruit staff, solicit bids and make/get suggestions to/from users. It is also a great place to support customers and create closer relationships with them. Moreover, “e-service environment creates the opportunity for providing value-added, integrated services, which are delivered by composing existing e-services” [42].

3.4 What does WBIS have to do with e-services?

This section clearly describes about concerning factors between two environments WBIS and e-services. First part of the section describes about e-services, second part with web based e-services and finalize the part with considering a small example by

taking BTH University Library as an organization providing information in the form of a system and services to the students in the form of books or e-books.

E-services mainly deal with one direction of flow. Considering value or information generated by an organization to their related customers and businesses [45]. E-services are self-contained, modular applications which described, located and published by the organization, and can invoked by the users. An organization component plays a major role with all of these roles [56]. It contains three different roles to acquire the service approaches through organization as considering service provider, requester and broker [52].

Sandhu (2008), e-service is concerned as interactive service being provided on the websites by an organizations as web based e-services. Web based e-service delivery allows for users with lots of chances in effective way by using the marketplace to attain any type of services, which acquires 24/7 ease of access, lacking geographic limitation and alter real time delivery of services [53].

The emerging web based e-services area appearing unlimited and increasing from “simple web based e-service area to complex e-service multiplier area” [54], are being evolved by the main organizations functions using through web based e-services. Several main organizations produce like pre-sales and after-sales service activities through it [49]. General example is HP quickly processing their after-sales service to web based e-services as a main business strategy, and attracting the customers/users to interact, provide services. Not only HP many organizations using their business strategies in the form of banking, airlines, car rental, management consulting, music, software and educational institutions are vastly using these web based e-services to deliver to meet the related e-customers demand [55].

Now a day's, web based e-services providing an instant electronic provision of intranet services (as “e” in front) [52]. Coming up to the real world, the organizations investing in airline ticketing, railway ticketing, and bus ticketing, interactively in pre-sales and after-sales product support through online knowledge and delivering the service [55].

However web based electronic services are quickly developing and emerging. WBIS concerning e-services constitute a new perspective, for structuring the perspective let's consider with an example of autonomous organization as BTH University Library system as IS. Taking BTH Library as an example, its main concern is to provide books or articles to their students, professors, and researchers. In order to organize this service, Libris (is a tool which provides a repository of searchable information) is connected with number of Universities within Sweden. The Libris accesses the arrangements of all books or articles generated by different Universities. Libris needs to set a value according to the specifications and co-operations providing by the Universities in Sweden. The basic approaches like publish, located and invoked depends upon the process between the three major roles, considering Libris as e-service agent, Student as e-service requester, and BTH University as e-service provider. This process is done online, where we can know the book is currently located at (which University).

This model gives a brief explanation of exchanging the information or value added by the three important roles as systems providing services. It allows developing, and describing IS to publish the services implemented by the organization through web.

Before providing the services, the WBIS should follow the minimum criteria's to publish, which are shown below as basic criteria's for WBIS concerning e-services.

3.4.1 WBIS for e-services basic criteria's

The basic criteria or activities needs to follow by any system to provide services to their customers or users are:

- WBIS for e-services needs to be developed and described.
- WBIS for e-services needs to be published via intranet or internet for potential users to trace.
- WBIS for e-services need to be accessible to potential users.
- WBIS for e-services must be brought into play for any benefits.
- WBIS for e-services must be up to date.

3.5 WBIS concerning e-services

As taking above criteria into consideration we can say that WBIS for e-services perspective requires three fundamental operations to publish, unpublish, update, discover, invoke and three roles as e-service provider, e-service requester and e-service agent. Considering the perspective as IS which develops and describes the information to publish, unpublish, up to date and providing service to e-service agent. E-service requestor can invoke the IS directly nor gets searchable options from service agent and locates the required information. Keeping all this, we designed WBIS for e-services perspective.

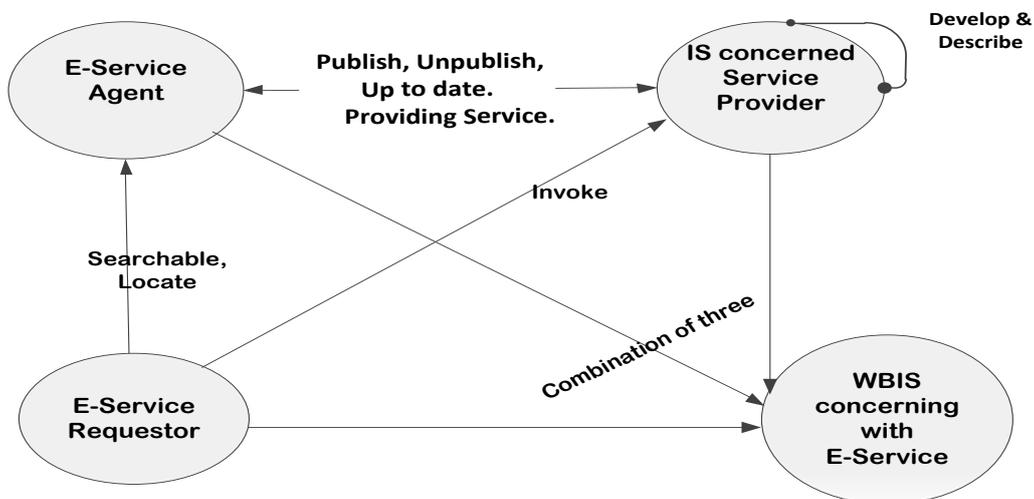


Figure 3-1: WBIS for e-services perspective [52, 56]

3.5.1.1 BTH University as an IS concerned service provider

A service provider that leaves a software application or any type of goods and services to customers/users (for instance comparing it with BTH library system which providing books, e-books, articles as a service to students and researchers). Service provider can develop, describe, publish, unpublish the up to date information from IS and provide the services to e-service agent and e-service requestor. From structural design perspective, it is the major hub for describing the information and providing service.

3.5.1.2 *Students as e-service requestor*

An e-service requestor is the customer getting value from e-service provider and e-service agent. Customers who are looking for a value and needs a service which is available on the web invokes to the service provider. Customers can find out the expected services from e-service agent or directly through e-service provider (for instance students are looking for a book or article from BTH library, if he/she gets the service directly from the university nor if it is not in the university, they can get the service by using Libris as a service agent, to now where the book is located within the co-operated universities).

3.5.1.3 *Libris as e-service agent to service provider*

An e-service agent provides a searchable repository of service descriptions from e-service provider. Where e-service providers can publish, unpublish and e-service requestor can get services directly in order to fulfill their required services (for instance Libris is the repository where it provides a searchable database of books and articles linking different Universities in Sweden).

Combinations of three e-service requestor and e-service agent by taking BTH library system as an example of e-service provider, we presented the design to show, how WBIS concerning through e-service perspective with BTH University.

4 USER SATISFACTION

4.1 Introduction

This chapter describes user satisfaction, their basic requirements and why are user satisfaction purposes for the study. Identify the requirements of users, measure their satisfaction, and how their satisfaction is evaluated and the necessary requirements for the study.

4.2 Background

The main perspective/approach of any business or services is to satisfy users. The success of any organization is seen through their grip in satisfying users. As the organization's servers users with different services, products they have to focus on what kind of users they are focusing on, because different users contain different levels of satisfaction. For example; many people like to drive a car but all don't like the same brand (VOLVO), some may like the same brand but not the same model.

User satisfaction levels do contain differences for services also. The satisfaction factors for everyone keep on changing so it becomes hard for organizations to deal with them. Users should be considered the center since users are the main motive to run services, business [57].

User involvement in IS development is generally considered an important mechanism for improving system quality and ensuring successful system implementation [10].

The growth of WBIS and advances in IT has changed the user environment [58]. User satisfaction is generally regarded as one of the most measures of IS system [12]. If web designers first understand and satisfy user's needs, then it can solve higher education institutions' problems [59].

Pearson, defines user satisfaction as "user satisfaction is the sum of feeling or affective responses to distinguishable factors of the computer-based information products and services that are provided within the organization" [60].

In [61], Lyons says, "only the processing system can't be considered good or best in itself, the true one to decide the value of the system are its users and their satisfaction within it".

As explained by Olson and Baroudi, in [2], implementation of IS system is expensive. To take a decision regarding the installation of any kind of IS it is hard to agree on whether a system is needed or not, if once implemented, it will be important to know whether it is performing properly or not. User's satisfaction is such an evaluation mechanism. User satisfaction is defined as "the extent to which users believe the IS available to them meets their requirements" [2].

IS environment has been evolved with the changes of user satisfaction [8]. Doll and Torkzadeh, has defined user satisfaction as "an affective attitude towards a specific computer application by someone who interacts with the application directly" [12].

The interaction of users with web based system is same as they interact with their computers applications [62]. If the users are capable of using the web based system once then they can use it unless technical problem occurs.

User satisfaction is the emerging topic for IS study, and has become the most research agenda for almost twenty years [63, 64].

As Tojib, Sugianto, Sendjaya, on [62], has said that there are three large stream of research on user satisfaction instruments which are done through considerable conceptual and empirical studies by different researchers. They are given as “User satisfaction with the overall IS/IT systems” [2, 8], “End user satisfaction with a certain type of IT application” [12], “User satisfaction with WBIS” [67, 68].

4.3 Troubles on User Satisfaction Instruments

According to Shirani, Aiken, and Reithel, [65], accepting what factors drive user satisfaction and what is its impact, for developing exact instruments to evaluate user satisfaction, are the main topic for research.

Some troubles associated with presenting user satisfaction instruments are visible. These troubles affect the instruments’ trustworthiness, their ability and usefulness in accepting the user satisfaction to build and connect amount issues. Some of the points are described below.

4.3.1 Lack of Theoretical Basis

The mainly used way of collecting the user satisfaction items or scales are through interviews and questionnaires. While collecting the details scales for different users may differ. Basically the scales are determined according to the literature review. So, the user may not get the proper understanding of those theoretical bases for their evaluation.

4.3.2 The Likert-type Scales

The Likert-type scale contains many divisions for example Doll and Torkzadeh (1988: 263-264) [12] has defined 5 point, Likert-type scales. Those five factors are Content; Accuracy; Format; Easy to Use; and Timeliness. Two problems have been identified in Likert-type scale. Firstly, it will be hard for the user to determine whether the question asked contains dissimilar subjects at same point in time or the same subject will appear on different point [66]. Secondly, Likert-type scales gives a quite rough calculate from one's actual rating. Subjects are limited for the choice to strength on scales. The limitation on the choice doesn’t motivate users for continuity.

4.3.3 Level of User Expertise and Organizational Context

Most user satisfaction instruments spotlight on system products and services. The instrument implemented to determine the user satisfaction should provide little attention to the users as a human. Bailey and Pearson (1983) in [8] gave an instrument which contains two of 39 items which are related to the user’s attributes; for example, user understanding of the system and degree of training provided to the user, remaining items deals with system. As the existing instruments are concern they don’t deals with users or organizational linkages, but they are related with the satisfaction of user’s prior experience, knowledge, and organizational context.

4.3.4 Post-Implementation Bias

The mainly used way of collecting the user satisfaction items or scales are through interviews and questionnaires based on knowledge with an available information system makes unfair towards post-implementation measurement. Before implementing the system, it would be better to take a test regarding user's attitude. To reduce possible dissatisfaction which can be detected before the implementation of the system then it helps on modifying user education, organizational changes, and other adjustments.

4.4 Measures of User Satisfaction

In [2], Olson and Baroudi, has found out four different types of user satisfaction measures described by different researchers, which are mainly concerned on evaluation of IS.

Gallagher's [70], developed user satisfaction measuring factor by focusing on questionnaire which will provide user perceptions of information values of reports granted it by an IS. The questionnaire was divided into two parts: to provide the dollar value of the report from the Manager, and the Managers rating of the reports on which gaps. There was the problem seen in this measure where both the measures were done on the reports, not on the quality of services provided by the system.

Jenkins and Ricketts [71] developed user satisfaction measure factor by focusing on “a survey of existing literature and structured interviews with leading researchers in the field” [71]. Taking eighteen out of 20 items with respect to 5 factors (i.e., input procedures, systems processing, report content, report form, report value) which is defined a priori for constituting user satisfaction. There arise limitations on this instrument, like Gallagher's [70] development, it was focus towards information systems products rather than IS services.

Larcker and Lessig [72] developed user satisfaction measure factor by focusing on two of 3-items which consist of “perceived usefulness.” Out of two dimensions the first scale of measurement is “perceived importance,” which indicates “whether the information is relevant, informative, meaningful, important, helpful, or significant” [72]. The second scale of measurement is “perceived usability” this indicates “whether the information format is unambiguous, clear, or readable” [72]. Larcker and Lessig's also had to face some of the limitations. Only the two dimensions, importance and usability, are not enough to derived, as the authors has noted, may be “ignoring additional dimensions of perceived usefulness, such as information accuracy or timeliness” [72].

Pearson [8, 73] developed user satisfaction measure factor which provides contribution to information satisfaction. Each factor contains four adjective pairs (“Consistent-Inconsistent; High-Low; Superior-Inferior; Sufficient-Insufficient”) are the adjective pairs that make up the factor. The “Satisfaction-Dissatisfaction” and “Important-Unimportant” are used for validating the factor. This instrument also has some problems like the sample was taken on small quantity (29 user managers), and they may have been unfair while participating for the development of this instrument.

From Seddon and Yip [69], literature reviews in different papers they found three user satisfaction instruments, which overlap each other in some points, they contain the question regarding qualities for information generated by the system. But they do differ

from each other in different factors of measurements. The different instruments of user satisfaction;

4.4.1 The Ives, Olson, and Baroudi Instrument

Ives, Olson, and Baroudi developed their instrument reviewing detail of Gallagher's [70], Jenkins and Ricketts [71], Larcker and Lessig [72], Pearson [8, 73]. Pearson's 39-scale user satisfaction measure was selected as the basis for their instrument. They constructed a questionnaire consisting of 33 scales which were for analyzing reliability, validity and factor analysis tests. A Short-Form questionnaire was also developed which only consist 13 scales. Three factors (EDP Staff and Services; Information Product; and User Knowledge and Involvement) were used as responses for reliability and validity test.

4.4.2 The Doll & Torkzadeh Instrument

In 1988, Doll and Torkzadeh designed their instrument to measure end user satisfaction. Where there was 18 items instrument which appears to be 5 point, Likert-type scales (2:263, 264). Their five factors are: Content; Accuracy; Format; Easy to Use; and Timeliness. Doll and Torkzadeh's four factors (Content; Accuracy; Format; and Timeliness) are all same with Ives, Olson, and Baroudi's Information Product. Doll and Torkzadeh don't have any concern with other factors of Ives, Olson, and Baroudi (EDP Staff and Services; and User Knowledge and Involvement).

4.4.3 A Five-Factor Measure of User Satisfaction for General Ledger Systems

Above both (Short-Form user satisfaction and Doll and Torkzadeh's user satisfaction) were claimed for general purpose factors related to IS success and IS effectiveness. For providing overall satisfaction with computer based GL systems, they constructed a more focused measure. This GL system is flexible for allowing users to organize users own report formats. The five independent variable to provide overall satisfaction with GL system are EDP Staff and Services; User Knowledge and Involvement; Information Product; Ease of Use; and GL- system Feature Usefulness-Satisfaction.

1. EDP Staff and Services	→ Short-Form user satisfaction
2. User Knowledge and Involvement	
3. Information Product	
a. Relevance	
b. Content	
c. Accuracy	→ Doll And Torkzadeh Instrument
d. Format	
e. Timeliness	
4. Ease of Use	
5. Usefulness-Satisfaction with GL- system Features	
a. Data capture	
b. On-line inquiry	
c. Report Design	
d. Report generation	
e. Cost allocation	
f. Budgeting	
g. Chart of accounts maintenance	
h. Security	
i. Documentation	

Figure 4-1: A five-factor measure of user satisfaction for general ledger systems [69]

Short-Form user satisfaction only uses factors 1, 2 and 3, Doll and Torkzadeh’s user satisfaction only uses factors 3 and 4, and Five-factor measure of user satisfaction for general ledger systems includes all 5 factors in it.

4.5 User Satisfaction for IS effectiveness model

It is hard to determine user satisfaction level (human mind), so it is hard for an organization to predict the future level of satisfaction of the users. Reviewing different articles we came to the conclusion to give one model related to measurement of user satisfaction. The model is drives from different articles related to user satisfaction but the basis is taken from Kanungo; Duda; and Srinivas [74].

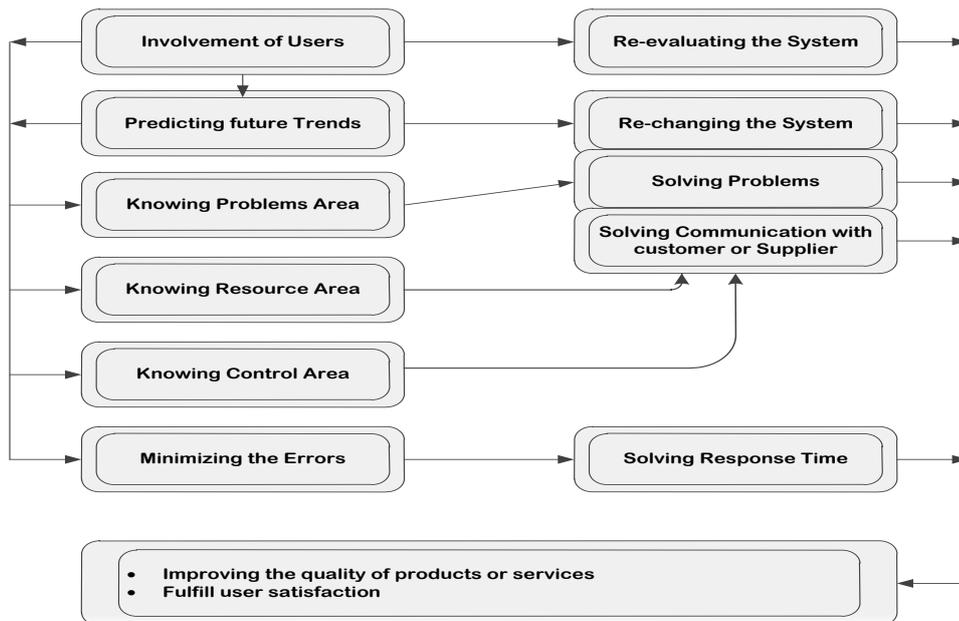


Figure 4-2: User Satisfaction for IS effectiveness model [74]

Above figure is an IS effectiveness model of user satisfaction, which can be described. Many organizations/industry implement their systems, later they focus towards user's satisfaction which seems inconvenient. The organization/industry takes user survey after they find less involvement of users in the system. To know user satisfaction the first part is to take survey/questionnaires regarding that system, before it is launched on the market. The outcome from this survey helps us to modify the features as per the user requirement and can launch the improved product to collect more users.

There are two factors to fulfill user satisfaction in this model. Firstly, the involvement of users in the system, before implementing/launching the system it will be better to involve the group of people, whom the product/services is focused to and take their feedback for improvement of the system. This method helps to improve the system, know the problems area, know the control area, minimize errors which leads to the improving quality of products/services (system) which will fulfill user satisfaction.

Secondly, predicting future trends, as per the history and previous changes in user's satisfaction the system can be generated. Which will also lead to fulfill user satisfaction improving quality of products/services (system) improving/solving all the upcoming problems.

This is a cyclic model any organization/industry can't sit quite, saying that they have already fulfilled user satisfaction. User desire keeps on changing so this model should be used frequently to know the changes in user satisfaction and future trends. The services/product which we provide to our users should be continuous, regular task which encourages users to give specific information/feedback, should be implemented to enhance the quality of the service [75].

5 Theories and Models

5.1 Introduction

This chapter compares different models that predict an end-user acceptance use of an IS. The first one is the IS success model, the second is the Technology Acceptance Model (TAM) to predict the use of an IS, and the third is Measuring the performance of the E-Service Acceptance Model (E-SAM).

5.2 Information System

An IS typically considered to be a set of components that collect the input, processes, and produce an output data or information and provide a feedback to meet an objective (whether the objective will be accepted by end-user or not).

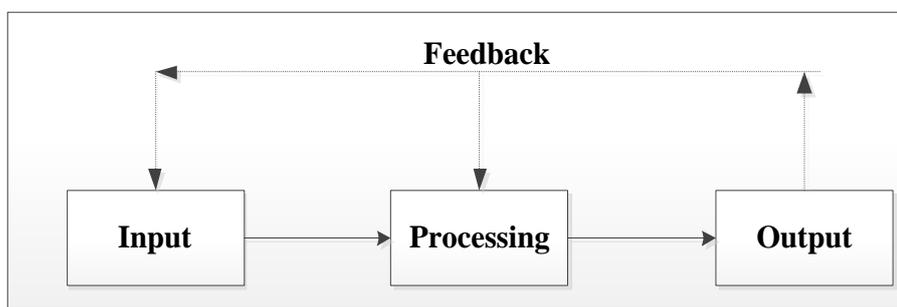


Figure 5-1: Information System (IS)

For the continuous improvement of the IS, the assessment is an important prerequisite to know the acceptance of the end users and continual usage by a feedback loop. The improvement is directly proportional to the overall performance of an organization, like it is measured by its effectiveness [77].

Suggestion is given by the above processing model that an IS was initially created, including with several features that can be characterized as exhibiting various degrees of system and information [84]. End user experiences it features and relate with satisfaction with the system or its information products. The flexibility provided by the system and its information impacts on end user individual's work. These can collectively impact on organizational also [84]. Performance of job and conclusion made by acceptance of user to measure perceived usefulness [84].

The usage of these IS increases the impact in improvements of the organization's output [79]. The measurement of user is important not only at the stage of design, but also after implementation. An individual's intention to utilize the system can also be measured [78]. Though out time, there exist several alterations in the environment, system and users in which they are operated. Changes in environment of business exists which in turn, affects the requirements of user information [80].

There are many different IS used by many different people in a variety of ways. An individual user with an individual task can't represent fully in a diversified way, whoever may be the user and whatever may be the task [78]. User from unlike designation take part in IS, IS needs to satisfy all the users individually. As the time elapses, IS drift from the era of right information at right time to the era of performance

improvement which is the role of the IS in organizational context and performance [82]. The quality of the usefulness of system could be treated by identifying if the total system functionality is being applied for aimed purpose [87].

For example, in this research taking the full functional usage of a websites as e-service systems providing service to BTH students should concern the end-user acceptance and continual usage of the system by taking a feedback for better process. E-service system acceptance has taken as new importance in e-services success measurements, where end-user requirements are “voluntary and essential to desired out-comes” [88, 89, and 90]. Understanding for IS success, e-service system acceptance is clearly a key variable [84].

E-service system usage continues to be used as “dependent variable in a number of empirical studies and continues to be developed and tested by IS researchers” [91, 92, 93, 94, and 95]. Process realization of IS and its effects drove to the introduction of D&M IS model. This model has three elements [84] which are,

- The creation of a system,
- The use of the system,
- The consequences of this system use, there exists no impacts or effects without the existence of acceptance of system and use.

5.3 IS effectiveness

Effectiveness figures out, how well the goal is achieved. IS can be an effective one, it helps to achieve the important goals to meet the requirements of an organization [82]. In order to show its influence on the environment, effectiveness is used as an IS evaluation measure, since IS systems are goal-oriented [83]. Every organization has a mission to improve its performance through its IS. Participatory involvement and continuous feedback helps to sustain the effectiveness as a constant feature, in IS related issues. IS is effective only when its result benefits to the organization whole and not to the individual units or sub units of an organization [81].

The concept of effectiveness is more explained in terms of resource viability. In order to enable the organization deal with the uncertainties of the technology, the IS activities should be streamlined. This goal is achieved only when the IS effectiveness is properly and continuously monitored [81]. Several aspects of the IS that is being measured as process, product, dimension of service and satisfaction of user have been considered by researchers. D&M’s IS success model is the most comprehensive research on success measurement of WBIS [84].

5.4 IS success D&M’s model

The D&M’s model (2003) [84], is a framework and a model for measuring the complex dependent variable in IS research. “This model is regarded as the most comprehensive IS assessment model within the body of IS research” [82]. “Nearly 300 articles and journals have referred, and made it off as IS success model. This wide popularity of the model itself is a strong evidence of the need for a comprehensive framework in order to integrate IS research findings” [84]. The success of D&M’s model of IS based on the work of Shannon and Weaver (1949) and Mason (1978) and on the study of 180 published papers that relate to the issue of IS success [85].

Mason (1978) [86], defines the model with five process of communication of IS as “the production of information, the product itself, the receipt of information, influence it has on the receipt, and influence it has on the system”.

Table 5-1: Mason (1978) To D&M Model (1992)

Stage of communication Mason (1978) [96]	Success category of D&M model (1992) [97]
Production.	System quality.
Product.	Information quality.
Receipt.	Information Use.
Influence on Receipt.	User satisfaction individual impact.
Influence on system.	Organizational Impact.

Shannon and Weaver (1949) [98], defines “technical level “as produces information by the communication system, “semantic level” as the information provided by the system should be success to provide the intended meaning, “effectiveness level”. On the receiver point of view it effects the information as how goal is reached.

Many researchers who worked on the D&M model complained that, it is not complete in certain areas. Like, Seddon (1997) [94], Seddon & Kiew (1994) [99], Pitt, Watson & Kavan (1995) [100]; suggested that the user involvement is a very basic factor which should be included and also argued by modifying the model by adding “Service Quality”, Bonner (1995) [101] also reviewed the D&M model and he introduced the concept of “information awareness” [85].

These researchers contributed a lot for the amendments to take place in the original model, thus supporting to produce an updated model. Thus the success model clearly needs further improvement and it is needed to be updated, as it can serve as a reference to select appropriate IS measurements.

Based on the evaluation and validation of those contributions from many researchers, D&M made minor refinements to the original model and proposed an updated D&M IS success model by adding “service quality, intention to use, user satisfaction and net benefits” [84].

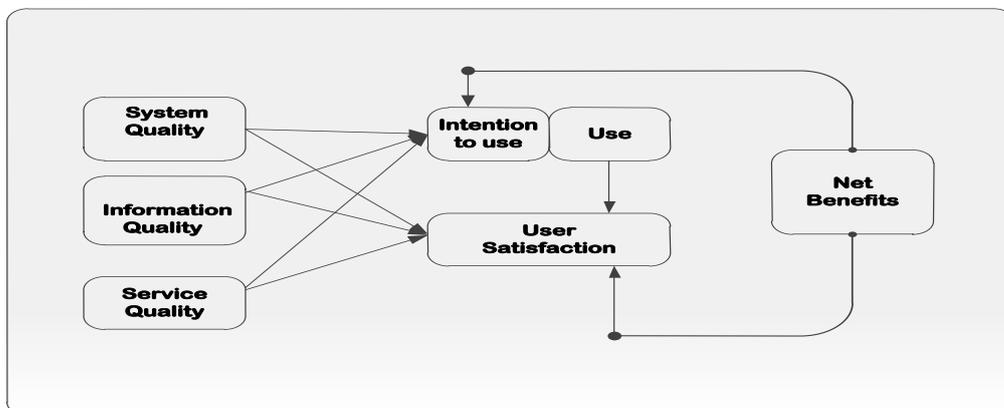


Figure 5-2: Updated D&M Is Success Model [84]

The following are the terms used in above figure 5-2.

- **System quality:** Measures the characteristics of an IS in the internet environment. Different types of characteristics can be measured in terms of “ease-of use, functionality, reliability, flexibility, data quality, portability, integration and importance” [84].
- **Information quality:** System usefulness and net benefits are strongly associated with information quality in recent empirical studies [94]. It has been measured in terms of “accuracy, relevance, understands ability, completeness, currency, dynamic, dynamism, personalization, and variety” [90].
- **Service quality:** Measuring the characteristics like “reliability, responsiveness, assurance and empathy” [84]. Many researchers mainly focused in measuring the products of IS organization (consist of both information provider and service provider) and neglecting in measuring service functions for IS effectiveness [100]. As a result, there is a risk factor for IS researcher to conclude effectiveness of IS without measuring the IS assessment with consideration of service quality [100]. Thus, it is concluded by many researchers for measuring service quality is a major part for IS effectiveness [102]. As per D&M [84], service quality should be updated its hardware or software (“tangible”), it should be dependable (“reliability”) and have to motivate the users with lots of interest through heart “empathy”. IS providers should assure the users (giving faith in the information or service providing by them).
- **Intention to use:** This is included along with “use”. “Intention to use” expose the attitude of the user, where as “use” shows the behavior of the user. As a result of this “intention to use”, “use” and “user satisfaction”, gives the better understanding of the “net benefits” [84].
- **User satisfaction:** This determines the user fulfillment toward the factor or evaluation of the users for that factor, which will provide a better understanding for net benefit of the organization.
- **Net benefits:** Gives the outcome of the objective or goal of the IS organization, “net benefits” are always awaited to be positive. Though the feedback loops are negative but also it is considered. The researcher must mention the context in which “net benefits” are to be measured and should define the users clearly. These dimensions can’t be measured without the influence of “system quality”, “information quality” and “service quality”.

Moreover, service quality and information quality needs to be measured frequently and developed for better processing success of IS. These six dimensions of success are proposed to be interrelated rather than independent. This are the important significances for reporting, measuring and analysis for IS success in empirical studies [84]. Thus the updated D&M model is a useful and successful model for improvising the measures of IS.

5.5 WBIS service assessment

The main purpose of this system is to issue and preserve data with the help of principles based on hypertext. A WBIS general include components with specific functionality, one or more web applications.

Accordingly, practitioners attempted to alter D&M model to include consequence of internet by assuming similar model especially to e-government and e-business environments. For particular e-domains, few studies proposed other models.

Ever since 1992, all researchers are addressing D&M IS success model as a fundamental study. By Molla and Licker (2001) [103], “this IS can be consider as website effectiveness by taking website as an IS”. Thus the research is no exception in recognizing the potential of the model technology relationships of websites and its applicability to identify success measures are as follows;

- Websites are operated with internet and it is essential to understand the relationships and requirements of end users,
- The major requirements leading satisfaction of users for WBIS is performance,
- Taking three websites which provides services, and evaluating their user satisfaction.

5.6 WBIS for e-services considering end-user requirements to validate website evaluation

This session explains the requirements of End User Experience (EUE), End User Motivation (EUM), Perceived Usefulness (PU), and Perceived Ease of Use (PEOU) [57] which may influence user acceptance of WBIS for e-Services by applying TAM model.

The websites are generally perceived by the E-Services System (ESS) successfully, but the web based assessments for e-services has been insufficiently conducting as per the end user’s primary requirements [108]. As innovation in the WBIS for e-services are rapidly increasing and been used by many organizations, it is necessary to know, how end users are able to adjust with this new WBIS for e-services [57]. WBIS for e-services support to improvise the business capabilities. User acceptance and continual usage of e-services system are critical success requirements which help to realize the potential of WBIS for e-services. The research on WBIS for e-services mainly concentrates on understanding the requirements which influence the users to adopt the e-service successfully.

TAM is key utilization model which has concern more. TAM is applied to investigate the end-user requirements to understand the “IS usage and IS acceptance behavior” [106]. TAM measures the influence the acceptance of a technology upon the usage of the technology itself [107]. The two constructs upon which TAM mainly focuses are PU and PEOU [104]. These two constructs nearly explains the user acceptance of technology. PU enhances the performance of the end-user and PEOU would enhance the ease to use [57]. The reason behind the design of TAM was to predict the use of IS. TAM focuses on the behavioral intention to use of IS [108]. The two constructs of TAM which had already shown success in the previous IS studies, is applied to e-commerce and the internet technology adoption [85].

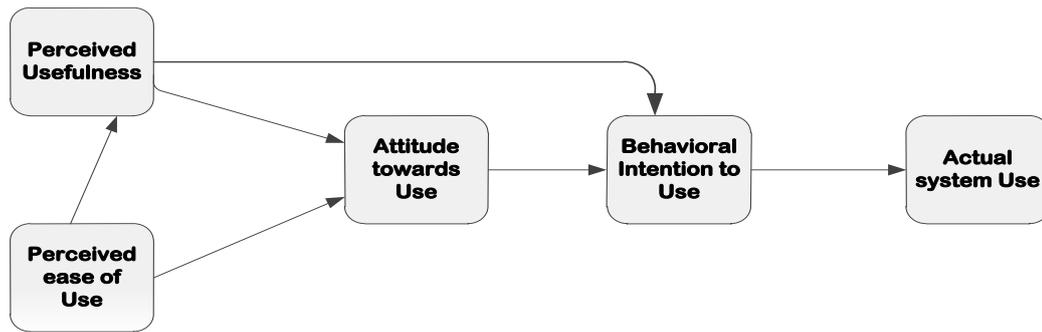


Figure 5-3: Technology Acceptance Model [109]

While the technology is constantly varying and subsequently changing day by day, which has influence of EUE, usage and acceptance behavior should be known for a successful e-service system. For better understanding of e-service system as the dimensions of technology and acceptance of the end user is the central concern to know the requirements of end user satisfaction. However, WBIS for e-services and user acceptance is mainly related to real time “intangible service” delivery through websites. Websites are “successively following the tangible products and services” [57]. Now, we are applying TAM to WBIS for e-services, to investigate the issues we are taking a model with five different requirements as (EUE, EUM, PU, PEOU) for end-user acceptance and the processes which include the End User (EU) continual success usage of services with the help of a feedback [105]. Here the feedback is an evaluation criterion, which is explained in Chapter 6.

The following model is considered applying TAM to WBIS for e-services.

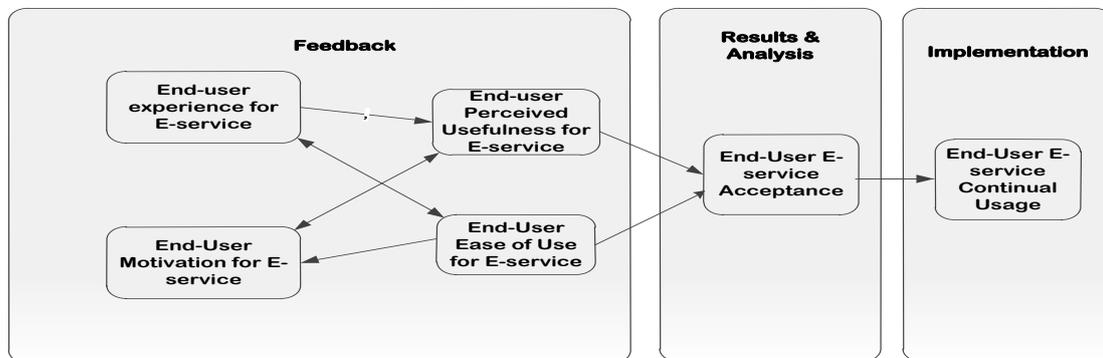


Figure 5-4: End-user requirements to validate website evaluation model [109, 105]

Above model is divided into three parts, feedback, results & analysis, and implementation. The first part deals with feedback, where the different divisions of end users situations are taken as feedback. After taking the feedback the task of this model is to analysis, evaluate for result. The results are analyses for implementing the system for continual usages. The following are the different terms explained from that figure 5-4.

5.6.1 End-User experience for e-service

To measure different experience of the end-users at different point of view is difficult, so, some aspects of user experience were not included on our survey like “feeling of

confusion” to the e-service system, “feeling of frustration” [105] towards WBIS for e-service.

5.6.2 End-User motivation for e-service

End-user motivation is of two types one is extrinsic and another is intrinsic [109]. It is requirement to know repeatedly, why the end user’s are not motivated to follow the service and why it makes to promote the motivation towards the service. Moreover, end user motivation, interestingly dominates the new technology usage for end user acceptance [110, 111]. The motivation level of the EUE which shapes the perception as a very important task to known, by analyzing the motivation level either negative or positive which reflects future usage behavior of acceptance can be varied or change according to acceptance by end user.

5.6.3 End-User perceived usefulness for e-service

This requirement shows how end users are going to support e-service system, how quickly the work is reaching and how performance of end users tasks are achieving “performance, productivity, effectiveness, usage of the e-service system , ease of use of e-service system” [105]. This gives interaction whether the task to end user is useful or not and is varied in acceptance and continual usage.

5.6.4 End-User ease of use for e-service

The requirements of ease of use for end user perspective it is measured as “understand ability, learning, flexible, effort , easy to use, navigation, movement” [105] that related to accessibility of the web pages on e-service system and finding the information, usefulness, accessibility of web pages and information.

5.6.5 End-User acceptance for e-service

End user experience and ease of use be highly suggested for effective analysis of user acceptance for WBIS for e-service [104]. End user motivation and perceived usefulness also relates to findings of users higher level motivation towards end user acceptance [104].

5.6.6 End-User continual usage for e-service

After the successful acceptance, continual usage is another determination in understanding different web based e-services for continuing the process of e-service system. End user acceptance and continual usage of web based e-services provides by end user are important context to measure WBIS e-services success for better proceeding. “The debate of IS and usage success is ongoing” [57].

6 Evaluation Model

6.1 Introduction

In this chapter we have presented the evaluation framework for our thesis and how survey has taken place, what are the different evaluation criteria, and division of evaluation criteria.

6.2 Background

Models and theories developed through literature review in research streams are very much difficult for implementing it practically (e.g. Legris et al., 2003 [113]) because they are linked with their theoretical field (e.g. psychology or sociology) [112].

Mostly, empirical validation is done by the University students in their projects, reports or thesis, they have to present for their qualification of their education, they only get limited time to prepare/test those validity. They (students) don't work with more difficult application and doesn't get time to focus fully on organizational context. It was difficult for us to bind theoretical models into practical framework. Taking Avery's [114] heuristics and Doll & Torkzadeh (1988) [12] End Users Computing Satisfaction instrument model (EUCS) into consideration, we came for measuring different users satisfaction level for three different e-service websites.

Below we have described the way we have presented our survey as well as their evaluation method.

6.3 Set of Heuristics

Avery [114], divides heuristics into five different categories, matching to Lavie and Tractinsky's work [115] (Usability and Functionality; Credibility and Service Quality; Design and Layout; Expressiveness and Creativity; and Persona and Pleasure). We have used many of the adjectives from Avery's; we added new principles and did not consider all of her categories which are used for survey questionnaire. As taking WBIS for e-services as a part of the survey all the heuristics from Avery was unimportant for our context. We have only taken the heuristics which were helpful for fulfillment of e-services websites. Considering Lavie and Tractinsky's we have divided heuristics into six different categories again putting e-service into consideration.

The following are the Avery's categories:

6.3.1 Usability and Functionality

1. Convenience – Information can be found and used within a few clicks of the mouse.
2. Ease of use – It is self-evident how to use the site.
3. Legibility – The fonts are appropriate in size, color, and style. The user can easily locate and read the text.
4. Navigability – It is easy to maneuver from one link to the next. The links are in a logical order.
5. Simplicity – Every element seems to perform a clear function.

6.3.2 Credibility and Service Quality

1. Credibility – The site appears believable and convincing.

2. Reliability – The site can be depended upon to offer current information and work at all times.
3. Accuracy – The information appears factual and free of inaccuracies or grammar errors.
4. Professionalism – The site appears to adhere to technical and ethical standards of professionals.

6.3.3 Design and Layout

1. Use of Color – The colors used are in agreement with the content of the site and with each other.
2. Balance – The visual weight of elements on either side of the web page are approximately equal.
3. Conformity – The site follows conventions of other academic websites.
4. Grouping – Related items are grouped close to each other. Unrelated items are further apart.
5. Unity – The site is composed of a relation of parts in pursuit of a common goal.
6. Consistency – The visual elements are applied consistently throughout the site.
7. Clarity – The intent, organization, and appearance of the site is unambiguous and directed.

6.3.4 Expressiveness and Creativity

1. Originality – The site takes an unorthodox approach and is distinguishable from other websites.
2. Sophistication – The site appears developed and complex.
3. Intrigue – The site captures my interest.
4. Special effects – The site includes animation, sound, or other unique forms of interactivity.

6.3.5 Persona and Pleasure

1. Enjoyment – The site is enjoyable to interact with.
2. Ability to Gratify – The site meets my expectations and is fulfilling.
3. Ability to Motivate – The site encourages me to act.
4. Persona or Image – The image of the visual and verbal elements is consistent and appealing.
5. Social Satisfaction – There is a sense of community on the site, allowing for interaction with others.

6.4 Selected heuristics for our survey

As we mentioned, we have only selected some categories from Avery's and one additional from Doll &Torkzadeh (1988) [12], the selection was made upon the evaluation for e-services websites, as we have taken Doll & Torkzadeh one category which is Timeliness, considering Timeliness as a most necessary part for evaluating service orientation, are as follows;

6.4.1 Usability

1. Ease of use – Is the site self-evident to use.
2. Simplicity – How simple do you find the performance of the web sites.

6.4.2 Service Quality

1. Reliability – Can you depend upon the site to offer current information and work at all times.
2. Accuracy – Is the information actual and free of errors (grammar, spelling and accurate).
3. Professionalism – Does the site abide with technical and ethical standard.

6.4.3 Layout

1. Color combination – Are the colors used in agreement with content and with each other.
2. Grouping – Are the related items grouped together.
3. Clarity – Are the intent and appearance of the site understandable and directed (flow).

6.4.4 Creativity

1. Interest – Do you think that the site is capturing your interest.

6.4.5 Satisfaction

1. Ability to Gratify – Is the site meeting and fulfilling your expectations.
2. Ability to Motivate – Does the site promote to act.
3. Overall Satisfaction – How satisfied are you from the site visits.

6.4.6 Timeliness

1. Up-to-date – Does the site provide up-to-date information.
2. In time– Does the site provide information in time.

Evaluation model is formulated for measuring the user satisfaction which is directed to highlight the variables that play an important role in determining usage of websites. Although WBIS comprise more than website only, the model formulated below can be treated as an estimator. The model has following components, which is mainly derived from Doll and Torkzadeh in [12] and set of heuristics from Avery [114], which is resulting mainly from Lavie and Tractinsky’s model [115].

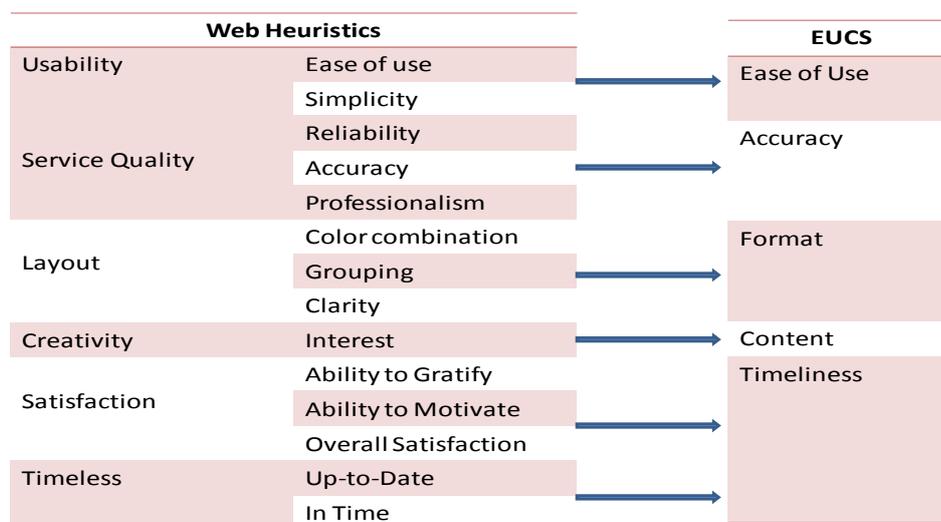


Figure 6-1: Evaluation Model

6.5 Evaluation Criteria

For evaluation we have chosen Doll and Torkzadeh's EUCS model [12], which consists of 5 components which are Ease of Use; Accuracy; Format; Content; and Timeliness. This instrument is regarded complete instrument to work on user satisfaction, because they have already evaluated their previous work under user satisfaction in their search for broad list of items. Now evaluation criteria on user satisfaction against web heuristics are done with the following five components as well as **Appendix I: Questions from Doll and Torkzadeh's EUCS instrument.**

For the evaluation of WBIS for e-services the main factor to be considered is information provided to the user which can be measured through content. The second or can be said as the most important evaluation part for e-services is information accuracy, in a formatted way and easy to use for the users seeking the services. Time being the crucial factor, should also be there for the measurement. So, these are the five components which we took from Doll & Torkzadeh's EUCS model.

6.5.1 Content

The evaluation in this section is done regarding the content of the information in the particular website and the user satisfaction from that information. Under this category the measurement is done regarding "system providing the precise information", "does the information content meets users needs", "does system provide sufficient information", and "does system provide reports that seem to be just about exactly what user need".

6.5.2 Accuracy

This category evaluates according to the accurate performance of the system as well as "Will the users be satisfied by the accuracy of the system". This section is concern about the accurate performance given by the system, and what is the users' satisfaction on that.

6.5.3 Format

It deals with the formatting of the system (webpage). Are the output presented in good format, is the information presented in clear format.

6.5.4 Ease of use

It deals with the easiness to use the system, how is the system implemented or designed for the users. It also considers user friendliness of the system as well as ease of use of the system.

6.5.5 Timeliness

This evaluation criteria deal regarding timely delivery of the information "did user gets the information needed in time". How is system providing up-to-date information to the users?

6.6 Population and Sample

Based on web based functionalities, public websites were selected to test set of web heuristics against user satisfaction criteria. To test the validity of selected criteria, twenty students were selected. Some participants did not have web design experience while some participants did. Questionnaires were designed and provided online via e-

mail or in printed form. Participants were the student from BTH, pursuing different education faculty.

6.6.1 Selection of Websites

The three public websites were selected, where all are of similar genre and purpose. These are the public groups operating in Sweden, the websites home pages in Swedish and English is presented in **Appendix II: WEB Sorts**. The description regarding why we did select this websites is in section 2.5. Selected websites are;

1. BTH Library (<http://www.bth.se/bib>)
2. Skatteverket (Tax Office, <http://www.skatteverket.se/>)
3. Migrationsverket (Migration Board, <http://www.migrationsverket.se/>)

6.6.2 Pilot Study

Before the main test was carried out we conducted a pilot survey taking six students from BTH. They recommended us to change and make our surveys questions more effective and attractive. The participants were from different educational backgrounds (Computer Science, Software Engineering, and Telecom Engineering). The revised survey questionnaires can be seen in **Appendix III: Survey Questionnaires**.

6.6.3 Participants

Twenty students studying at BTH was only considered as the participants who could provide the full survey in time. The average age was 30 (min 25, max 35). Some participants did not have web design experience while some participants did. The survey was not done at college premises. The participants received no compensation. The participants were requested to fill the questionnaires and send it back through e-mail.

6.6.4 Data Collection (Procedures)

Participants were given consent forms and a survey via email or printout. The steps for completing the survey were as follows:

1. Participants filled out background information and should have PC's with internet services to complete other questions.
2. Participants were given time to browse website for five minutes each (if necessary can browse more).
3. Participants placed and noted certain content of different websites.
4. Participants rated each website for overall impression.
5. They then employed the heuristic (qualifier and statement) to rate each website on a scale of 1 to 3.
6. Participants could follow the same directions for next two websites or answer the questions in parallel for all three sites.
7. After the complication of the survey, participants could send their filled survey through e-mail or could print and hand in.

6.7 Hypotheses

After sampling distribution, it is important to make correct inference about population and heuristics categories. Hypotheses were formulated to evaluate the user satisfaction in using web sites. User satisfaction as dependent variable and heuristics categories as

independent variables were taken into considerations. Following hypotheses were formulated according to Fisher [119];

- **Null Hypothesis**

H0: There is no difference in ratings from person to person for user satisfaction considering heuristics.

If and only if the following postulates are significant,

H01: User satisfaction consideration with usability AND

H02: User satisfaction consideration with service quality AND

H03: User satisfaction consideration with layout AND

H04: User satisfaction consideration with creativity AND

H05: User satisfaction consideration with satisfaction AND

H06: User satisfaction consideration with timeliness.

6.8 Data Analysis Tools

In this research, content analyses as well as statistical analysis were performed to complete the research work. After data collection, Microsoft Excel 2007 was used mainly to enter, arrange, categorize, calculate and perform statistical analysis.

Various statistical functions were used like AVERAGE, TTEST, CORREL, and the like. One of the important feature in excel while performing statistical analysis is using 'data analysis tools' [117, 118].

7 Results & Conclusion

7.1 Introduction

In this chapter, we present results of test, analyze end-user satisfaction measures, offer suggestions for improvements for the different web based e-services, discuss limitations of this research, present answers of our research questions, and present our final conclusion with what can be done in near future.

7.2 Collection of data

As the research was carried out as a Master Thesis project, there were set time limits within which we had to plan and carry out our empirical studies. This narrowed down the research/survey and analysis. For the survey, we could only include a sample of twenty (20) people, because we got replies from a number of individuals but many of the surveys were incomplete, and some did not send it in time.

All the persons who did the survey were BTH students doing their degree in different fields. The average age was 30 (min 25, max 35). The student who did reply the survey questionnaires were international student in Sweden who did not knew Swedish language. So, the general question “Do you know Swedish Language?” was not considered as an evaluation factor. Nearly fifty percent (50%) students, who took part in survey, did had experience in designing web based applications. The data was collected as we want to understand the text and scope of design expertise in the selected survey group.

7.3 Data Analysis

This section gives implications of the findings from survey. Based on ANOVA (both one and two way), it can be said that there were significant differences in website ratings. This shows both correlation and variance analysis for factors (i.e. heuristics categories and ratings) taken under consideration. Two types of data analysis was conducted which are Correlation Matrix which can be seen in **Appendix: Correlation Matrix**, and ANOVA table which can be seen in **Appendix: ANOVA Table**.

Correlation Matrix is a measure of the linear relationship between two variables. A high correlation indicates a high positive linear relationship between variables, meaning that as one variable increases the other variable also increases.

ANOVA is most widely used statistical method for quantitative data [116]. An ANOVA tests whether one or more samples are significantly different from each other [116]. Reason behind an ANOVA is to see if there are any differences between groups on same variable.

ANOVA matrices for both websites and heuristics categories are based on the F-test performed for all possible combinations among heuristics categories and websites. The detailed calculations are presented at **Appendix: One-way ANOVAs**, with main focus

on F-test values, because F-test gives the two-tailed probability that the variances between variables are not significantly different. On ANOVA matrix ‘p’ value determines significant if ‘p’ value is < 0.05, and insignificant if ‘p’ value is > 0.05.

7.4 Evaluation of websites

In this study, differences between the websites were highly insignificant (p-value > 0.05 level), which indicates that there were considerable differences among website ratings in some of the categories. The website ratings are shown in table as taken from the survey. On the below table 1, 2 and 3 are the rating taken from the survey, Max is the maximum for that category.

Table 7-1: Average Website Rating

Web Heuristics/Websites Responses		Website 1: BTH				Website 2: SVE				Website 3: MVE			
		1	2	3	Max	1	2	3	Max	1	2	3	Max
Usability	Ease of Use	1	3	16	16	9	10	1	10	11	6	3	11
	Simplicity	3	12	5	12	4	15	1	15	9	10	1	10
Service Quality	Reliability	15	3	2	15	7	7	6	7	6	11	3	11
	Accuracy	14	3	3	14	6	11	3	11	6	2	12	12
	Professionalism	4	2	14	14	2	18	0	18	15	5	0	15
Layout	Color Combination	2	13	5	13	12	6	2	12	6	9	5	9
	Grouping	1	14	5	14	1	13	6	13	4	14	2	14
	Clarity	3	5	12	12	7	12	1	12	2	16	2	16
Creativity	Interest	2	11	7	11	7	11	2	11	13	7	0	13
Satisfaction	Ability to Graftify	0	18	2	18	4	16	0	16	9	8	3	9
	Ability to Motivate	12	5	3	12	5	15	0	15	6	8	6	8
	Overall Satisfaction	3	10	7	10	1	19	0	19	12	7	1	12
Timeliness	Up-to-date	1	17	2	17	10	6	4	10	17	3	2	17
	In time	2	14	3	15	8	9	2	9	1	11	8	11

Figure 7-1 below gives more clear view of table for each heuristic for different web pages.

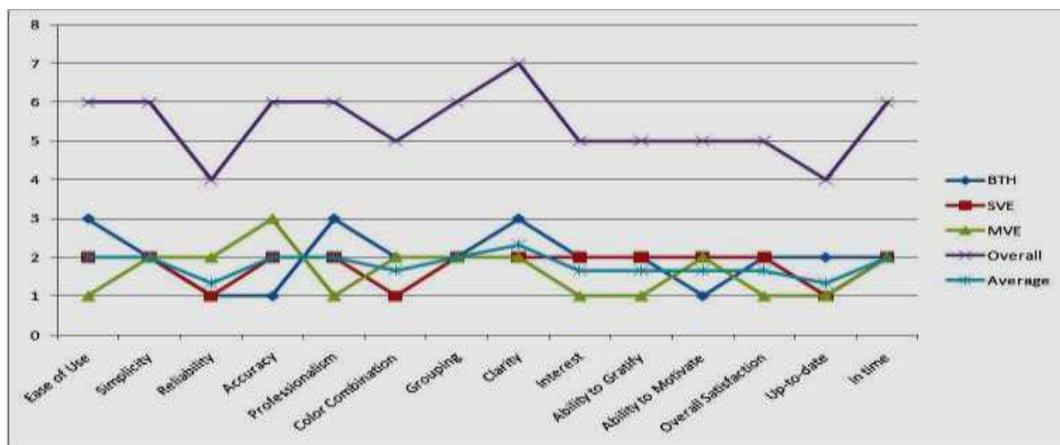


Figure 7-1: Average Website Rating

Above we can clearly see the perception of different users regarding their satisfaction with the web pages. Some of the users did match their response to one another but many of them varied in one or other form. The horizontal line represents the categories from the survey as well the vertical line represents the point given by participants (rating for different websites for different categories).

As we can see (taking BTH into consideration) most of the users agreed on ‘Ease of use’, ‘Professionalism’, and ‘Clarity’, was the most effective part while using the BTH Library web pages.

Taking SVE into consideration, most of the users did not consider the web site effective. The web pages were mostly considered average.

Taking MVE into consideration, in users point of view they evaluated the web site below the average. The most effective part considered by the users was in ‘Accuracy’.

The table below is the correlation matrix of three different web sites.

Table 7-2: Correlation Matrix: Website Ratings

Correlation Matrix	BTH	SVE	MVE
BTH	1.0000		
SVE	0.9926	1.0000	
MVE	0.9967	0.9880	1.0000

Moreover, table above shows the correlation between websites. Based on above information, user satisfaction with BTH is highly correlated with user satisfaction with MVE. In order to see how the main categories correlated, average ratings for the heuristics among categories were taken into considerations. However, appendix **Correlation Matrix: Web Sites** gives a correlation matrix for each and every individual website listed. As correlation matrix is the relation with one another, in the above context we have drawn out the correlation matrix of websites.

7.5 Evaluation of heuristic

The figure below shows the point given by the users for different heuristic for different web sites.

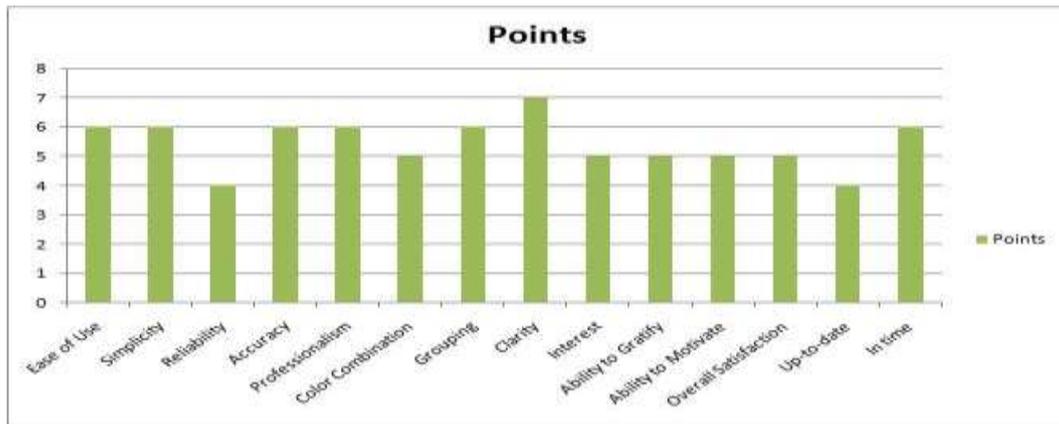


Figure 7-2: Average Heuristic Rating for all three websites

According to the users point of view the heuristic were evaluated according to different web sites as per the users perception/satisfaction. The horizontal line represents categories from the survey as well vertical line represents the points for different categories provided by participants. As we can see in the above figure that ‘Reliability’ and ‘Up-to-date’ are under average scale, which indicates that all the web sites should focus on improving their performances on such categories. This shows that all the web sites were perceived as bad in these aspects.

As above ‘Clarity’ is the top most scorer of all, which indicates that all the web sites were clear in presuing their information to the users. Other heuristics are rated normal, indicating that web sites can improve them for better services, but they can carry on with same quality.

Table below is of correlation matrix, showing interrelationship among heuristics categories of all three websites.

Table 7-3: Correlation Matrix Categories

Correlation Matrix	YU	YSQ	YL	YC	YS	YT	YUS
Usability (YU)	1.0000						
Service Quality (YSQ)	0.6318	1.0000					
Layout (YL)	-0.0822	0.7206	1.0000				
Creativity (YC)	-0.9042	-0.2402	0.5000	1.0000			
Satisfaction (YS)	0.5919	-0.2508	-0.8520	-0.8794	1.0000		
Timeliness (YT)	0.2210	0.8956	0.9538	0.2168	-0.6553	1.0000	

User Satisfaction (YUS)	0.8851	0.9199	0.3910	-0.6016	0.1488	0.6494	1.0000
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The above correlation matrix for different categories shows the relationship between two variables. As we can see that Usability (YU) is not significantly related with Layout (YL) and Creativity (YC), and Service Quality (YSQ) is not significantly related with Creativity (YC) and Satisfaction (YS). The most important relationship is considered with User Satisfaction (YUS). All the categories are significantly related to User Satisfaction (YUS) except Creativity (YC) which clarify that if Creativity (YC) increases User Satisfaction (YUS) decreases.

The calculation is based on data presented in **Correlation Matrix: Categories**. Based on information above, all the heuristic categories are highly correlated with one another, indicating significant differences among these variables.

7.6 Evaluation of End-user Satisfaction

Figure below indicates the average of rating scale among categories. The detail of chart is presented in Category Scale Averages. The figure below describes end-user satisfaction for overall heuristics for the different web sites.

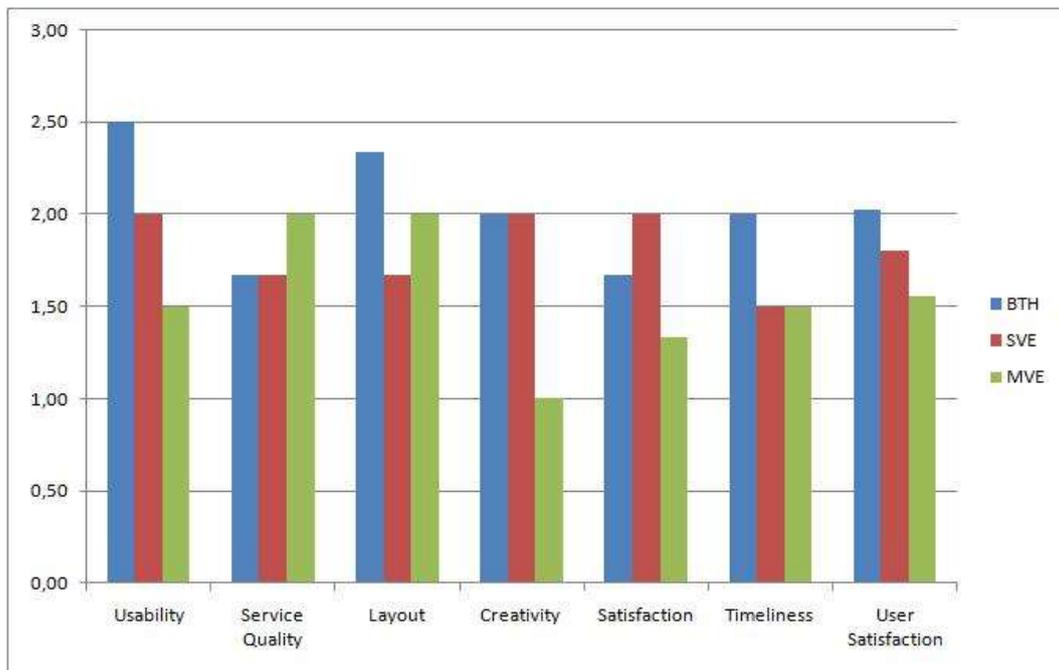


Figure 7-3: Category/Websites Averages

The above figure is the evaluated outcome taken according to survey taken, Blue line denotes BTH, Red line denotes SVE, and Green line denotes MVE. They were taken into account according to Avery's [114], and Doll and Torkzadeh [12] models. User Satisfaction is dependent factor of all other independent factors (Usability, Service

Quality, Layout, Creativity, Satisfaction, and Timeliness). From all the independent factors we have evaluated user satisfaction considering them as effective factor to calculate user's satisfaction for WBIS for e-services. The horizontal line represents heuristics were as vertical line represents points for different websites.

The figure below presents level of user satisfaction for different web pages. This figure gives an overview on the basis of end user satisfaction regarding different heuristics. It is shown to clarify the scale of end-users satisfaction for different websites.

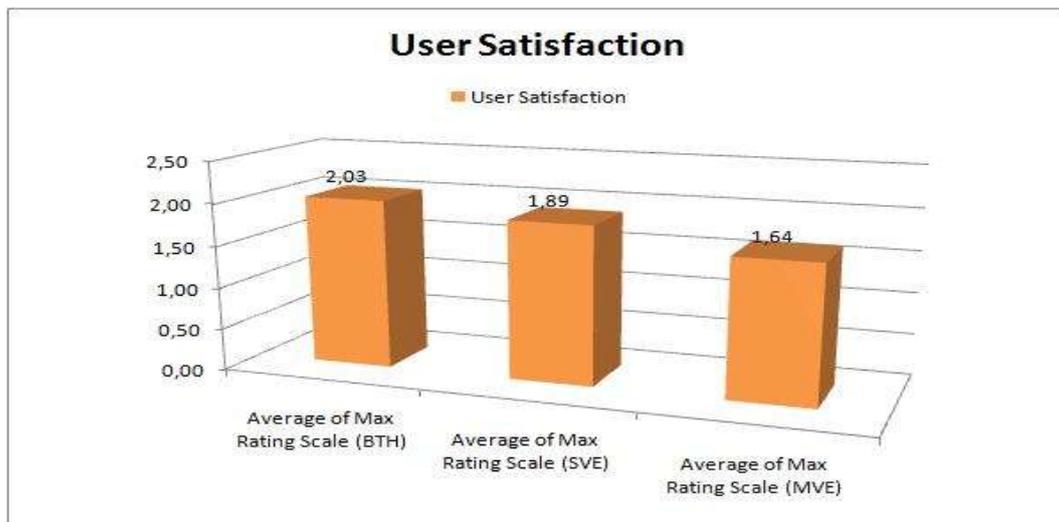


Figure 7-4: Bar Diagram for User Satisfaction

Both figures above indicate that BTH is rated superior for user satisfaction; SVE is rated in an average for user satisfaction; MVE is rated lowest for user satisfaction. BTH holds 2.03 scales out of 3.00 which are 36.5% as the highest SVE holds 1.89 scales out of 3.00 which is 34.0% being second and MVE holds 1.64 scales out of 3.00 which is 29.5% as being last.

As comparing three web sites for e-services we can see that they don't vary much from one another in satisfying users' satisfaction. BTH Library being the services provider for the students (who were the participants for survey) of BTH may be the reason that it got highest rank among these three websites. Other two also can't be said bad enough comparison to BTH. There were different factors to compare user satisfaction, on some of the factors BTH was strong with relating to other two, but in other's factor BTH was weak.

7.7 Hypotheses Analysis

This section gives the analysis for hypothesis formulated earlier. P-Value was taken as basis for evaluation. The detailed calculation and analysis is presented in p-value, it is shown in **P-Value of Websites and Heuristics**.

Table 7-4- Hypotheses Analysis

Hypotheses	P-value	Analysis
H0: There is no difference in ratings from person to person for user satisfaction considering heuristics.		The null hypothesis failed, because all the supporting postulates were found significant.
H01: User satisfaction considering with usability.	0.0571	Insignificant. Since, P-value is more than 5% level of significance.
H02: User satisfaction considering with service quality.	0.0592	Insignificant.
H03: User satisfaction considering with layout.	0.0589	Insignificant.
H04: User satisfaction considering with creativity.	0.0561	Insignificant.
H05: User satisfaction considering with satisfaction.	0.0606	Insignificant.
H06: User satisfaction considering with timeliness	0.0596	Insignificant.

Above analysis showed that user satisfaction appeared to be dependent of above heuristics categories. Users ranked perceived all the categories similarly. Since, the Null Hypothesis is rejected; we can conclude the rating from person to person differs for user satisfaction. Combination of all heuristics categories are considered for rating of user satisfaction by users. The above result shows that, the users are not biased in particular category. It is clear from these studies that website variables or features should not be studied in separate.

7.8 Suggestion for improving websites

As seen from the above there is not much difference in comparison in this case with other websites considering user satisfaction. Users rated different for different heuristics, which can be taken for analyzing drawbacks for different websites.

Taking BTH into consideration, we can see that most of the survey participants were unsatisfied on some of the heuristic like 'Reliability', 'Accuracy', and 'Ability to Motivate'. BTH being the University Library's website is should be more focus towards accuracy of information, reliable for the information to their users (student), and ability to motivate their users to use their services. To increase/motivate the users, BTH library should focus on such categories, and improve their quality.

Taking SVE into consideration, we can see that most of the survey participants were unsatisfied on some of the heuristic like ‘Reliability’, ‘Color Combination’ and ‘Up-to-date’. SVE being the public tax office, they should morally focus on reliable for the information, and up-to-date information which means information at perfect time. Color Combination does not matter much on the context on SVE because they are morally towards information service. To improve user satisfaction SVE should focus on improving reliable information and up to date information/services. This shows that they are at their fulfillment of their purpose for the websites.

Taking MVE into consideration, we can see that most of the survey participants were unsatisfied on some of the heuristic like ‘Ease of use’, ‘Professionalism’, ‘Interest’, ‘Ability to Gratify’, ‘Overall Satisfaction’ and ‘Up-to-date’. Due to lower scale in much heuristics the user satisfaction was lowest of all. MVE being the migration board, they should morally focus on providing information to their users, in easy format as well as in time. This shows that the survey participants did not find any difficulty from the information provided by the website, but did not couple with ease of use and timeliness. As we have taken evaluation criteria in different categories, MVE should improve their website mainly for ease of use and up-to-date, on which the survey participants were unsatisfied.

For the improvement of the above websites they can follow “User satisfaction for IS effectiveness model” which is clearly described in section 4.5. To implement the model first task will be finding out the target group (like students for BTH), conduct survey among those target group, and identify problem area, resource area, control area as well as prediction of future trends. Then develop the updated system, following procedures defined as re-evaluation, re-change, solving problems, solving communication gaps, and solving response time in that model.

7.9 Limitations

There were several limitations to this study. The following are the most important of these;

- The sample number of participants limits the validity of the study.
- Also, the number of websites chosen (three websites) may not be a representative sample.
- The participants were part of the target population of student, but most of them did not have web design experience, which might not be typical for them.

7.10 Answers of Research Questions

In this research we were able to examine the importance of users in services oriented organization, and dealing with two different user satisfaction models we came to a conclusion of pointing out a model for measuring user satisfaction.

From survey analysis we can say that there are different web heuristics to measure different categories of user satisfaction. As per the researcher, they can choose different heuristics and make a survey for different categories of WBIS. We have presented our answers for our research questions with the help of literature review and survey analysis.

○ **How does the WBIS concerning e-services?**

WBIS is the platform for every task performed via internet. E-services can be said as a part of WBIS because we know that e-service is the “Services delivered over the internet” [46].

By considering real world into experience and referred by many articles, we concluded the WBIS concerning e-service perspective as by taking BTH University Library as an example of WBIS (service provider) organization providing e-service to students/researchers in the form of e-books or books.

E-services are self-contained, modular applications which are developed, described, located and published by the organization [52]. WBIS organization plays a major responsibility with all these roles to provide service to end user [56].

We consider e-service as an interactive software based application by IS obtains through web is called WBIS for e-services. The perspective design is explained in section 3.5. This may not only be considered as an effective model for WBIS for e-services, but as per our context as literature review, we came with this model as effective.

○ **Which is the most effective model of WBIS according to present context?**

Every organization has a mission to improve its WBIS for e-service performance. Participatory involvement and continuous feedback helps to sustain the effectiveness as a constant feature. By consideration of three models D&M (2003), TAM model (1986) and Sandhu (2009), we concluded to measure the end user’s experience, motivation, perceived usefulness, perceived ease of use for the service acceptance and continual usage of end user requirements for WBIS for e-service.

For better understanding to the organizational perspective to evaluate the end user requirements by taking feedback, and analyzing those feedback to results/analysis and implementation of those results in effective way considering continual usages are important task for effectiveness (explained in section 5.6).

Further proceedings for theoretical framework, we consider the most effective model to validate WBIS for e-service as a key to evaluate heuristics (are in section 6.4).

○ **Are the end-users familiar with current WBIS implementations?**

As per the analysis from the survey they have shown positive response towards those three WBIS for e-service websites. While measuring the user satisfaction, we saw that there was a vast rating differences towards WBIS for (the three chosen) e-services.

When the user can rate the websites without bias, they can be considered as being familiar with WBIS. The answer to this research question is more clearly shown in section 7.6, where we can see the rating for different heuristics are not same and they have rated as per their satisfaction for the websites they evaluated.

- **How can designers capture and include feedback from users as an improvement tools?**

The heuristics projected in this thesis represent some of the elements that can be scored and reflected upon by a designer. Based on these heuristics, a designer can come up with own list of heuristics and create a similar survey for user's to measure audience response, as well as the designer can take the result from the users that we have calculated and perform task as per they have commented for e-service. In section 7.5, we can see the rating of different users for different websites, which indicates designer the lacking point in those websites and can implement to improve the websites. The details of the heuristics are presented in section 6.3 for WBIS.

7.11 Conclusions

This study has purposed the solution for change in technology and significantly different end-user computing environment, where it is necessary to develop and validate an instrument to measure user satisfaction with WBIS in this information age. To fulfill this objective, the point to be consider was EUCS instrument developed by Doll and Torkzadeh (1988) [12] and set of web heuristics developed by Avery [114]. Both of these instruments were tested to measure satisfaction in a web-based environment. Websites were taken as delegate to WBIS for e-services. User satisfaction matters in service websites (e-services) as well. Not only usability, service quality, layout, creativity, timeliness and satisfactions are important for evaluation criteria, aesthetics can also be the important factor for evaluating the websites.

Another interesting part was to know whether user's initial reactions to satisfaction matches their judgment after extended evidence. It indicates that initial responses and more extended evidences on individual heuristics tend to correlate for both terms of satisfaction and overall reactions. While there are no magical formulas that work for every service websites can be evaluated with same criteria, but if all the criteria are taken averaged together they can provide a systemic indication of overall satisfaction, further research may reveal other categories, such as teasing, lurching, and playfulness etc.

From a practical perspective, EUCS instrument and some of Avery set of web heuristics which are important as per the choice of the websites can be applied to evaluate end-user applications, especially WBIS. Last but not least, it can be used to compare different IS that perform the same functions.

From the survey we can conclude that adaption of these six heuristics categories for the evaluation of user satisfaction produce the consistence outcome. More clearly inclusion

of these heuristic categories doesn't lead to any biased decision. So we can use these heuristics categories as consistence parameters to identify users' satisfaction of WBIS for e-services.

7.12 Summary of the Thesis

In this thesis we have,

- Explained the importance of WBIS, e-services, user satisfaction;
- Described a short, but fairly comprehensive list of heuristics that address user satisfaction, which can be used by both users and designers;
- Preliminarily tested which of these factors appear to correlate and which may be helpful in determining overall satisfaction;
- Recommended a way of using and extending these heuristics.
- The important implementation of this study was knowing different models and implementation of such models taking e-services as consideration.

In summary, both heuristics and EUCS that we chose for e-services were successfully tested to measure user satisfaction, and it can be said that this is a step in the right direction, and recommend additional research. As many other authors has just provided the models related to WBIS, we have gone into it and have discussed more about e-services in WBIS.

7.13 Future work

- There are a number of avenues of future research. Future research should attempt to identify additional components of satisfaction that are specific to a web-based environment. Some components that could be relevant are user perception of privacy and security.
- Although sample was taken according to the study of this topic, there can be a further study on the same topic focusing on different division of population like student, children, and adults.
- Future research can extend study to examine satisfaction with other web-based systems like internet portals, e-commerce sites, e-governance sites, commercial sites, combination of different websites, and the like.
- To prove correlations, more people should be surveyed with more diversity and have they reviewed a greater numbers of websites.
- It would be interesting to do further research on how user satisfaction is tested in design and development contexts for WBIS/e-services, and how feedback mechanisms for such user evaluation are supported.

8 Reference

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9 APPENDIXES

9.1 Appendix I: Questions from Doll and Torkzadeh's EUCS instrument

G1. Is the system successful?

G2. Are you satisfied with the system?

C1. Does the system provide the precise information you need?

C2. Does the information content meet your needs?

C3. Does the system provide reports that seem to be just about exactly what you need?

C4. Does the system provide sufficient information?

A1. Is the system accurate?

A2. Are you satisfied with the accuracy of the system?

F1. Do you think the output is presented in a useful format?

F2. Is the information clear?

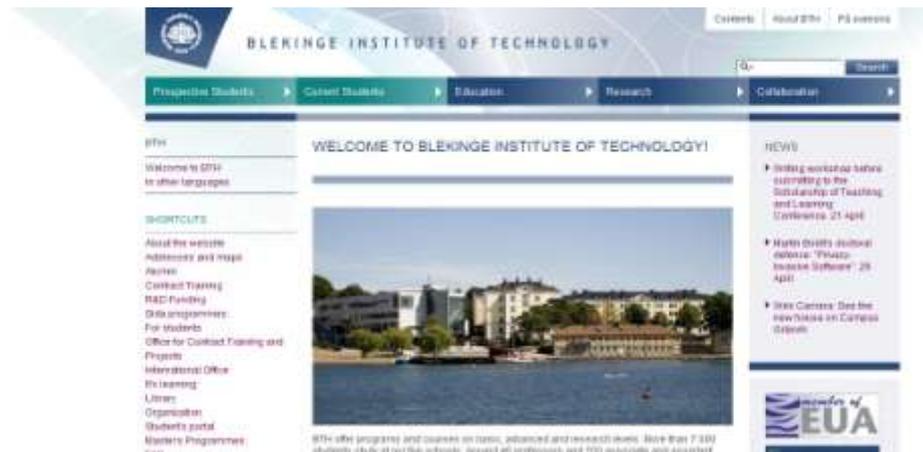
E1. Is the system user friendly?

E2. Is the system easy to use?

T1. Do you get the information you need in time?

T2. Does the system provide up-to-date information?

9.2 Appendix II: Websites



BTH in English



BTH in Swedish



Skatteverket in Swedish



Skatteverket in English



Migrationsverket in Swedish



Migrationsverket in English

9.3 Appendix III: Survey Questionnaires

Blekinge Institute of Technology
Department of Computer Science
Ronneby, Sweden

Dear Respondent,

We the student of BTH, are going to conduct a survey regarding “Measurement of Users Satisfaction”, which is the part of Master Thesis. You are being asked to participate in an experiment designed to gather information on what design aspects make a service website successful. This research project was designed solely for research purposes and no one except us, will have access to any of your responses. All responses will be kept confidential. The survey is anonymous.

Your participation in this project is voluntary. You do not have to answer any question(s) that you do not wish to answer. Please be advised that you may choose not to participate in this research, and you may withdraw from the experiment at any time without consequence. There is no direct benefit or compensation for participation. This experiment will take approximately 15-20 minutes. There are no anticipated risks associated with participation.

Sincerely,

Prasanna Pokhrel

Praneeth Babu V.

General Information:

Name:

Age:

Gender:

Male

Female

*1. How often do you use the web?

Rarely

Quite often (1-3 days a week)

Daily

*2. Is Swedish your first language (Mother language)?

Yes

No

*3. What is your Profession?

Student

Teacher

Researcher

Other's.....

*4. Have you ever designed a web page?

Yes

No

You have to evaluate three different websites giving different services to their customers/users for this survey. You can do it by opening one website at a time and evaluate/answer the questions, or open all the sites and evaluate/answer the questions all at a time. The following are the websites we are dealing with.

1. BTH Library (<http://www.bth.se/bib>)
2. Skatteverket (Tax Office, <http://www.skatteverket.se/>)
3. Migrationsverket (Migration Board, <http://www.migrationsverket.se/>)

*5. How do you find the web visual appearances, attractiveness?

Poor Average Satisfactory

BTH Library

Skatteverket

Migrationsverket

Ease of Use

*6. Is the site self-evident to use?

Hard Moderate Easy

BTH Library

Skatteverket

Migrationsverket

Simplicity

*7. How simple do you find the performance of the web sites?

	Tough	Moderate	Simple
BTH Library			

Skatteverket

Migrationsverket

Reliability

*8. Can you depend upon the site to offer current information?

	Not at all	Somewhat	Much
BTH Library			

Skatteverket

Migrationsverket

Accuracy

*9. Is the information actual and free of errors (grammar, spelling)?

	Not Accurate	Somewhat Accurate	Accurate
BTH Library			

Skatteverket

Migrationsverket

Professionalism

*10. Does the site abide with technical and ethical standard?

	Not at all	Somewhat	Much
BTH Library			

Skatteverket

Migrationsverket

Color combination

*11. Are the colors used in agreement with content and with each other?

	Not	Good	Excellent
BTH Library	Good		
Skatteverket			
Migrationsverket			

Grouping

*12. Are the related items grouped together?

	Not	Good	Best
BTH Library	Good		
Skatteverket			
Migrationsverket			

Clarity

*13. Are the intent and appearance of the site understandable and directed (flow)?

	Not	Good	Excellent
BTH Library	Good		
Skatteverket			
Migrationsverket			

Interest

*14. Do you think that the site is capturing your interest?

	Not at	Somewhat	Very
BTH Library	all		Much So
Skatteverket			
Migrationsverket			

Ability to Gratify

*15. Is the site meeting and fulfilling your expectations?

	Not at	Somewhat	Much
	all		

BTH Library
Skatteverket

Migrationsverket

Ability to Motivate

*16. Does the site promote to act?

	Not at all	Somewhat	Motivates
BTH Library			
Skatteverket			
Migrationsverket			

*17. Does the site provide up-to-date information?

	Not at all	Good	Perfect
BTH Library			
Skatteverket			
Migrationsverket			

*18. Do you think you will get the information needed in time?

	No	Unsure	Yes
BTH Library			
Skatteverket			
Migrationsverket			

Overall satisfaction

*19. How satisfied are you from the sites visits?

	Unsatisfied	Satisfied	Highly Satisfied
BTH Library			
Skatteverket			
Migrationsverket			

Additional Comments (if any):

.....

9.4 Appendix IV: Correlation Matrix

9.4.1 Correlation Matrix: Categories

Following table has average of maximum rating scores for heuristic categories for each websites. Two-tailed TTEST values are also computed for both categories and websites.

Web Categories /Web Average Scores	Heuristics Rating	BTH	SVE	MVE	Average Row Total (RT)	TTEST (Two-tailed) of Categories
		Average of Max Rating Score	Average of Max Rating Score	Average of Max Rating Score		
Usability (YU)		14.00	12.50	10.50	12.33	0.0571
Service Quality (YSQ)		14.33	12.00	12.67	13.00	0.0592
Layout (YL)		13.00	12.33	13.00	12.78	0.0589
Creativity (YC)		11.00	11.00	13.00	11.67	0.0561
Satisfaction (YS)		13.33	16.67	9.67	13.22	0.0606
Timeliness (YT)		16.00	9.50	14.00	13.17	0.0596
User Satisfaction (YUS)		81.67	74.00	72.83	76.17	
Squares of Column Total		6669.44	5476.00	5304.69		
TTEST (Two-Tailed) of Websites		0.0930	0.4843	0.2491		

Based on heuristics categories from above table, correlation matrix is derived as under:

Correlation Matrix	YU	YSQ	YL	YC	YS	YT	YUS
Usability (YU)	1.0000						
Service Quality (YSQ)	0.6318	1.0000					
Layout (YL)	-0.0822	0.7206	1.0000				
Creativity (YC)	-0.9042	-0.2402	0.5000	1.0000			
Satisfaction (YS)	0.5919	-0.2508	-0.8520	-0.8794	1.0000		
Timeliness (YT)	0.2210	0.8956	0.9538	0.2168	-0.6553	1.0000	
User Satisfaction (YUS)	0.8851	0.9199	0.3910	-0.6016	0.1488	0.6494	1.0000

Based on website average rating scores from above table, correlation matrix is derived as under:

Correlation Matrix	BTH	SVE	MVE
BTH	1.0000		
SVE	0.9926	1.0000	
MVE	0.9967	0.9880	1.0000

9.4.2 Correlation Matrix: heuristics

Following table has maximum rating scores for heuristics for each websites. Two-tailed TTEST values are also computed for both set of heuristics and websites.

Heuristics/Websites	BTH	SVE	MVE	Total	TTEST of each Heuristics
Ease of Use	16	10	11	12	0.7623
Simplicity	12	15	10	12	0.7542
Reliability	15	7	11	11	0.4642
Accuracy	14	11	12	12	0.4987
Professionalism	14	18	15	16	0.1930
Color Combination	13	12	9	11	0.1836
Grouping	14	13	14	14	0.2896
Clarity	12	12	16	13	0.8049
Interest	11	11	13	12	0.4092
Ability to Graftify	18	16	9	14	0.5761
Ability to Motivate	12	15	8	12	0.5910
Overall Satisfaction	10	19	12	14	0.8033
Up-to-date	17	10	17	15	0.5140
In time	15	9	11	12	0.4990
User Satisfaction	14	13	12	13	
TTEST of Websites	0.1239	0.8716	0.1506		

9.5 Appendix V: ANOVA Table

9.5.1 One way ANOVA

One-way ANOVAs for three different websites and heuristic categories were carried out, taking two of them in pairs from rows and columns, which are based on table below:

Categories	Average of Max Rating Score BTH	Average of Max Rating Score SVE	Average of Max Rating Score MVE	Overall Average (O)
Usability (YU)	14.00	12.50	10.50	12.33
Service Quality (YSQ)	14.33	12.00	12.67	13.00
Layout (YL)	13.00	12.33	13.00	12.78
Creativity (YC)	11.00	11.00	13.00	11.67
Satisfaction (YS)	13.33	16.67	9.67	13.22
Timeliness (YT)	16.00	9.50	14.00	13.17
User Satisfaction (YUS)	13.61	12.33	12.14	12.69

Row Combination: [(YU, YSQ), (YU, YL), (YU, YC), (YU, YS), (YU, YT), (YU, YUS), (YSQ, YL), (YSQ, YC), (YSQ, YS), (YSQ, YT), (YSQ, YUS), (YL, YC), (YL, YS), (YL, YT), (YL, YUS), (YC, YS), (YC, YT), (YC, YUS), (YS, YT), (YS, YUS), (YT, YUS)] = 21

Column Combination: [(BTH, SVE), (BTH, MVE), (BTH, O), (SVE, MVE), (SVE, O), (MVE, O)] = 6

9.5.1.1 ANOVA between BTH & SVE

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	4.8896	1	4.8896	1.1533	0.3080	4.9646
Within Groups	42.3963	10	4.2396			
Total	47.2859	11				

9.5.1.2 ANOVA between BTH & MVE

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	6.4827	1	6.4827	2.3440	0.1567	4.9646
Within Groups	27.6554	10	2.7655			
Total	34.1381	11				

9.5.1.3 ANOVA between BTH & overall

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	2.9338	1	2.9338	2.2809	0.1568	4.7472
Within Groups	15.4347	12	1.2862			
Total	18.3686	13				

9.5.1.4 ANOVA between SVE & MVE

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.1121	1	0.1121	0.0262	0.8745	4.9646
Within Groups	42.7613	10	4.2761			
Total	42.8734	11				

9.5.1.5 ANOVA between SVE & Overall

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.4564	1	0.4564	0.1793	0.6794	4.7472
Within Groups	30.5407	12	2.5450			
Total	30.9971	13				

9.5.1.6 ANOVA between MVE & Overall

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	1.0759	1	1.0759	0.8171	0.3837	4.7472
Within Groups	15.7997	12	1.3166			
Total	16.8757	13				

9.5.1.7 ANOVA between YU & YSQ

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.8889	1	0.8889	0.5896	0.4716	5.9873
Within Groups	9.0445	6	1.5074			
Total	9.9334	7				

9.5.1.8 ANOVA between YU & YL

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.3930	1	0.3930	0.3647	0.5679	5.9874
Within Groups	6.4659	6	1.0776			
Total	6.8590	7				

9.5.1.9 ANOVA between YU & YC

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.8888	1	0.8889	0.6037	0.4666	5.9873
Within Groups	8.8333	6	1.4722			
Total	9.7222	7				

9.5.1.10 ANOVA between YU & YS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	1.5842	1	1.5842	0.3098	0.5979	5.9873
Within Groups	30.6837	6	5.1139			
Total	32.2679	7				

9.5.1.11 ANOVA between YU & YT

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	1.3888	1	1.3888	0.2941	0.6071	5.9873
Within Groups	28.3333	6	4.7222			
Total	29.7222	7				

9.5.1.12 ANOVA between YU & YUS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	-1.8E-15	1	-1.8E-15	-8.6E-16	#NUM	5.9873
Within Groups	12.3333	6	2.0555			
Total	12.3333	7				

9.5.1.13 ANOVA between YSQ & YL

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.0997	1	0.0997	0.1884	0.6794	5.9873
Within Groups	3.1770	6	0.5295			
Total	3.2768	7				

9.5.1.14 ANOVA between YSQ & YC

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	3.5555	1	3.5555	3.8476	0.0975	5.9873
Within Groups	5.5444	6	0.9241			
Total	9.1000	7				

9.5.1.15 ANOVA between YSQ & YS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.0997	1	0.0997	0.0218	0.8873	5.9873
Within Groups	27.3948	6	4.5658			
Total	27.4946	7				

9.5.1.16 ANOVA between YSQ & YT

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.0555	1	0.0555	0.0133	0.9119	5.9874
Within Groups	25.0444	6				
Total	25.1000	7				

9.5.1.17 ANOVA between YSQ & YUS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0	1	0	0	1	5.9874
Within Groups	5.7556	6	0.9592			
Total	5.7556	7				

9.5.1.18 ANOVA between YL & YC

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	2.4642	1	2.4642	4.9850	0.0670	5.9874
Within Groups	2.9659	6	0.4943			
Total	5.4301	7				

9.5.1.19 ANOVA between YL & YS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.3990	1	0.3990	0.0964	0.76661	5.9874
Within Groups	24.8163	6	4.1361			
Total	25.2153	7				

9.5.1.20 ANOVA between YL & YT

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.3042	1	0.3042	0.0812	0.7852	5.9874
Within Groups	22.4659	6	3.7443			
Total	22.7701	7				

9.5.1.21 ANOVA between YL & YUS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.0135	1	0.0135	0.0515	0.8280	5.9874
Within Groups	1.5753	6				
Total	1.5888	7				

9.5.1.22 ANOVA between YC & YS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	4.8464	1	4.8464	1.0697	0.3409	5.9874
Within Groups	27.1837	6	4.5306			
Total	32.0301	7				

9.5.1.23 ANOVA between YC & YT

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	4.5	1	4.5	1.0872	0.3372	5.9874
Within Groups	24.8333	6	4.1389			
Total	29.3333	7				

9.5.1.24 ANOVA between YC & YUS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	2.1126	1	2.1126	3.2150	0.1231	5.9874
Within Groups	3.9427	6	0.6571			
Total	6.0553	7				

9.5.1.25 ANOVA between YS & YT

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.0064	1	0.0064	0.0008	0.9780	5.9874
Within Groups	46.6837	6	7.7806			
Total	46.6901	7				

9.5.1.26 ANOVA between YS & YUS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.5594	1	0.5594	0.1301	0.7306	5.9874
Within Groups	25.7931	6	4.2988			
Total	26.3525	7				

9.5.1.27 ANOVA between YT & YUS

Source of Variation	SS	DF	MS	F	P-Value	F Crit
Between Groups	0.4459	1	0.4459	0.1141	0.7469	5.9874
Within Groups	23.4427	6	3.9071			
Total	23.8887	7				

9.5.2 Two way ANOVA Table

Source of Variation	SS	Df	MS	F	P-Value	F Crit
Sample	0	0	65535	65535	#NUM	#NUM
Columns	8.9323	3	2.9775	1.2278	0.3212	3.0087
Interaction	0	0	65535	65535	#NUM	#NUM
Within	58.1961	24	2.4248			
Total	67.1285	27				

9.6 P-Value of Websites and Heuristics

Web Categories /Web Rating Scores	Heuristics /Web Average	BTH	SVE	MVE	Average Row Total (RT)	TTEST (Two-tailed) of Categories	Decision
		Average of Max Rating Score	Average of Max Rating Score	Average of Max Rating Score			
Usability (YU)		14.00	12.50	10.50	12.33	0.0571	Insignificant
Service Quality (YSQ)		14.33	12.00	12.67	13.00	0.0592	Insignificant
Layout (YL)		13.00	12.33	13.00	12.78	0.0589	Insignificant
Creativity (YC)		11.00	11.00	13.00	11.67	0.0561	Insignificant
Satisfaction (YS)		13.33	16.67	9.67	13.22	0.0606	Insignificant
Timeliness (YT)		16.00	9.50	14.00	13.17	0.0596	Insignificant
User Satisfaction (YUS)		81.67	74.00	72.83	76.17		
Squares of Column Total		6669.44	5476.00	5304.69			
TTEST (Two-Tailed) of Websites		0.0930	0.4843	0.2491			
Decision		Insignificant	Insignificant	Insignificant			