Understanding user acceptance of digital library

Bachelor’s thesis within Informatics

Author: Esmail Farmahini Farahani
Maryamsadat Kaviani

Tutor: Marius Mihailescu

Jönköping August 2011
Abstract

The use of Digital library has grown considerably past two decades. Using new technology effectively depends on acceptance for that technology, which in turn would be affected by users’ perception of that technology’s usefulness and ease of use. Research on “usable” digital library shows that potential users of digital libraries may not use it, in spite of the system availability and the millions of dollars that have been spent. There is a need to identify external factors which has an affect users’ intention of using this system.

By considering the characteristics of quantitative approach, and also by reviewing the research questions, quantitative research method was selected, and desired outcome was reached by using experiences and attitudes of users of digital library. Technological Acceptance Model (TAM) has been chosen as theoretical framework for this thesis. It describes the effect of two external factors, i.e. individual differences (computer experience, self-efficacy) and system characteristics (relevance, terminology and navigation) to increase user acceptance of digital library at Jönköping University.

Based on a sample of 360 students, the result demonstrates effects of factors on behavior intention via both perceived usefulness and perceived ease of use.
# Table of Contents

1 **Introduction** ................................................................. 1  
  1.1 Background ..................................................................... 1  
  1.2 Purpose........................................................................... 4  
  1.3 Interested parts ............................................................... 4  
  1.4 Disposition ...................................................................... 4  

2 **Theoretical framework** ....................................................... 6  
  2.1 Digital Library .............................................................. 6  
  2.2 Technology Acceptance Model .............................................. 6  
    2.2.1 Perceived ease of use ............................................... 6  
    2.2.2 Perceived usefulness ............................................... 6  
  2.3 External factors ............................................................. 8  
    2.3.1 Individual differences ............................................. 8  
    2.3.2 System characteristics ............................................ 10  

3 **Methodology** ..................................................................... 13  
  3.1 Research process .......................................................... 13  
  3.2 Research philosophy ...................................................... 14  
  3.3 Research approach ......................................................... 14  
  3.4 Research strategy .......................................................... 15  
  3.5 Research choices ........................................................... 16  
  3.6 Data collection ............................................................... 17  
  3.7 Analysis process ............................................................. 18  
  3.8 Credibility ...................................................................... 18  

4 **Jönköping University Library** ............................................. 20  

5 **Empirical findings** ............................................................ 21  

6 **Analysis** ......................................................................... 23  
  6.1 Perceived ease of use on intention behavior intention (H1) .... 23  
  6.2 Perceived usefulness on intention behavior intention (H2) ...... 24  
  6.3 Perceived ease of use on perceived usefulness (H3) ............ 26  
  6.4 Computer self-efficacy on perceived ease of use (H4) .......... 26  
  6.5 Computer experience on perceived ease of use (H5) ............ 31  
  6.6 Relevance on perceived usefulness (Ha6) ......................... 33  
  6.7 Relevance on perceived ease of use (Hb6) ......................... 35  
  6.8 Terminology on perceived ease of use (H7) ....................... 36  
  6.9 Navigation on perceived ease of use (H8) ......................... 37  

7 **Conclusion** ....................................................................... 38  
  7.1 Contribution ................................................................. 38  
  7.2 Critique of method used in the study ................................ 40  
  7.3 Further research ............................................................ 40  

References ............................................................................... 41
I Introduction

This chapter provides an introduction this thesis and background information about digital library. The background includes the definition of digital library, and gives a brief overview of history and benefits of DL. Furthermore, this chapter explains purpose of the thesis, research questions and also identifies interested parties.

Using of Digital Library (DL) has been growing during past two decades (Thong, Hong, & Tam, 2002). Like other new technologies (Venkatesh, Morris, & Davis, 2003), effective use of DL depends on users’ acceptance. While millions of dollars have been invested on digital libraries, researchers indicate that huge number of potential users may still not use them. Many researches have been devoted to develop DLs systems; they have found out that DL remains underutilized (Barnett, 1998). When this system is not used widely, then it will be hard to defend researchers’ considerable investments, so the potential benefits they would offer will not increase users. Thus it’s important to identify external variables that increase user acceptance of DLs. Therefore, in order to lead implementers and designers of DLs, and also to prevent underutilization and improve user acceptance having a good understanding of which external factors would have an effect on users’ behavior and intention. The aim of this thesis is identification of variables that may guide to better user acceptance. Technology acceptance model is adopted to find out how significant is the relationship between external variables and perceived ease of use and perceived usefulness.

1.1 Background

Digital library research has grown significantly in the 1990s (Borgman, 1999). The passion of digital library projects was jointly triggered by U.S government and growing on accessibility of Internet Worldwide (Fox, Akscyn & Furuta, 1995). Before the turn of the twenty-first century a few digital libraries had come into being. First, it was the joint initiative of the National Science Foundation (NSF), Department of Defense (DOD), Advanced Research Projects Agency (ARPA), and the National Aeronautics and Space Administration (NASA). The second one was the National Digital Library Federation Agreement initiated in May, 1995 which was led by Library of Congress in collaboration with 14 other research libraries. The purpose was to gather and make available the digitized objects across the nation for different users such as citizens everywhere and students (Rajashekar, 2006). There are many DL research projects in US and because of this fact, definition of DLs are abundant (Borgman, 1999).

The purpose of Digital Library Federation Agreement which had been led by Library of Congress and 14 other research libraries was to gather and make available the digitized objects across the nation for different users such as citizens everywhere and students (Rajashekar, 2006). The term of digital library (DL) hasn't been created by any specific person or organization, but it has gone through lots of attempt by many specialists from different viewpoints. A digital library is an organized digital collected object, such as video, text, images and audio, along with methods for access and retrieval, maintenance, selection, and sharing of the collected objects (cited in Witten & Bainbridge, p.2). There is another perception for DL as "institution" which describes digital library as an organization that provides the resources such as specialized staff, to structure, select, and also offer intellectual access, distribute and interpret, and make sure of working the persistence over time of digital collection, so it is economically and readily available for communities (Digital Library Federation (DLF)). Digital libraries are important for or-
ganizations such as colleges and universities to help to capture and manage intellectual assets as a section of information strategy. American universities were the first organizations who have started the project related to digital archive and library according to different recourses.

DL has been also described as a “convenient and familiar shorthand to refer to electronic collections and conveys a sense of richer content and fuller capabilities than do terms such as database or information retrieval system” (Borgman, 1999, p. 231). The concept of digital library is different with different user in different organization, as well as different phrases such as digital archive and digital repository. There are a huge number of literatures which has attempted to define these entities and separate one from the others. Here are some definitions from different authors:

- Digital library is the collected digital information which has been organized. DL has ability to combine the gathering and structuring of information, which archives and libraries can do the same, but DL has possibility with the digital representation through computers (cited in Michael Lesk, 2006).

- Managed collected information with associated service, information has been stored in digital formats and user can access over the network. There is a crucial part in this definition which is that information is “managed”. A stream of data which sent from a satellite is not library by itself. But those data, when is organized systematically, then it becomes a digital library collection (cited in William Arms, 2006).

According to Arms (2000) the major advantages of DL than paper library includes:

- Having the DL decline the costs for users since it provides the information to users wherever there is network connection and computer, so user won't have to meet the library never ever.

- Users can easily keep and update the information currently.

- All digital objects would be always available, no more limitation with time and geography.

- With the paper library, there is always some problem such as checked out, stolen, and miss-shelved which all those issues are disappear in DLs.

Except user acceptance issues which will discussed in this thesis, There are also some key issues facing digital libraries such as copy right and distribute the digital objects which this issue refers to management rights. Cost of content refreshing, and moreover with increasing number of users and multimedia content, network band-width would be an issue as well.
According to Fox et al. (1995), the terminology of DL has different meaning to different people. Witten & Bainbridge (2006) defines DL as an organized digital collected object, such as video, text, images and audio, along with methods for access and retrieval, maintenance, selection, and sharing of the collected objects. Emergence of DL through popularity of using online document has caused fundamental change of the library industry (Crawford, 1999). The previous focus on DL research (Adam, Atluri & Adiwijaya, 2000; Watters, 1999) was about system integration and information retrieval. In spite of using many resources to develop DLs, this technology is still underutilized. It will be complicated to invest in potential benefit of DLs if this technology is not used widely. So it is important to find the factors that affect user acceptance of DL. Therefore, the present researches are more about interaction between users and systems. So far, many case study projects of individual DLs have been conducted, such as Florida center for library automation (Liu, Dantzig & Sachs, 2000), Alexandria DL (Hill, Carver & Larsgaard, 2000), which mainly focused on the implementation part. There is a need for research on this technology from users' perspective. Although, there are lots of efforts to improve usable DL, there are still many unnoticed DLs by users (Hsieh, 1996). Therefore, understanding of user acceptance of DL is a major need and will help to identify critical external factors that affect users’ intention of using DL. User acceptance is the key factor to enhance use of DL effectively as with other technologies (Venkatesh et al. 2003).

The authors have used the technology acceptance model (TAM). This theory has been applied in adoption behavior of information systems (IS) in different organization (e.g. Jackson, Chow & Leitch, 1997; Venkatesh & Davis, 2000). Previous researchers have identified TAM as a theory of reasoned action with simple structure (Davis et al., 1989; Mathieson, 1991; Taylor & Todd, 1995). This model explains IS adoption behavior (Davis et al. 1989). Referring to TAM, adoption behavior has been determined by intention for using the particular system (DL), and in turn, it was determined by perceived usefulness and perceived ease of use. The important purpose of TAM was conducted by measuring the users’ perception of systems’ ease of use and usefulness to predict the intention for utilizing the IS. TAM shows the effect of external factors on usage intention throughout perceived ease of use and usefulness. So, this thesis will study the impact of external factors on DLs’ user acceptance by using TAM as a theoretical framework. Studying usage intention from "user" and "system" perspectives helps university authority to implement more usable DL and prepare the potential users of new IT. The potential impact of two types of factors will be examined.

Information system is any combination of information technology and people’s interaction like algorithmic processes (Beynon, 2009). Digital library, also known as one of the complex information systems. Sometimes users deny to use information systems due to complexity and this problem is a common problem in digital library projects as a result, study in users acceptance and knowing the important factors which can improve user’s acceptance of digital library can help organizations and developers to have successful and usable digital libraries. Jönköping University is not an exception and this common problem also affect user’s intention behavior in our university. We also had interviewed one of the librarians and she mentioned that students have problem in interacting with digital library and due to this they modified a lot in the interface of the digital library but because different databases are used student still have problem finding which database fits their requests. All these facts lead us to identification of what can
improve users’ acceptance for digital library in our university and this has motivated us to investigate this issue.

1.2 Purpose

Our purpose is to find a way to improve the users’ acceptance of digital library. Digital library is considered as a new technology that will be further developed and used in the future. Organizations spend large some of money to develop digital libraries. Therefore, it is important to have useful digital libraries. In order to reach the purpose we formed our research question as follow:

*How can we increase the users’ acceptance for digital library in Jönköping University?*

In order to answer this question, we adopt technology acceptance model which was created for understanding the user acceptance of any new technology by the users and therefore it was tested and used for both simple and complex information systems. We also needed to find out the factors that affect user’s behavioral intention and the way they affect user acceptance of digital library as a result we developed our second research question:

*What are the determinants of user acceptance of digital library?*

Therefore knowing the factors and the way they may impact users’ behavior intention can underscore the character of usable digital library for developers. This is how our research will achieve its objectives.

1.3 Interested parties

The outcome of this thesis can be useful for two different groups:

- Designers and developers of digital libraries, so that they can understand the indicators of a useful digital library and the way their impact on users’ acceptance of digital library.

- Researchers who want to adopt TAM as their theoretical model can use the extended model which is presented in this thesis.

1.4 Disposition

The authors have structured this thesis to reach the objectives through six following chapters:

*Chapter 1:* This chapter starts with introduces the subject to the readers. And then continue with purpose and aim and what exactly has been studied in this thesis.

*Chapter 2:* TAM is clarified in this chapter in order to increase the understanding of chosen field. Knowledge about those variables that effect on user acceptance of DL is also presented.

*Chapter 3:* Appropriate selection of method to collect data in order to fulfill the research question and purpose will be explained in this chapter.
Chapter 4: Jönköping University Library. This chapter describes the case chosen for case study strategy.

Chapter 5: this chapter describes the results of empirical data which is included gathered primary data by using questionnaire, and gathered secondary data such as questionnaires' item.

Chapter 6: In analysis chapter authors compare theoretical base with empirical observation. Thus, it includes the reflection of authors about the research subject.

Chapter 7: Last chapter identify the answer to the research question by presenting the conclusion made from analysis section.
2 Theoretical framework

This chapter will describe the theoretical framework of this thesis (TAM) to understand the users’ acceptance of DL by identifying the impact of system characteristics and individual differences through perceived usefulness and perceived ease of use on digital library.

2.1 Technology Acceptance Model

In the past decade, researchers have spent so much effort to explain and predict user acceptance of IT. Based on empirical evidence, TAM has been identified as a parsimonious and powerful model to identify usage intention and behavior (Davis, 1989). TAM theorizes that usage of IS has been determined by user intention to adopt the system (DL) and that is identified by persons' belief about the system. In mentioned theory, there are two kinds of beliefs involved, namely, perceived usefulness and perceived ease of use.

Perceived usefulness is referred as “the extent to which users believe that using the system will increase their study or job performance” (Davis, 1989, p. 320). Perceived ease of use is referred as “the extent to which person believe that using the system is free of effort” (Davis, 1989, p. 320). The users would prefer to use the system when it has valuable function, so perceived usefulness will be proposed to have a direct effect on adoption intention. On the other hand, when user finds the system easier to work with, then the person would intend to use the system.

![Figure 2-1: TAM (Davis et. al. (1989), Venkatesh et al. (2003)](image)

According to TAM, perceived ease of use affect perceived usefulness; both two usability variables affect behavioral intention to use and behavioral intention have influence on actual system use. The casual relationships between factors are depicted above in figure 2.1.
2.1.1 Perceived usefulness and perceived ease of use

In general, the information technology has lots of potentials to improve performance of the organization but these performances sometimes are blocked by users’ unwillingness to accept and use available system. This problem is one of important issues which can cause system failure. Due to this issue, it is always significant to illustrate user acceptance in management information system. (Davis, 1989)

There are many different variables that can influence system usage by the individuals but researcher figured out that, perceived ease of use and perceived usefulness are two most important factors, which have been suggested by previous studies in this field. It is important to understand people intention to use the system and this can be influenced when they believe the system will help them to perform their job. It is a significant issue in acceptance of a system when individuals believe that particular system would enhance their job performance and this refers to perceived usefulness.

Perceived ease of use is used to refer an individual to trust using a particular system which is free of physical and mental effort and when users believe using a specific system would help them do their job better is known as perceived usefulness. New information systems sometimes can be found helpful to use by the users and they would believe the system can perform their job better but at the same time they can refuse the system when it is hard and complex to use. (Davis, 1989)

The significant effect of perceived ease of use on behavioral intention was suggested in prior researches, both direct effect and indirect effect. (Agarwal & Prasad, 1999; Davis et al., 1989; Hu, Chau, Sheng, & Tam, 1999; Jackson et al., 1997; Venkatesh, 1999; Yi & Hwang, 2003). Davis (1989) suggests that perceived usefulness could significantly affect the users’ intention to use of information systems. Accordingly perceived ease of use and perceived usefulness can affect the adaptation of a new system and also intention to use of a system. In this research project such relationships in the context of using Jonkoping university digital library will be re-examined.

Dependent upon the TAM components, the following hypothesis will be focused in this study.

**H1:** Perceived ease of use will have a positive effect on behavior intention to use the Digital library.

**H2:** Perceived usefulness will have a positive effect on behavior intention to use the Digital library.

**H3:** Perceived ease of use will have a positive effect on perceived usefulness of the Digital library.
2.2 External factors

According to the previous researches which adopted TAM as their framework (Agarwal, 2000), two main categories of external variables namely individual differences and system characteristics can have impact on perceived ease of use and perceived usefulness. Based on literature review, we explain our research model which contains two individual variables as well as three different system characteristics. In this section we present individual differences variables and system characteristics which are chosen as external factors. The particular system characteristics and individual differences covered by terminology, relevance, navigation, computer self-efficacy and computer experience. The following table describes definition of mentioned factors.

Table 2-1: Factors leading to user acceptance

<table>
<thead>
<tr>
<th>Factor</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminology:</td>
<td>The sentence, word, abbreviation that used by system</td>
</tr>
<tr>
<td>Relevance:</td>
<td>Users’ information need is matched with system content</td>
</tr>
<tr>
<td>Navigation:</td>
<td>User can move easily around the system</td>
</tr>
<tr>
<td>Computer self-efficacy:</td>
<td>Individual capability of users to use a new system</td>
</tr>
<tr>
<td>Computer experience:</td>
<td>Experience in computer usage</td>
</tr>
</tbody>
</table>

2.2.1 Individual differences

One of the most important issues in technology adoption is about understanding the factors, which are dealing with acceptance or rejection of a new information system by individuals (Davis, Bagozzi & Warshew, 1989). As result of this issue, the TAM has been used to illustrate users’ acceptance behavior in information systems (Adams, Nelson, &
TAM framework was also have been used to identify the external variables that affect perceived ease of use and perceived usefulness which are the core elements in TAM. Davis (1989) suggested that internal variables in TAM, which, refer to beliefs and attitudes, mediates the effects of external variables on individual’s intention to use of Information systems. These external variables connecting internal believes and intention to use of an information system assumed by TAM and individual differences. Several external variables were identified, for example, Venkatesh (1996) suggested that factors like subjective norms, images, job relevance have potential to affect user acceptance of IS. Moreover it was also found that the individual differences and interface characteristics can affect perceived ease of use (Hong et al., 2001).

As it was mentioned above, in the previous researches two main categories of external variables were identified with the use of TAM model, which are individual differences and system characteristics. According to Zmud (1979), individual differences have the most potential effect on information system success. Factors such as personality and demographic variables can refer to the individual differences in addition, situational variables which can cause differences in users’ attributes like experience and training, can also be counted as individual differences. As it concludes, beliefs are the core of TAM and influence all other factors, which may have effect on user acceptance of new information system. There are a few classifications of individual differences variables given by the research literature. Zmud (1979) made taxonomy of these variables and divided them into categories of demographics, personality, and cognitive style.

According to the past research of individual differences variable which have effect on user acceptance of IS, Bostrom, Olfman, and Sein (1990) categorized individual differences variables into four different aspects:

- How users think about their jobs and also what their points of view about computers are.
- The way and strategies they chose to reasoning, memory and visual abilities.
- Individuals’ perceptive characteristics such as intelligence.
- Representational traits like their work experience.

In other classification from the same researchers, they assumed that individual characteristics such as learning experience, inspirational perceptive and task domain knowledge and also the users experience that they have from their previous works with IS can be a set of individual variables which can effect on their intention to use of IS (Agarwal & Prasad, 1999). It has been suggested that individual differences in virtual environment can be related to usage and success in online library systems (Davis, 1993). Consequently, after considering the pervious researches and nature of individual differences, we discover that computer self-efficacy and computer experience, which are most frequently used in other researches, can have impact on perceived ease of use.

- Computer self-efficacy efficiency demonstrates the ability of users to utilize a computer individually. Compeau & Higgins (1995) illustrated computer self-efficacy based on social cognitive theory. Computer self-efficacy is stated by various IS researcher as one of the well-known factors which impact on general computer usage behavior among the user intention (Venkatesh & Davis, 1996).
Consequently, according to different scientific literature which sustain the different factors that have impact on users practice behavior on digital library (Hong et al., 2001), our hypothesis bear the computer self-efficacy will affect perceived ease of use of the digital library.

**H4:** Computer self-efficacy will have a positive effect on perceived ease of use of Digital Library.

- **Computer experience** refers to the level of the user’s knowledge about computer and how long they utilize the computer. Computer experience can impact on the interaction of individuals with different software packages (Jacobson & Fusani, 1992; Thompson, Higgins & Howell, 1994; Igbaria, 1995) In the Information Technology perspective, individual’s computer skills and the length of use are two important factors which, should be take into account to have better understanding of the dimensions of general computer experience (Thompson, 1994). The familiarity of users with computer and the span of time that the individual deal with computer is a critical object to measure user’s computer experience. Greater degree of computer experience involves greater role in individual’s transaction with different software packages. Even though these experiences may not have direct impact in users’ usage behavior of digital library, they can help the users to learn how to work with digital library easer (Hong et al., 2001). Hence, we intend that more computer experience will have impact on perceived ease of use of the digital library. Figure 2.3 is showing the impact of hypothesis four and five on perceived ease of use.

**H5:** Computer experience will have a positive effect on perceived ease of use of the Digital Library.

![Diagram](image)

Figure 2-3: Individual differences based on TAM.

### 2.2.2 System characteristics

System characteristics are recognized as one of the external factors which has effect on users’ intention of using new information system. Previous research projects on TAM argue that system characteristics have impact on behavior intention throughout perceived ease of use and perceived usefulness (Venkatesh & Davis, 1996). Specific system characteristics will be highlighted as critical in influence on usage of digital library (Park, 2000). According to Davis et al. (1989) this external variable has impact on both
perceived usefulness and perceived ease of use. The relationship between different system characteristics and both perceived ease of use and usefulness can be identified as usability of DL (Park, 2000). Usability defines how a computer system can be used easily and effectively by specific user (Shackel, 1991). These two elements of usability bear a close resemblance to both beliefs in TAM. According to Landward’s (1994) categories of interface usability determinants, this thesis propose relevance, terminology and navigation and as external variables of user acceptance of DL.

- **Relevance**: In the context of DL, relevance can be interpreted as the degree for which DLs meet users’ information need (Reez & Schultz, 1967). Relevance refers to integrability of DL into work practice that means how system smoothly fits to user's work practice (Kling and Elliot, 1994).
  
  User satisfaction is related to relevance of the resources that meet their information needs (Gluck, 1996). The goal of DLs is to provide relevant information to users. Yao (1995) added that a resource is useful only when user considers that relevant, so relevance has a link with usefulness. Also when DLs have a lot of relevant document which user is looking for, users can find the document they want easier. So user would interpret that DL as easy to use comparison to another DL that has little relevant document in it. Therefore, the authors hypotheses that relevance of DL's document to user's need is related to both perceived ease of use and usefulness.

  **H6**: Relevance of DL to the user's document needs has a positive effect on perceived usefulness of DL.

  **Hb6**: Relevance of DL to the user's document needs has a positive effect on perceived ease of use of DL.

- **Terminology**: Another determinant of system characteristic is terminology, which refers to sentence, and word that is used by system (Lindgaard, 1994). The success of DLs depends on how person can interact with the system via structured queries and that depends on how person understand the terminology used by system. This factor is one of the key successes of DL, because user needs to understand clearly the description and structure of the system. A potential issue in DLs is difference between language that users speak and the terminology that is used by DL, which may be a professional terms that is unfamiliar to user. Users usually face problems when searching for information, since the vocabularies that they search to find their document is different from vocabularies that provider use, more over this problem would decrease the potential benefit of DL's user (Lingaard, 1994). In one of the previous research on Alexandria Digital Library Project (Hill et al., 2000), terminology identified as a significant factor in users evaluation. So we hypothesis that terminology has direct effect on perceived ease of use of DL.

  **H7**: Terminology clarity has a positive effect on perceived ease of use.

- **Navigation**: refers to the ease with which DL's user can move around the system (Lindgaard, 1994). A common problem happens when users want to locate the document that they need. As the quantity of documents increase, structure of storage of documents becomes more complex. User may feel "lost" while trying to search in DL's documents. Navigation aid makes a logical flow for user to fol-
low and conduct efficient information search. Therefore, we hypothesis that this factor has direct effect on perceived ease of use.

**H8: Navigation clarity has a positive effect on perceived ease of use**

Figure (2.4) shows that relevance have effect on both perceived ease of use and perceived usefulness (Ha6, Hb6), while terminology and navigation have effect on perceived ease of use (H7, H8).

![Figure 2-4: System characteristics based on TAM](image-url)
3 Methodology

In the light of background information and theoretical framework that introduced previously, methodology chapter concern about how empirical finding was conducted. In addition, this chapter includes detail information about research approach, research philosophy, research strategy, research choice.

3.1 Research process

The process of undertaking this thesis work consists of selecting a suitable method to gather and analyse the data. The data, which has been gathered and analysed, and help researcher to generate new knowledge and reach the research question. Saunders et al. (2007) has talked about research strategy, research approach, data collection and time horizon which are different layers of research onion and authors try to apply these layers to be sure that every important steps of research process has been followed. In this thesis, positivism as philosophy, deductive as approach, case study as strategy and mono methods in choices layer were chosen and are shown in italic in each layer of figure 3.1.

![Research onion based on Saunders (2007)](image)

Research thesis is a systematic way of going through different steps to make practical use of theoretical foundations into analysis and reaching solutions and making conclusion. There is a need for studying to identify different factors to determine user’s adoption of DL. In this project the determinants of user acceptance of DLs will be discussed.
3.2 Research philosophy

Saunders, Lewis, and Thornhill (2007, s. 101) define that the research philosophy has a great influence on research strategy choice and on research method. Understanding the research philosophy is the first step in determining the methodology. It lets authors to have a better idea regarding why they approach their study the way they do (Saunders et al., 2007). Epistemology focuses on the field of knowledge. It’s about what is considered acceptable knowledge in a field of study (Saunders et al., 2007). It also identifies how knowledge is created and affected by researchers’ assumption. Positivist and interpretivist are two assumptions in epistemology. As positivist you will be: “working with an observable social reality and that the end product of such research can be law-like generalizations similar to those produced by the physical and natural scientists” (Saunders et al., 2007). Authors adopt the positivist, because the targeted outcomes are external factors and conditions which are going to be followed when new technology is adopting according to users’ need. Authors aim to find out external factors in general that affect user acceptance of this technology, the difference between users as social actors are not taken under consideration.

3.3 Research approach

One of the most important aspects in each research is to choose the research approach. There are two different approaches, deductive and inductive approaches that can help the researcher to form a theory and describe the conclusion. This section has tried to explain the chosen approach for this thesis.

The authors chose deductive approach which is also known as theory testing because it is trying to test one existing theory and generate it among collected empirical data. It also explains the relationship between variables. According to Robson (2002), each deductive research includes five sequential steps.

1. *Form a hypotheses according to the theory, about relationship between different variables, which can be tested.* In this step regarding to the technology acceptance model and our literature review we formed our hypotheses which are assuming the effects of different external factors in the user’s intention to use of digital library.

2. *Hypotheses should be clarified in operational term as well it focused on the relationship that shared among two different concepts or variables.* Regarding to this phase, we tried to understand the affection of individual differences variables and system characteristics on perceived ease of use and perceived usefulness.

3. *Testing the operational hypotheses.* For this phase of the deductive approach it is necessary to have research strategy, which is case study and we chose the digital library Jönköping University in this project and will describe further in next section.

4. *Inspecting the result of the questionnaire.* In this part, after gathering the results from the questionnaire and analyzing them we come up with the conclusion.
5. **Modifying the theory according to the findings.** The last step of our work was to modifying the relationship between the external variables and users intention to use of digital library.

### 3.4 Research strategy

According to Yin (2003), three important conditions should be considered in choosing the right research strategy.

**First is the type of research question(s)**

Identifying the form of research question is the most important part in each research study. To understand the nature of the research question, researcher should answer the question (what is my study about?) and (which kind of question should be used? “What”, “where”, “why”, “who” or “how”? ). In general “what” questions are more likely to be exploratory research in this type of research, any kind of strategies can be used. In contrast, “how” and why questions are more explanatory and preferred research strategies for this type of study are case study, histories and experiments because in “how” and “why” questions researcher is trying to understand the operational links.

**Second important condition is the extent of control over the behavioral events.**

The other important difference between research strategies is the amount of power of the researcher has to access and control over behavioral events. The case study strategy is suggested when researcher tries to examine contemporary events but when the relevant behavior cannot be manipulated or in other words, when the investigators have little or no control over the events.

**The last important condition is the focus on contemporary events.**

Since “how” or “why” questions mainly asked about contemporary set of events case study strategy can be helpful to find the answer for such research questions. Although, case study and history strategies have many same techniques but direct access to the events and ability to interview with individuals who are involves in the events are important factors which can make case study strategy more suitable than history strategy.

After considering the three important conditions which mentioned above, the case should be selected from firms, people and elements (Ghauri & Gronhaug, 2005). According to the Yin (1994), the selected case should have the characteristics which are mentioned and identified in theoretical framework. It is critical to select the right person or individuals to hand out the questionnaire because the selected group should have perspective of research questions and objective of the thesis (Ghauri & Gronhaug, 2005). Robson (cited in Saunders, Lewis & Thornhill, 2007) also described the characteristics of case study as follow:

- Uses of multiple source of evidence.
- “An empirical investigation of a particular phenomenon within its real-life context”.
- Can answer to “why”, “what” and “how” questions.
According to the definition of case study strategy and after considering the information needed for this thesis with respect to nature of our research question, authors elected the Jönköping University as a case study and international students of Jönköping University as a sample. This decision was made because the case chosen was accessible and authors have experience in using the digital library of Jönköping University. Consequently, the structured questionnaire was handed out by email to the international students of Jönköping University. The objective of this thesis was to find out the factors which can improve the user acceptance of digital library. In this regard, the goal is to obtain the user’s point of view of using digital library of Jönköping University.

3.5 Research choices

Sounders (2007) identify mono method research choice when researchers choose single data collection technique (qualitative or quantitative) and corresponding analysis procedure. According to Kumar (2005) quantitative and qualitative research method can be distinguished based on data collection process, purpose of research and analysis of empirical data. Reichardt and Cook (1979) made a description of quantitative study as describe below (cited in Ghauri & Gronhaug, 2005):

- Focus on testing and verification; facts and reasons
- Logical and critical approach
- Controlled measurement
- Objective
- Hypothetical-deductive
- Result oriented
- Particularistic and analytical
- Generalization by population membership

The purpose of quantitative method is to quantify the variation in a phenomenon, predetermined methodology and analyzes those data with statistical procedure. In this thesis, we search for producing statistically reliable estimate of which external variables would effect on user acceptance of DL. Since the desired outcome, would be reached by hypotheses-based and more objective (the objective in this thesis, is discovering experiences and attitudes of DLs users). Considering those mentioned options with the characteristics of quantitative approach and also by reviewing the research questions, quantitative research method is more appropriate and has been selected (Saunders, 2007).

However, we have been aware that by using questionnaire as a single data collection method, it may be better to complete them with other method such as in-depth interview, and adapting multiple methods. For example a questionnaire to discover the impact of external factors on user acceptance of DL can be complemented by using in-depth interview to explore and understand more deeply about their experience of using DL. In order to do the in-depth interview we should arrange meeting with all the respondents which is too time consuming. Since this thesis has been run during the sum-
mer and access to the student to do the interview wasn’t possible, we could only choose to send the questionnaire to collect the primary data.

3.6 Data collection

The quantitative research method was employed in this thesis, in order to gather the data, we have used self-completion questionnaire which sometimes refers to self-administered questionnaire. In this method, respondents completed the questionnaire by themselves. Respondents can receive the questionnaire in several ways such as mail or postal questionnaire (Saunders, 2007). Respondents were screened if she/he has used DL before. Questionnaire conducted via e-mail to DLs’ users in Jönköping University. The major components of questionnaire included the measurements of all variables in TAM (see Appendix A). All those measurement was taken from previous DL and IS researches (Venkatesh & Davis, 1996; Agarwal & Prasad, 1999). Questionnaire went through iterative round for revision based on feedback from academics that are familiar with questionnaire design. Moreover, the questionnaire was pilot-tested on 10 students and was found to be significant and easy to follow. After confirmation of the content validity in questionnaire, we proceed to use it in the main data collection.

Drawing samples involves different steps, after defining the population and identifying sample frame, it is necessary to choose a sampling procedures. This section has tried to explain different steps in sample drawing for this thesis. Sampling procedure concerns with selection of group of individuals which can represent a large number of populations with same characteristics it is also mainly related with statistical overview. Kotler and Fox (1995) distinct that each sampling process required answering three important questions which are:

- **The survey questions should be answered by whom?**
  This question defines sampling unit. Regarding to our research objectives, while the research is about digital library of Jönköping University, we planned to have students of the University as our target for sample unit.

- **To have a good and reliable project how many units are needed?**
  Answer to this question will describe the sample size. At first we tried to capture all the students of the University however after gathering data about the number of students of the university we figure out that there are 12000 student studies in the University. It was difficult to target this group for sample unit for us because for reliable sample we should have at least 20 percent of the sample unit (Pareto, 1971) and it was not possible for us to access 2400 student during the summer vacation due to this problem, we chose to have international students which are 1200 students, as our sample unit and this decision has twofold for our thesis first we still have students as our target which can represent all students of the university and also they are international which means they have variety of different individual differences which can help us to have better result in our research.

- **Which procedure should be chosen to collect respondents?**
  After defining the sample unit and sample size it was decided to have non-probability samples as our procedure. This kind of sampling procedure is more frequently used when the research strategy is a case study (Saunders, 2007),
which is also selected as research strategy for this project. Purposive or judgment sampling is one of sub group methods in non-probability sampling in which researchers have the ability to use their own judgment when they want to select a case and this can gives best result to research objectives. This method of sampling mostly adopted when the sample size is small such as case study researches and when selecting the case is in instructive manner (Neuman, 2000).

3.7 Analysis process

The logic behind the performed analysis in this thesis is based on the logic of applying Technology Acceptance Model (TAM). Answer to the research question derived through the TAM, verified throughout the empirical findings, combined with the variables found from empirical data collection and is used as a basis of determining the variables which affect the user intention towards accepting the DL. The authors utilize TAM in order to achieve their objective. According to TAM the external factors are the ones which affect the user acceptance of DL. These factors were discovered from the literature review (presented in secondary data). The questions in questionnaire concern these factors. The relationship between external factors and perceived usefulness and perceived ease of use retrieved from the questionnaire. Furthermore the questions reveal how user perceives DL through each factor (what’s their attitude of acceptance). Moreover, the objectives are being achieved, finding out the factors that affect user acceptance, finding out the relationship between factors and perceived ease of use and perceived usefulness.

We analyzed the collected empirical data from the questionnaires. The authors classified the gathered knowledge in a way to illuminate the factors of proposed TAM. We have prepared a summary of the result that derived from empirical data. Since vast amount of data were gathered through the questionnaires, therefore there was no interpretation pitfalls which happens mostly during interviews.

3.8 Credibility

In order to have a credible research, authors need to maintain high quality of empirical finding and have a good design. Reliability and validity are the two important issues that need to be paid attention (Saunders et al. 2007).

3.8.1 Validity

Validity was defined by Saunders et al. (2007, p. 614) as “the extent to which data collection method or methods accurately measure what they were intended to measure”. Considering validity in the research process is important to have reliable and trustworthy study. The validity of this thesis is improved by applying the right model (TAM) which has been used in the same field previously and it helped to improve the validity of this thesis (Thong et al. 2002). Furthermore, authors use TAM variables to formulate the questionnaire items. Validity can be also described as the absence of systematical errors to measure data. It’s divided into internal and external validity. (Lundahl & Skärvad, 1999).

- **Internal validity** concerns the degree that the method used for gathering data measures what was intended to measure. In order to provide the internal validity, authors asked the right question to the right respondent (Lundahl & Skärvad, 1999). In order to fulfill that, the questionnaire was filled by students at Jönkö-
ping University who were DLs’ users. This measure was taken to get relevant and actual response from the respondent regarding the subject matter. Respondent can also pose a threat to the validity of empirical data such as, respondent doesn’t understand the question or miss it by the mistake which authors tried to overcome of this threat by setting few questions for each factor, so if respondent misses one question about one factor, there would be a chance to get result by other questions on that part any way. Or respondent could be not aware of the a factor which could be bias opinion, in order to reduce this risk, authors have tried to conduct the short and straightforward questions in questionnaire.

- **External validity** refers to **generalizability** and is defined by Saunders et al. (2007, p. 598) as: “the extents to which the findings of a research study are applicable to other settings” and its goal is to produce theories which are generalizable to any population. The finding of our thesis is applicable to other DLs system. Our improved model (figure7.1) can be used in other research in order to increase the user acceptance of DLs. Under same circumstances research study in this thesis can be held as generalizable. However, there is no evidence at this point that this thesis will be completely applicable to all DLs situations, under any circumstance.

### 3.8.2 Reliability

Reliability is defined by Saunders et al. (2007, p. 609) as being: “the extent to which data collection technique or techniques will yield consistent findings, similar observations would be made or conclusions reached by other researchers or there is transparency in how sense was made from the raw data”. In this thesis, authors have used scientific sampling method, and if another author conduct his/her project under the same circumstances and using the quantitative method and same sampling method, they will get the same outcome.
4 Jönköping University Library

*In this section will give a short historical background of that case chosen for our case study.*

Jönköping University was established in 1977, this University was organized with five departments at the beginning and in 1987 it had been reorganized to three departments: Economics, Culture and Information and Engineering and Education.

Jönköping University (JU) is one of the three private schools in Sweden with non-profit institution of higher education with the right to awards doctorates. This university operates with Swedish Government and conforms to national degree regulations and quality requirement. It’s organized as a group with four schools owned by Jönköping University Foundation. (Jönköping University webpage)

- Jönköping International Business School
- School of Engineering
- School of Health Science
- School of Education and Communication

JU conducts different researches and offers graduate studies, undergraduate studies, doctoral studies and contract education in schools.

The Jönköping University Library (JUL) is the important information resource for scientific researches. JUL provides collection of printed and electronic form of resource. It was awarded Library of the Year in Sweden in 2005. JUL holds around 60,000 books in electronic form and 200,000 in printed form. Around 19,000 journals, 18,000 are available in electronic form. E-journals and E-books are easily accessible by using the username and password to the users network account at JU from home. There are four comprehensive special collections in addition to general collection.

- European Documentation Centre.
- Case law, Legislation, official documents that has been published by the European Union.
- Information Centre for Entrepreneurship.
- Entrepreneurship, innovations and small business in a special collection that has grown to one of the biggest of its kind in the world.
- Information Centre for Foreign Law.
- International company and tax law. The collection comprises law literature from all parts of the world.
- MässDok - The Trade Fair Library.

After long period of investigation on JUL, we have found out that there are many students at JU that are actually using the DL less than what they need to use as student to get their information’s need. They had several different problems they have face when using the DL.
5 Empirical findings

This section presents a sketchy summary of the empirical data conducted for this thesis through the questionnaire on the basis of established theories and literature review.

Empirical findings represent the usability of DL from respondents' point of view through both perceived ease of use and perceived usefulness. The majority of the subjects were between 24-29 years old, nearly 55% of the subjects were male. Around 43% of the respondents were students at international school (JIBS), respondents at engineering school (JTH) were 27.50%, at communication school (HLK) were 17.50% and at Health school (HHJ) were 12.50%. Their year of study ranged from less than one year to more than three years. 10% of respondents have been studied for one year, 57.50% of respondents have been studied between one and three years, and 32.50% of respondents have been studied for three years. In range of frequency of using DL, almost 32% use the system less than once a month, and around 30% use it once a month, in summary, the respondents reflected the characteristics of student population of Jönköping University.

Table 5-1: Questionnaire Findings

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERM1</td>
<td>10%</td>
<td>55%</td>
<td>28%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>TERM2</td>
<td>5%</td>
<td>45%</td>
<td>50%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>REL1</td>
<td>10%</td>
<td>43%</td>
<td>47%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>REL2</td>
<td>10%</td>
<td>28%</td>
<td>49%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>NAV</td>
<td>3%</td>
<td>5%</td>
<td>41%</td>
<td>51%</td>
<td>0%</td>
</tr>
<tr>
<td>CSE1</td>
<td>8%</td>
<td>38%</td>
<td>33%</td>
<td>21%</td>
<td>0%</td>
</tr>
<tr>
<td>CSE2</td>
<td>5.13%</td>
<td>48.15%</td>
<td>35.90%</td>
<td>12.82%</td>
<td>0%</td>
</tr>
<tr>
<td>CSE3</td>
<td>5%</td>
<td>50%</td>
<td>32.50%</td>
<td>12.50%</td>
<td>0%</td>
</tr>
<tr>
<td>CSE4</td>
<td>5%</td>
<td>32.50%</td>
<td>57.50%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>CSE5</td>
<td>2.50%</td>
<td>52.50%</td>
<td>40%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>CE1</td>
<td>27.50%</td>
<td>50%</td>
<td>27.50%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>PEOU1</td>
<td>20%</td>
<td>40%</td>
<td>30%</td>
<td>7.50%</td>
<td>2.50%</td>
</tr>
<tr>
<td>PEOU2</td>
<td>10%</td>
<td>47.50%</td>
<td>30%</td>
<td>10%</td>
<td>2.50%</td>
</tr>
<tr>
<td>PEOU3</td>
<td>17.50%</td>
<td>32.50%</td>
<td>37.50%</td>
<td>37.50%</td>
<td>12.50%</td>
</tr>
<tr>
<td>PEOU4</td>
<td>12.50%</td>
<td>42.50%</td>
<td>27.50%</td>
<td>12.50%</td>
<td>5%</td>
</tr>
<tr>
<td>PU1</td>
<td>15%</td>
<td>42.50%</td>
<td>42.50%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>PU2</td>
<td>12.50%</td>
<td>4%</td>
<td>45%</td>
<td>2.50%</td>
<td>0%</td>
</tr>
<tr>
<td>PU3</td>
<td>10%</td>
<td>32.50%</td>
<td>52.50%</td>
<td>5%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Literature review: Multiple choices have been used for variables and grouped together on questionnaire. The questionnaire was included the measurements of all the variables in our model (Appendix 1). The measurements in questionnaire were based on literature about DL and IS and they were modified to be appropriate the DL context. The items measuring both perceived usefulness and perceived ease of use were from validated measurement inventory of variables of TAM in the past (Davis, 1989). System characteristics was measured by items namely, relevance, navigation and terminology and those were taken from the Alexandria DL’s user survey (Hill et al., 1997). The items to measure computer self-efficacy were developed by Compeau and Higgins (1995). And to measure behavior intention, the authors used items which were taken from past application about TAM (Venkatesh & Davis, 1996; Agarwal & Prasad, 1999). The item to measure Computer experience was about how many years user has experience to use DL. In the following table (5.1) empirical finding of questionnaire has been shown.
6 Analysis

This chapter is divided into four main parts that follow TAM, (Davis, 1993). The first part describe the impact of perceived ease of use and perceived usefulness on behavior intention, the second part discuss about the impact of perceived ease of use on perceived usefulness, the third part describes impact of individual differences on perceived ease of use, and the last part explains system characteristics on perceived ease of use and perceived usefulness.

We decided to use Maine effect plot which is a statistical technique, which gives us a simple visual analysis of the means of the response variables for each level of a factor. The main effect plot can help the researchers and give them the general idea of which main effects may be important and also visualizing factors which have the most impact on response. In the graph the reference line shows the overall mean and it used to picture the magnitudes of main effects. The main effect is calculated by subtracting the overall mean for the factor from the mean for each level. To avoid repeating the name of variables which used in this part, we used abbreviations for them which are mentioned as bellow:

- **PEOU**: perceived ease of use.
- **PU**: perceived usefulness.
- **CSE**: computer self-efficacy.
- **ComEx**: computer experience.
- **REL**: relevance.
- **Term**: terminology.
- **Nav**: navigation.
- **BI**: behavior intention

6.1 Perceived ease of use on intention behavior intention (H1)

Considering technology acceptance model, we supposed that perceived ease of use will has impact on user’s behavior intention on digital library. To prove this hypotheses we examined all four variables of perceived ease of use (PEOU) which, we asked from respondents on behavior variables however table 6.1 represents just two variable and we skip the other two factors (PEOU3 & PEOU4) because they did not representing useful information. For this section we supposed PEOU variables as factors and behavior intention (Behave1) as response. As can be seen In figure 6.1, we can understand that those users who believe it is easy to learn how to use digital library, they would like to use digital library more in future this shown by PEOU1. 10 percent of respondents those who advocated disagree to this question are those who don’t want to use digital library more in future however those who think that interaction with digital library is clear and understandable, they will use it more in future.
After examining PEOU variable on Behave1, now we will test same variable of perceived ease of use on Behave2 variable. No one of respondents advocated disagree for Behave2 question and results just have divided between strongly agree to neutral for this variable. Figure 6.2, represents the linkage between POUE variables on behave2 as a result the curve is moving near to the mean line and there is not much difference between the respondents points of view all of them generally stated working with digital library is easy to learn and it is easy for them to be skillful in using it. They also will intended to use digital library if they have access to that.

**6.2 Perceived usefulness on intention behavior intention (H2)**

After analyzing perceived ease of use (PEOU) factors on Behavior intention (Behave1 & 2). To test our second hypotheses (H2), now we will examine perceived usefulness (PU) variables on Behavior intention. Figure 6.3 represent relations between PU variables and Behave1 factor. PU1 representing 15 percent of student who chose strongly agree are those users who think digital library will help them to accomplish their studies more effectively and also believe that they will use DL more in future but there is not a big difference between students who vote strongly agree, agree or neutral. In PU2 also we can see that students who say that using digital library will help them to improve
their performance in their studies, they will use digital library more in future in this part just 2 percent of respondents were disagree. We can also see that students who stated digital library help them to prepare for examination and doing their assignment easier (PU3) and just 5 percent of student were disagree. PU4 also represents students who think digital library is useful in their studies they will use digital library more in future in PU4, 13 percent chose strongly agree and 48 percent of them chose agree and the rest of them chose neutral. Only 2.5 percent of respondents advocated disagree to Behave1 question and this represents those students who don’t want to use digital library more in future.

![Main Effects Plot for Behave1](image1)

Figure 6.3: PU on Behave1

After testing PU variable on Behave2, the following results are observed.

Figure 6.4 represents those respondents who stated digital library is helpful for them and improve their performance in their studies (PU1, PU2) and also those who think digital library is helping them to prepare for the exams and it is useful (PU3, PU4) also mentioned that they will intend to use digital library if they have access to that. For Behave2 question, 35 percent of respondents advocated strongly agree, 53 percent agree and 12 percent neutral.

![Main Effects Plot for Behave2](image2)

Figure 6.4: PU on Behave2
6.3 Perceived ease of use on perceived usefulness (H3)

According to figure 6.5, people who responded that learning to use the DL is not easy for them, they believed that using DL won’t enable them to accomplish their study or for example in, users who believe that DL is easy to use are those who believe DL is useful for their studies. When DL provide relevant document they will be more useful. Moreover, if users find out that using DL is easy, then they will use it more to reach their information need. Also, if user finds DL difficult to use, then they won’t find DL useful anymore.

![Main Effects Plot for PU2](image)

Figure 6-5: PEOU on PU2

6.4 Computer self-efficacy on perceived ease of use (H4)

In hypotheses number four (H4), we supposed that computer self-efficacy will have positive effect on perceived ease of use of digital library. As it was discussed earlier, Computer self-efficacy refers to the ability of users to utilize a computer individually. We tried to ask questions which can help us to understand any possible linkage between this factor and perceived ease of use. We code the question in this part as CSE which represent Computer Self Efficacy. There are five question in this part and all of them tried to figure out if the students can use and utilize digital library by themselves or they think they need to get some help either from the others or the help menu bar. With the help of the main effect plot we can see that what the user’s answers to these questions and also what they think about perceived ease of use at same time. In the figure 6.3, the X axis represent the answer of respondents for the computer self-efficacy question and Y axis represents answers for the perceived ease of use question. In this part, Computer self-efficacy questions are supposed as independent factors and PEOU question are dependent variables.
It is obviously shown in the figure 6.6, strong linear linkage between these two variables. The curve starts at point 1 in the X axis and 1.5 in Y axis. This point represents 5.3 percent of users who strongly believe that it is easy to learn how to work with digital library when they get help from help tool bar as a reference. The curve is rising up steady and reaches the top at the point (4, 3.25) where represents 13 percent of the respondents who think they cannot use digital library even if they use help tool bar and they don’t believe that the learning to use digital library is easy for them.

Figure 6-6: CSE2 on PEOU1

Figure 6.7 demonstrates that people who think they can learn and use digital library when they see someone else using it before they tying it by themselves think that learning to use digital library is still difficult for them in contrast those students who don’t need this kind of help are those users who believe that learning to work with digital library in easy for them. This shows that users who found t learning to use digital library is difficult, they don’t think they can use it even if they get visual help from the others in contrast people who believe that learning to use digital library is easy, they don’t need to get visual help from anybody and just little help from help toolbar is enough for them. 13 percent of respondents think that they cannot use digital library even when they see someone else using it.

Figure 6-7: CSE3 on PEOU1
In CSE5 which is represents in figure 6.8, again we can see that there is a linear linkage between these variables. This table shows only 5 percent of users think they need help when they using digital library and they are those who think learning to use digital library is difficult in contrast to them students who believe that learning to use digital library is easy they don’t need help to work with digital library.

As it can be seen in figure 6.9, people who don’t need to get any help while using digital library are those who also believe that learning to use digital library is easy in contrast to them, 20 percent of respondents who are disagree with CSE1 believe that it is not easy to learn how to use digital library.
We can see that 5 percent of students who chose strongly agree for the CSE4 question and they think that if they have just built in help facility they can use digital library are those who also believe that digital library is clear and understandable. There is no big deference between students who chose agree and natural for CSE2 which consisting about 84 percent of the respondents but there is huge difference between them and students who think that they cannot complete their task with just built in.

![Main Effects Plot for PEOU2](image)

Figure 6-10: CSE4 on PEOU2

In figure 6.11 we can see that those respondents who think they can use digital library if they just get help from help tool bar also think that they can be skillful in using digital library. The curve is rising up and reaches the peak at point (4, 3.4) where represents 14 percent of users who think help toolbar is not enough for them and they cannot be skillful in using digital library.
Another linkage is shown by the figure 6.12 between CSE2 and PEOU4 which represents those students who think that the help tool bar is enough for them to use digital library found that digital library is easy to use while users who help tool bar is not useful for the think that digital library in not easy to use and they chose disagree for both questions where the curve reaches the point (4, 3) at the peak. 5 percent of respondents chose strongly disagree and 12 percent chose disagree in PEOU4.

The last strong linkage which gives us useful information to prove our hypothesis number four is between CSE5 and PEOU4 which is shown in figure 6.13. Here also we can see in the starting point of the curve which representing those users who think the digital library is useful if they get help when they got stuck and without help they cannot use it they also believe that digital library in not useful. The curve is stopped at the point
(4, 1.5) where we can see that those students who do not need any help which consist just 5 percent of the respondents; they believe that digital library is useful.

According to our hypothesis (H4) where we supposed that the computer self-efficacy will have impact on perceived ease of use, we can prove that those students which have higher level of computer self-efficacy will find digital library easy to use.

### 6.5 Computer experience on perceived ease of use (H5)

In this section we examine the computer experience factor in individual differences which also supposed to affect perceived ease of use which formed our hypotheses number five (H5). With reviewing the linkage between ComEx2 and PEOU1, we can understand 23 percent of users who feel very confident about using computer also strongly believe that it is easy to use digital library although 27 percent of the respondents who are little confident when using computer are those who think that it is not easy to learn how to use digital library.
ComEx1 has also linkage with PEOU2. According to the figure 6.15, we can say that students with more experience in computer usage think that interaction with digital library is clear and understandable.

![Main Effects Plot for PEOU2](image)

**Figure 6-15: ComEx1 on PEOU2**

In figure 6.16, we can see that users with more computer experience think that it is easy for them to be skillful in using digital library compare to those who have less computer experience. In the second table where the linkage between ComEx2 is examined also we can see student who feel very confident strongly believe that they can be skillful easily at using digital library.

![Main Effects Plot for PEOU1](image)

**Figure 6-16: ComEx1 & 2 on PEOU1**

Consistent to our hypotheses we can conclude that computer experience has impact on perceived ease of use and those student who have more computer experience will also find digital library easy to use.

In system characteristics part, the result of external variables on both perceived ease of use and perceived usefulness were mixed. Both terminology and navigation have direct relationship with perceived ease of use, supporting H7 & H8, while relevance was found to be significant determinant of perceived usefulness (H6). The effect of these
three external factors on both perceived ease of use and perceived usefulness were supported. According to the tables above, all hypotheses predictors on perceived ease of use and perceived usefulness was significant in the proposed direction.

### 6.6 Relevance on perceived usefulness (Ha6)

Relevance has strong effect on perceived usefulness because it’s about content of the system and more over the purpose of DL is to provide relevant document which user needs. Analyzing the response from this part shows that relevance has a direct effect on perceived usefulness and supports hypotheses Ha6. For example, as it shows on the figure 6.17(REL2,PU1), respondents who responded that document in DL is relate well to their studies, are those people who believe that using DL help they accomplish their study more effectively. On the other hand, people who believe that DL doesn’t have enough resource for their study needs are those people who are disagree that DL is useful in their study as well figure 6.18(REL2,PU4).

![Main Effects Plot for PU1](image)

Figure 6-17: Rel2 on PU1
Refers to figure 6.18 (REL2, PU3), users who responded that DL has enough resource for their study, they believe that DL help enough to do their assignment and be prepare for examination. And some responses was naturel, which means they believe that DL has resource relate to their study but not enough, and they weren’t strongly agree with DL helping them prepare for examination.

Figure 6-18: Rel2 on PU3
6.7 Relevance on perceived ease of use (Hb6)

According to figure 6.19 (REL2, PEOU1), respondents who agreed that DL has enough resource for their study needs, also believed that learning to use the DL are easy for them and moreover they find it easy to use PEOU4. Respondents who disagreed that DL enough resource for their study, believed at learning to use DL are not easy for them.

![Main Effects Plot for PEOU1](image1)

Figure 6-19: Rel2 on PEOU1

In figure 6.20 (REL2, PEOU3), respondents who were disagree that DL has enough resource for their studies, believed that it wouldn’t be easy for them to be skillful at using DL. In the same table has been shown that respondents, who think that DL has enough resource for them, are agreed that it is easy to be skillful at using DL.

![Main Effects Plot for PEOU3](image2)

Figure 6-20: Rel2 on PEOU3
6.8 Terminology on perceived ease of use (H7)

Among the factors of system characteristics, terminology has strongest impact on perceived ease of use of DL. Users who agreed that terms used throughout DL is understandable and consistent for them, are those ones who believes that DL is easy to use or they would be skillful at using DL easily. On the other hand, respondents who responded that terminology in DL is not understandable for them are those who believe that being skillful at using DL is not easy for them. (figure 6.21).

![Main Effects Plot for PEOU2](image)

Figure 6-21: Term2 on PEOU2

Also respondents who responded terms in DL are not understandable for them are those users who believe that learning and using DL is not easy. According to figure 6.22, some of the respondents believe that being skillful at using DL is not easy even though the terms is understandable for them.

![Main Effects Plot for PEOU3](image)

Figure 6-22: Term2 on PEOU3
6.9 Navigation on perceived ease of use (H8)

Respondents responses shows that navigation has smaller but still important and direct impact on perceived ease of use of DL and support hypotheses number eight, as its clear on figure 6.23 (Nav, peou1) users who think that sequence of screen of DL is not confusing are those people who are agree that learning to use DL is easy for them. Respondent who agreed that sequences in DL is confusing are those who strongly disagreed that learning to use DL is easy for them.

Figure 6-23: Nav on PEOU1

Users who believe that sequence of screen of DL is confusing are those who responded that strongly disagreed that being skillful at using DL is easy for them. On the other hand, users who believed that sequences on DL is not confusing at all, are those respondents who believed that being skillful at using DL is easy for them (figure 6.24).

Figure 6-24: Nav on PEOU3
7 Conclusion

THIS RESEARCH IS A RESPONSE TO THE CALL for increasing the user acceptance of DL at Jönköping University. Utilizing the well-established TAM as a theoretical framework, critical external factors (two individual differences and three system characteristics), were proposed to have significant influence on the intention to use a DL via both perceived ease of use and perceived usefulness.

According to our first research question (How can we increase the users’ acceptance for digital library in Jönköping University?) with considering the technology acceptance model, perceived ease of use and perceived usefulness are identified as important factors which can improve users’ acceptance of digital library. We find out that when users have more experience with using digital library they interact more efficiently and clearly with digital library and this will increase perceived ease of use and perceived usefulness. Regarding to TAM, we also find out perceived ease of use can also impact on perceived usefulness.

Considering our second research question (What are the determinants of user acceptance of digital library?), two categories of external factors, namely system characteristics and individual differences were identified as important determinants which can impact users’ intention to use of digital library throughout perceived ease of use and perceived usefulness. Computer self-efficacy and computer experience identified in individual differences category are important factors can impact perceived ease of use. Relevance, terminology and navigation were also find out as important factors in system characteristics category which can impact users’ intention to use digital library through both perceived ease of use and perceived usefulness. Relevance can have impact on both perceived ease of use and perceived usefulness.

7.1 Contribution

Given the growth of DLs recently, it is significant for practitioners and researchers to understand how to increase usage and make DLs more effective. Therefore, from a practical perspective, understanding the effect of external variables in user acceptance can help implementers and designers of DLs to create a better fit between system users’ personal characteristics.

The result of this study demonstrated how to improve usability of DL. To be more precise, investing huge amount of money on DLs across the world to develop usable DL shows the importance of DL. According to this purpose, the developers should focused on designing user friendly interfaces, which embrace various requirements like using student familiar terminology, well depicted buttons and icons, consistent interface style, and clear navigation flow. In this light, developers should consider that the interfaces should ask users in the early stages to make decision that DL is usable for students. Consequently, the content in DL should relate to student requirements. DL should accommodate different background knowledge of students by developing customized interfaces.
7.2 Suggestions

➢ To increase computer self efficacy and computer experience

Organizing preliminary courses in DL for all new students will help university authorities to increase computer self efficacy and computer experience of students. Increase in students’ knowledge of digital library and familiarity with DL will improve the ease of use. While there is no control of the amount of computer knowledge and experience of students, training sessions on other kind of software applications can also be useful to increase computer self-efficacy.

➢ To increase relevance

Developers should gather and understand clearly students requirements to provide more relevant content in digital library which can afford students expectations.

➢ To increase terminology

Designers have to avoid using technical terms, however in some cases with the clear explanation they can use them. Instructions in the interface of digital library should be drafted in clear and understandable manner for general users. Since Jönköping University is an international university with students coming from different countries with different background and knowledge of English language, lots of efforts have to be put in to provide better fit between systems vocabulary and students’ language.

➢ To increase navigation

Designers should provide navigation aids and descriptive labels to improve navigation in digital library. Redundant pages should be removed and screens should help users to navigate easily.

By following the suggestions, authors believe DL at Jönköping University will be able to entice more students to adopt them. This thesis tested and also extended TAM with considering the DL of Jönköping University and added two categories of external factors to it. Figure 7.1 presents the improved model, based on TAM which is our contribution to this topic.
Our results can be generalized for other DLs and our suggestion can be useful for other organizations and universities which already have DL or they are planning to introduce it.

7.3 Critique of method used in the study

When reflecting the chose method, we feel obligated to make conclusions regarding the choice. Would the same method been chose if we were to investigate on this research question again? Our answer is that we probably would choose a similar method, with minor complements. First, we would use a larger sample size - rather double the population, In order to improve the reliability of this thesis. Secondly, we would rather to increase the number of questions in questionnaire. Questions related to each factor would be more in detail and it also give respondents more chance to elaborate. It would help to have better foundation in conclusion and recommendation within the study as well.

7.4 Further research

During our studies we faced other interesting questions which can be investigated in further research. Questions such as: Is there any other categories except individual differences and system characteristics which can have impact on user acceptance? Or what are the other factors in individual differences and system characteristics that may have impact on perceived ease of use and perceived usefulness? These questionas and examine other factors that might impact user acceptance of DL.
References


References


Appendix I

Demographic questions:

1) What is your age?
   i. Under 19
   ii. Between 19-24
   iii. Between 24-29
   iv. Older than 29

2) What is your gender?
   i. Female
   ii. Male

3) Which school are you studying?
   i. JIBS
   ii. JTH
   iii. HLK
   iv. HHJ

4) How long have you been studying in Jonkoping university?
   i. Less than one year
   ii. Between one and three years
   iii. More than three years

5) How often do you use digital library?
   i. More than once during a day
   ii. About once a day
   iii. Few times a week
   iv. About once a week
   v. About once in two weeks
   vi. About once a month
   vii. Less than once a month

Terminology:

- TERM1: The term used in digital library is understandable for me.
- TERM2: The terms used in DL are consistent with terms is use to search my information needs.

Relevance:

- REL1: Documents in DL relate well to my study.
- REL2: The DL gives me enough resource for my study.
Appendix

Navigation:
- NAV: The sequence of screens on DL is confusing.

Computer self-efficacy:
- CSE1: I would complete the assignment using digital library without needing help from anybody.
- CSE2: I can use digital library if I had only used the help tool bar as a reference.
- CSE3: I can use digital library if I had seen someone else using it before trying it myself.
- CSE4: I can use and search via digital library if I had just a built-in help facility for assistance.
- CSE5: Digital library is useful if I could get help when I got stuck.

Computer experience:
- CE1: How long do you have experience using computer? …… Year
- CE2: How confident do you feel about using computer?

Perceived ease of use:
- PEOU1: I believe that learning to use the DL is easy for me.
- PEOU2: Interaction with DL is clear and understandable.
- PEOU3: It is easy for me to be skilful at using DL.
- PEOU4: I believe that DL is easy to use.

Perceived usefulness:
- PU1: Using DL helps me to accomplish my study more effectively.
- PU2: Using DL enable me to improve my performance in study.
- PU3: Using DL helps me to do my assignment easier and prepare for examination.
- PU4: Digital library is useful in my study.

Behavior intention:
- BI1: I would like to use DL more in the future.
- BI2: Assuming that I have access to DL, I intend to use.