

# Technology Acceptance Factors in E-commerce Environment - Case DHL Express

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School of Economics

# TECHNOLOGY ACCEPTANCE FACTORS IN E-COMMERCE ENVIRONMENT

Case DHL Express

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### ABSTRACT

Nowadays, people are more and more shifting their consumption to the Web. In logistics and freight services, shipping and tracking of shipments, which were earlier done by phone or fax, are now executed in the Web with specific shipping applications. The object of this thesis is to find out which factors form a user's perception of an e-commerce application and how the perception can be influenced and improved. The thesis is conducted for DHL Express by studying the acceptance of their most used shipping application, DHL IntraShip.

The main goal of this research was to discover which factors form a user's perception about an e-commerce application and which forces moderate the determining factors. The biggest objective for the literature study is to build a model, which explains how the perception of the acceptance of an application is build and the relationships between the factors and the moderating forces behind them. Another objective of the study is to apply the constructed model to the case application and identify influencing factors in practice. The third objective was to provide information about the practical problems in the DHL IntraShip application.

The theoretical study is done by analyzing different technology acceptance theories and the factors in them. Also the connection between technology acceptance factors and usability definition is searched, but eventually only loose connections were discovered. Based on this analysis, a revised e-commerce technology acceptance model for B2B business is constructed, which suggests that the factors forming a user's opinion about an e-commerce application are perceived usefulness, perceived ease of use, perceived reliance and trust. In addition to these, facilitating conditions are affecting straight the actual usage behavior. The moderating factors that either strengthen or weaken the importance of the determining factors were stated to be gender, age and experience of use.

The empirical research is constituted by interviewing six B2B frequent users of DHL IntraShip. The chosen research method was semi-structured interviews combined with an observation study. Based on the empirical research, the revised technology acceptance model was tested and verified: perceived usefulness, ease of use reliance, trust and facilitating conditions seemed to affect the perception of DHL IntraShip. However, the factors were modified by gender, age and experience as follows: the effect of perceived usefulness is stronger for men, young and users with high experience, perceived ease of use affects stronger for older females and weaker for users with high experience, perceived reliance is stronger for novice users and trust affects more the perceptions of females.

**Keywords:** TAM, UTAUT, technology acceptance factors, usability, e-commerce

**Total number of pages:** 101

## Teknologian hyväksyttävyystekijät verkkokauppaympäristössä - Case DHL Express

### TIIVISTELMÄ

Nykyään ihmiset siirtävät kulutustaan yhä enemmän Internetiin. Logistiikka- ja rahtipalveluissa, lähetysten teko sekä niiden seuraaminen, jotka aiemmin suoritettiin puhelimitse tai faksilla, ovat siirtyneet tehtäväksi Internetin kautta toimivilla nettisovelluksilla. Tämän tutkimuksen tarkoituksena on selvittää tekijät, jotka muodostavat käyttäjän mielikuvan sovelluksesta sekä kuinka siihen voidaan vaikuttaa ja kuinka parantaa. Tämä tutkimus on tehty DHL Expressille ja siinä tutkittiin heidän käytetyimmän noutotilaussovelluksensa, DHL IntraShipin, hyväksyttävyyttä.

Tutkimuksen päätavoitteena oli saada selville, mitkä tekijät muodostavat käyttäjän käsityksen verkkokauppasovelluksesta sekä millaiset tekijät muokkaavat löydettyjen määrävien tekijöiden merkitystä teknologian hyväksyttävyyteen. Teoreettisen tutkimuksen tärkein tavoite oli rakentaa malli, joka selittää kuinka käyttäjät muodostavat käsityksen teknologian hyväksyttävyydestä sekä siihen vaikuttavien tekijöiden suhteet ja niitä muokkaavat ominaisuudet. Toinen tutkimuksen tavoitteista oli testata muodostetun mallin toimivuutta käytännössä sekä tunnistaa vaikuttavat tekijät. Kolmas tavoite oli tuottaa DHL Expressille tietoa sovelluksen ongelmakohtista.

Teoreettinen tutkimus suoritettiin analysoimalla erilaisia teknologian hyväksyttävyyksille ja tekijöille niissä. Myös yhteyttä käytettävyyden sekä teknologian hyväksyttävyyden välillä tutkittiin, mutta se osoittautui näiden teorioiden väliltä ainoastaan häilyväksi. Analyysin perusteella muodostettiin muokattu teknologian hyväksymismalli verkkokaupan ympäristöön, joka soveltuu erityisesti B2B liiketoiminnan tarkasteluun. Malli esittää, että teknologian hyväksyttävyyteen vaikuttavat hyödyllisyys, helppokäyttöisyys, riippuvuus sekä sovelluksen luotettavuus. Tämän lisäksi helpottavat tekijät (esim. koulutus) vaikuttavat suoraan päätökseen käyttää työkalua. Muokkaavia tekijöitä, jotka joko voimistavat tai heikentävät kunkin määrävien tekijän merkitystä, ovat sukupuoli, ikä ja käyttökokemus.

Empiirinen tutkimus suoritettiin haastattelemalla kuutta DHL IntraShipin käyttäjää. Tutkimusmenetelmä oli puolistrukturoidut haastattelut sekä havainnointi. Empiirisen tutkimuksen perusteella muokattu teknologian hyväksymismalli testattiin ja vahvistettiin toimivaksi soveltuvien osien. Hyödyllisyyden, helppokäyttöisyyden, riippuvuuden, luottamuksen sekä helpottavien tekijöiden todettiin vaikuttavan hyväksyttävyyteen. Näitä tekijöitä muokkasivat sukupuoli, ikä ja kokemus seuraavasti: hyödyllisyys vaikuttaa hyväksyttävyyteen vahvemmin miehillä, nuorilla sekä kokeneilla käyttäjillä, helppokäyttöisyyden vaikutus on voimakkaampi vanhemmilla naisilla sekä heikompi kokeneilla käyttäjillä, riippuvuus on suurempi uusilla käyttäjillä ja luottamuksen vaikutus on suurempi naisilla.

**Avainsanat:** TAM, UTAUT, teknologian hyväksyttävyystekijät, käytettävyys, verkkokauppa  
**Sivujen lukumäärä (liitteineen):** 101

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# **1 Introduction**

The presence of computer and information technologies in today's organizations has expanded dramatically. According to Westland et al. (2000) some estimates indicate that, since the 1980s, about 50 percent of all new capital investment in organizations has been in information technology. According to Gorla et al. (2010, 1) excellence in IS-quality involves using state-of-art technology, following industry "best practice" software standards, and delivering "error-free" performance. The value of IS can be realized by improving profit margins for the firm, providing easy-to-use and useful applications, and designing easily maintainable software.

These are some of the reasons why companies are more and more interested in the acceptance and usability of IT applications and their development. In addition to financial investments, another reason for such a great interest, is that e-commerce systems or other technological services affect perceived customer service which, when reaching a high level, contributes to more loyal customers and naturally also to better revenues for the entire business. Also information technology adoption and use in the work place remains a central concern of information systems research and practice. According to Venkatesh et al. (2000), despite impressive advances in hardware and software capabilities, the troubling problem of underutilized applications continues. Reunis et al. (2006) also state that full benefits from information systems can be achieved only if and when the end-users adopt the tool and apply it successfully in their everyday work using the system correctly and to its full potential. The lack of this 'intended behavior' is also one of the major causes leading to "a productivity paradox", which is a lot discussed issue mainly because of the scarce returns stemming from huge investments in information technology.

## **1.1 Background Information**

This study examines, if there are some specific factors, which define the acceptance of an e-commerce application and also the quality of one. The case company of the study is DHL Express, which is one of the biggest logistics service companies in the world and the global market leader in the international express business. This study aims at expanding the results gathered from the theoretical part to practice by studying the usability dimensions of DHL



IntraShip application. In practice the IntraShip application works as follows: the B2B customers of DHL Express fill in the bill of freight, make a pick up order and conduct a manifest (send the information to DHL Express) with the application. They can also track where their orders are on a specific moment and look for their shipping details in the history module. There has been a constant complaint from B2B customers about an unsatisfactory service quality, so that is the reason why DHL Express is keen to finding out, how can improve the service and more specifically, which factors affect the customer perceptions of the application quality. DHL Express wishes to discover, are there some concrete spots of improvement in the application or are the flaws in the overall service experience.

## **1.2 Research Questions**

Practitioners generally evaluate systems not only to predict acceptability but also to diagnose the reasons underlying lack of acceptance and to formulate interventions to improve user acceptance. In this sense, research on how usefulness and ease of use can be influenced by various externally controllable factors, such as the functional and interface characteristics of the system, development methodologies, training and education, and user involvements in design is important (Davis 1989, 335).

The theoretical research questions of the study can be divided into two parts:

- 1) Which determining factors affect the customer perceptions of an e-commerce application?
- 2) Which moderating factors increase or decrease the importance of each determining factor?

The theoretical contribution of the research is to be able to define the factors which affect a user's perceptions about an e-commerce application. The theoretical research, in the study, is done by investigating, which determining factors are used in the previous literature to define the antecedents for technology acceptance. In addition to the basic technology acceptance theories, also those which are expanded to cover applications operating in e-commerce and web -environments are studied in order to find the specific factors that apply in those circumstances. However, since these theories are almost always just considering some specific industry or special kind of software, some research must be done to find the factors

which fit into this specific situation. The main goal of the theoretical study is to find and place the right factors in revised e-commerce TAM, which is constituted according to the literature study.

The practical research problem is also divided into two parts:

- 1) Which factors affect the perceptions of DHL Express' B2B customers about the DHL IntraShip application?
- 2) What kind of errors or points of improvement can be found from DHL IntraShip application and how strongly these factors seem to be affecting the acceptance and usability of the software?

The empirical part of the study is done by interviewing DHL Express' B2B customers and also conducting a short observation survey, where the participants are asked to make a shipping order with the IntraShip application and think aloud while proceeding. The interviews were semi-structured discussion occasions. All together six interviews were conducted and each interviewee was representing a separate company. The majority of the respondents were using the application daily and it seemed that it was pretty mandatory for accomplishing their daily work tasks. By interviewing these B2B customers, the possible errors are searched from the application.

### **1.3 Structure of the Study**

This thesis consists of five main parts. The first part is a background study, which presents the current issues in e-commerce application also applied in logistics and freight sector and the case application DHL IntraShip in detail. The second part of the study, a theoretical part, is divided in three chapters, which concentrate on three essential subjects: technology acceptance theories, usability definition and technology acceptance in e-commerce web applications. The third part concentrates on introduction of the empirical research. It contains the presentation of the case company, DHL Express, reasoning why the exact research methodology was chosen and the introduction of the interview framework used in the empirical research. The fourth part of the thesis consists of the presentation of the interview results; the analysis and discussion of the results. In the fifth part the final conclusions are drawn, theoretical and managerial implications are presented and also the limitations of the

research discussed. In the end of this section, also some further research avenues are proposed.

The background study begins with introducing and defining e-commerce business, also applied in logistics and freight sectors, explaining how e-commerce applications are used in logistics environment and lastly introducing DHL Express' IntraShip application, which is the case application researched in this study.

In the theoretical part the three main frameworks of the research are discussed: Technology acceptance model (TAM), TAM2 and Unified theory of acceptance and use of technology (UTAUT). The technology acceptance model (TAM) is originally introduced by Davis (1990) and it has also been revised various times later on. Jakob Nielsen's usability definition (Nielsen 1993) will be presented in chapter four. In his study, Nielsen (1993) divides the usability of an application to be consisting of five attributes: learnability, efficiency, memorability, errors and subjective satisfaction. These five factors of usability will be presented and discussed and after that the interrelationships between technology acceptance factors and usability measures will be searched and combined. Since some revised technology acceptance models (TAM2 and UTAUT) are also widely accepted in the literature and in practice and they contain more interpretative factors than the original TAM, also these theories will be included in the study and used in building the revised TAM model, which is finally presented in the chapter five. In the end, the main goal of the theoretical research is to build a model, which combines factors from technology acceptance models, exploiting also the observations gathered from usability and technology relationships, and apply these contributions to the e-commerce environment. This revised e-commerce TAM will be introduced in the end of the fifth chapter of this thesis.

In the second main part of the study, the case company, DHL Express, will be introduced. Then the research methodology will be discussed and presented: combined semi-structured interview and an observation technique. The main goal of this part is to explain, why these exact methods are chosen and which are the pros and cons of them. In the last section of the sixth chapter the interview framework will be introduced. The total framework consists of three parts: tentative preliminary questionnaire (demographics, usage habits, importance of the application), usability survey (divided in five factors, which are all evaluated on a scale

from one to five) and technology acceptance framework (contains 26 questions which are constituted based on different technology acceptance models).

In the seventh chapter of the thesis the interview results are discussed. First the results from the usability questionnaire are presented and then the participants of the study are described. The interviewees and their basic information are also presented one by one in the Appendix A. After the demographics, the usage experience and usage habits are carefully analyzed and discussed and the interview results are discussed based on the factors of revised e-commerce TAM, which is constructed in the chapter five. The goal is to carefully analyze the results in order to find out, how the four determining factors (perceived usefulness, perceived ease of use, perceived reliance and trust), are influencing the intention to use and finally the usage behavior of the DHL IntraShip application. Also the antecedents behind these factors are analyzed and the revised e-commerce TAM is modified to cover the case application, DHL IntraShip based on the interview results. In the end of the chapter seven, the practical issues, found from the application, are presented. These errors are divided in six categories: logic and functionality; buttons, fields and links; updating and saving information; training; communication and instructions; printing issues and others.

In the final part of the research, the ultimate conclusions are drawn. First the theoretical implications, which are formed based on the literature research, are presented. Then the theoretical conclusions are drawn from the interview results and based on those, the managerial implications are introduced. Lastly the limitations of the research are discussed and some further research avenues proposed.

## **2 E-commerce and Web Applications**

E-commerce is a wide concept with multiple definitions depending on the context and viewpoint. According to Electronic Commerce Association it can be defined as “*covering any form of business that is executed, using any information and communication technology*”. García-Sánchez et al. (2005, 223) states that “*e-commerce offers opportunities to dramatically improve the way that businesses interact with both their customers and suppliers, to make business negotiations faster, cheaper, more personalized, and more agile*”.

Nowadays, people are more and more shifting their shopping to the Web and to make this easier, companies are constantly aiming at developing more effective and user-friendly e-commerce applications. These e-applications have been developed from a first generation stage, where the buyers are humans who browse through a catalog of commodities in Internet and make purchases through a website, to a second generation solutions with a greater degree of automation on both the buyer’s and the seller’s side. E-commerce is very popular in commodities and apparel business, but it is also expanding to other industries. To give an example, in logistics and freight services the actions, which were earlier done by phone or fax is now executed with help of special web-based applications. One of the greatest advantages brought by using these solutions is that they reduce significantly the amount of manual work for both of the parties – the buyer and the seller.

### **2.1 E-commerce in Logistics and Freight Services**

E-commerce can be divided to B2B and B2C sides. In the case of B2B e-commerce, Hesse (2002, 216) defines the e-commerce as “the exchange of information and transactions between different commercial agents, such as firms”. It is an outcome of the interaction of technological applications and their adoption by certain users, leading to particular consequences. E-commerce innovations are divided by Hesse (2002) to *front-end* and *back-end solutions*. Most innovations in e-commerce are front-end solutions, which refer to the way goods and services are being ordered by customers, basically what the customers see of the e-commerce application. For example the basic e-commerce applications that logistics service providers offer for their B2C or B2B customers on their web pages, are these kinds of services. Internet sites of companies function as main platforms for information exchanges and transforming them into market transactions. Hesse (2002, 216) lists several advantages

provided by e-commerce in general, such as more reliable and predictable orders for supplier, acceleration of the entire ordering process, faster delivery, online shipment tracking and greater market transparency. However, in addition to these front-end effects, e-commerce has also influence on the back end of the supply chain. They are, for example, how the logistics routes are designed, how the inventory levels are managed and so on. According to Hesse (2002) these processes have this far undergone only some minor changes due to the increase of e-commerce and in many cases they have not been changing at all.

## **2.2 Web Applications in Logistics Sector**

E-commerce applications support and execute business processes for many business domains such as call centers and online retail stores. Because of the growing business requirements, these applications have increasingly evolved to provide sophisticated functional features through their graphical user interfaces (Zou et al. 2007, 837). However, especially for novice users, the right usage of an application is not self-explanatory. The users often need guidance through the process, because many times the applications are unfortunately designed from the perspective of the IT personnel rather than the actual business users. This may cause problems, because the users don't understand the application's logic or the language nor the terms used in it. Even though user-friendliness of technical solutions overall is a highly emphasized issue nowadays, still especially the development of applications that are rather aimed at accomplishing some "mandatory tasks" than at "entertainment" is in its infancy.

One innovational application of the e-commerce business in logistics and freight companies is ordering via online 'freight brokers'. In these kinds of solutions the point is that the customer can race the participating companies. When the customer can choose their service provider based on the price details and other terms of delivery, the transparency of the markets increases and the users of the solutions have more options available. However, Hesse (2002, 216) lists some disadvantages which have hindered these kind of solutions to become too popular among companies: first, not all of the shippers want to join the auctions since a large number of firms in the US and in Europe are still operating on the basis of yearly contracts; second, even though the innovation may create some cost advantages, at the same time it causes reliability and predictability problems; and third, many logistics providers don't necessarily want to reveal their proprietary information to their competitors through these

applications (pricing delivery times etc.). However, sometimes it is almost mandatory to be involved in these competitive structures, because all the other companies are as well and by dropping out of it would mean losing a huge potential of growth and sales.

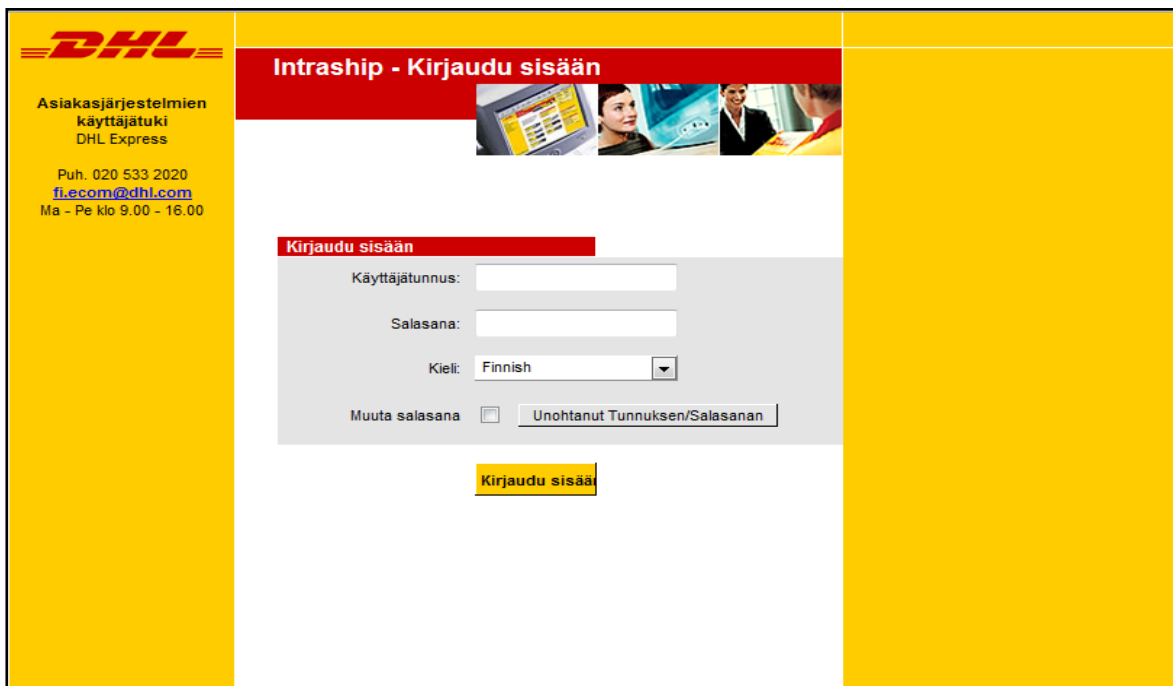
### **2.3 Introduction of the Case Application – DHL IntraShip**

This study concentrates on the factors, which make e-commerce solution acceptable among its users. Here acceptance is defined to be covering the entire user satisfaction, which consists for example of usefulness and ease of use perceptions. The case application of this study is an online shipping tool called DHL IntraShip and it will be introduced in this chapter next. IntraShip is the main application that DHL Express' B2B customers are using for shipping. It is a web-based e-commerce tool for shipping order making and their tracking. The application is used through DHL Finland's website and it is aimed at account holders of DHL Express, so basically to "volume shippers". DHL Express promotes the application to be automating customer's shipping routines: preparing, tracking and managing shipments. Through the tracking aspect of the software, the customers are able to follow the shipments at all times during the day. Information about prior shipments will be stored in the application for few months. Reports provided by the application are meant to help customers to manage shipping volumes comprehensively.

DHL Express promises that IntraShip users will be able to perform several functions with the application such as printing of the delivery documents, creation of necessary customs documents such as invoices for the purchases and pro-formas, make shipping orders, send a pre-notice by e-mail for the recipient of the shipment, track the sent shipments and create statistical and delivery reports when necessary. DHL IntraShip can basically be used anywhere anytime as long as the customer has an access to the Internet and is registered as an account holder for DHL Express. DHL Express also offers their customers IT-support by phone and if they are encountering problems with the shipping, they can also call the regular customer service of DHL Express. DHL Express offers also other web-based applications for their customers such as DHL ShipNow, DHL Proview and DHL Connect, which is however not generally used anymore.

Next the ordering process and some functionalities are presented shortly with some describing pictures. The value adding potential for DHL Express' customers with IntraShip application

are at least that no manual bills of freight are needed any more, no unnecessary phone calls or faxes when shipping is done and the possibility to see and track the old shipments online. Next, I will describe the basic process of making a shipment with DHL IntraShip. In the figure 2-1 is presented the Sign in –screen of intraShip, which opens up when the application appears in the browser. In order to enter the solution, a user name and a password are asked and required. The language can be chosen from the screen as well, before entering the solution.



**Figure 2-1** Sign in –screen

The first view that opens up is the Shipment list overview –screen, is seen above in the figure 2-2. From the transport mode icon, either road or air-transport can be chosen. After that, the order can be continued by clicking “Add order” –link on the left side of the screen (see the arrow).



**DHL**

Asiakasjärjestelmien käyttäjätuki  
DHL Express

Puh. 020 533 2020  
fi.ecom@dhl.com  
Ma - Pe klo 9.00 - 16.00

ID#: 100023583

**Transport type:**

Shipment list overview

Add order  
Special Order  
Search filter  
Address book  
Reports  
End-of-Day manifest  
Pick up  
Client options  
Global Track & Trace  
Mailinglist administration  
DHL Web  
General Info  
Client Information  
Logout

Deutsche Post DHL

**Intraship - Shipment list overview**

**Shipment list**

Deselect all | Select all | Print | Global Track & Trace | Delete

Show all unprinted orders

Customer no. of sender	Shipment Date	Status	Product Code	Receiver	User	Shipment No.	Select	Copy	Email
ID	Shipment weight	Number of packages				shippers reference			

**Figure 2-2** Shipment list overview- screen

The next step in the process is to fill out the shipper's information and the screen can be seen in the figure 2-3. If the customer has already saved one or more contact information in the application, they can be picked up from a list. Also, the one that was used and saved last, will appear to the screen as default option. However, if a new information is used, the fields can be entered manually.

**DHL**

Asiakasjärjestelmien käyttäjätuki  
DHL Express

Puh. 020 533 2020  
fi.ecom@dhl.com  
Ma - Pe klo 9.00 - 16.00

ID#: 100023583

**Transport type:**

Shipment list overview

Add order

Special Order

Search filter

Address book

Reports

End-of-Day manifest

Pick up

Client options

Global Track & Trace

Mailinglist administration

DHL Web

General Info

Client Information

Logout

Deutsche Post DHL

**Intraship - Add order**

Shipper Receiver Shipment details Piece Details Notify Receiver

Origin code: ???

Sender ID: Yritys Oy

Company name: **Yritys Oy**

Contact: **Matti Meikäläinen**

Account: 160546022 Testinumero

Address 1: Maaherrantie 12

Address 2: Maaherrantie 12

Address 3:

ZIP: City: 00260 Helsinki

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Email: matti.meikalainen@mail.fi

Vat No:

GOGREEN:

Time stamp:

Search Add address Update address Clear fields

Update page Invoice address...

**Bold fields are mandatory.**

Save and return Save/Print

Figure 2-3 Shipper's information

After that, the receiver's contact information can be added by moving to the next interleaf which is presented below in the figure 2-4. Just like before, already existing information or completely new one may be used. In both of the screens mandatory fields are expressed with bolding. These fields have to be filled before entering forward.

**DHL**

Asiakasjärjestelmien käyttäjätuki  
DHL Express

Puh. 020 533 2020  
fi.ecom@dhl.com  
Ma - Pe klo 9.00 - 16.00

ID#: 100023583

**Transport type:**

Shipment list overview

Add order

Special Order

Search filter

Address book

Reports

End-of-Day manifest

Pick up

Client options

Global Track & Trace

Mailinglist administration

DHL Web

General Info

Client Information

Logout

Deutsche Post DHL

**Intraship - Add order**

Shipper Receiver Shipment details Piece Details Notify Receiver

Combined shipper & receiver screen

Company name: **Alihankkija**

Contact: **Matti Meikäläinen**

Address 1: Nouto-osoite

Address 2:

Address 3:

Match code:

ZIP: City: 02200 ESPOO

Country: Finland

Phone: 0123456789

Fax:

Email:

Vat No:

Destination code:

Paid by:

Search Add address Update address Clear fields

Update page Find destination code Global Mail

**Bold fields are mandatory.**

Save and return Save/Print

Figure 2-4 Receiver's information

After filling in the sender's and receiver's information, the shipment details are reported in the next interleaf which is shown in the upper part of the figure 2-5. All the necessary fields have to be once again filled and then you can move to the last phase of the shipment.

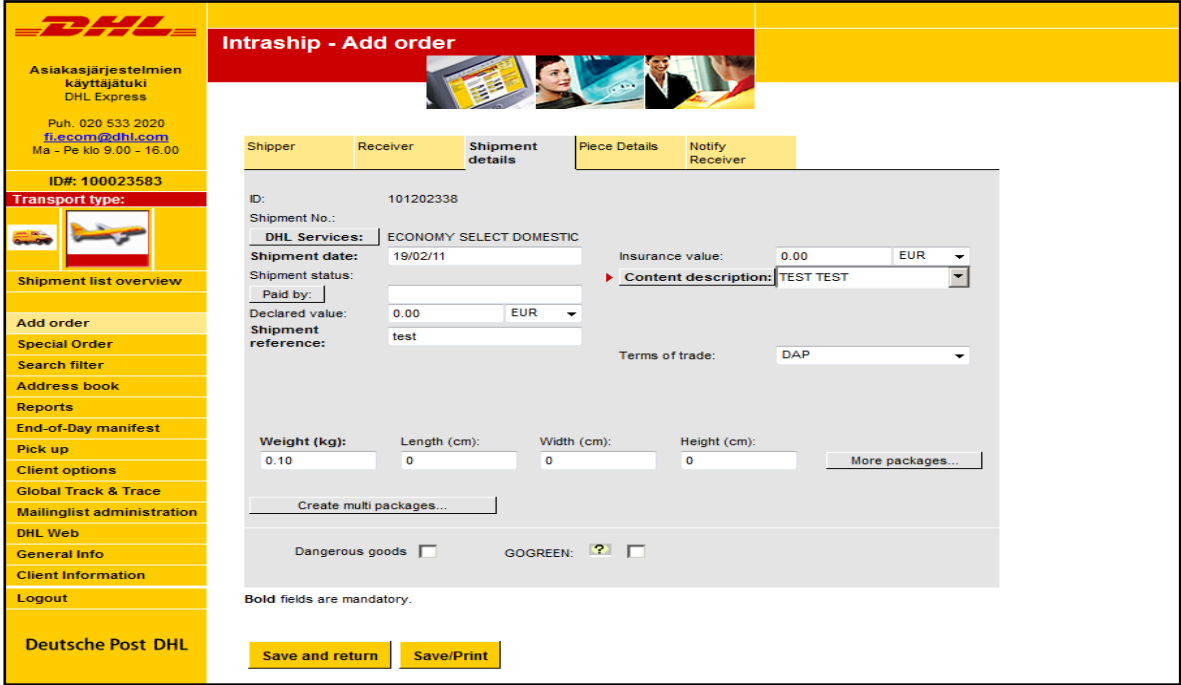


Figure 2-5 Shipment details –screen

Sending a pre-notice to the receiver is presented in the figure 2-6 below. This means that it is possible to send the receiver either an e-mail or a SMS beforehand about the upcoming shipment. The process can be finished by clicking the Save/Print –button, which will create all the necessary documents and save the case.

**DHL**

Asiakasjärjestelmien käyttäjätuki  
DHL Express

Puh. 020 533 2020  
fi.ecom@dhl.com  
Ma - Pe klo 9.00 - 16.00

ID#: 100023583

**Transport type:**

Shipment list overview

Add order

Special Order

Search filter

Address book

Reports

End-of-Day manifest

Pick up

Client options

Global Track & Trace

Mailinglist administration

**Intraship - Add order**

Shipper Receiver Shipment details Piece Details **Notify Receiver**

Email text:

Name of receiver:

Email:

Shipment No.:

Number	Receiver	Action

Bold fields are mandatory.

**Figure 2-6** Notify receiver –screen

Making a shipping order is a three-phase process with DHL IntraShip. First the customer fills in the information for the bill of freight, then orders a pick up and thirdly send the manifest (sends the information) to DHL. As long as the manifesto is done, it is possible to edit or delete the already made cases through a Contract editing –screen, which is to be seen in the figure 2-7.

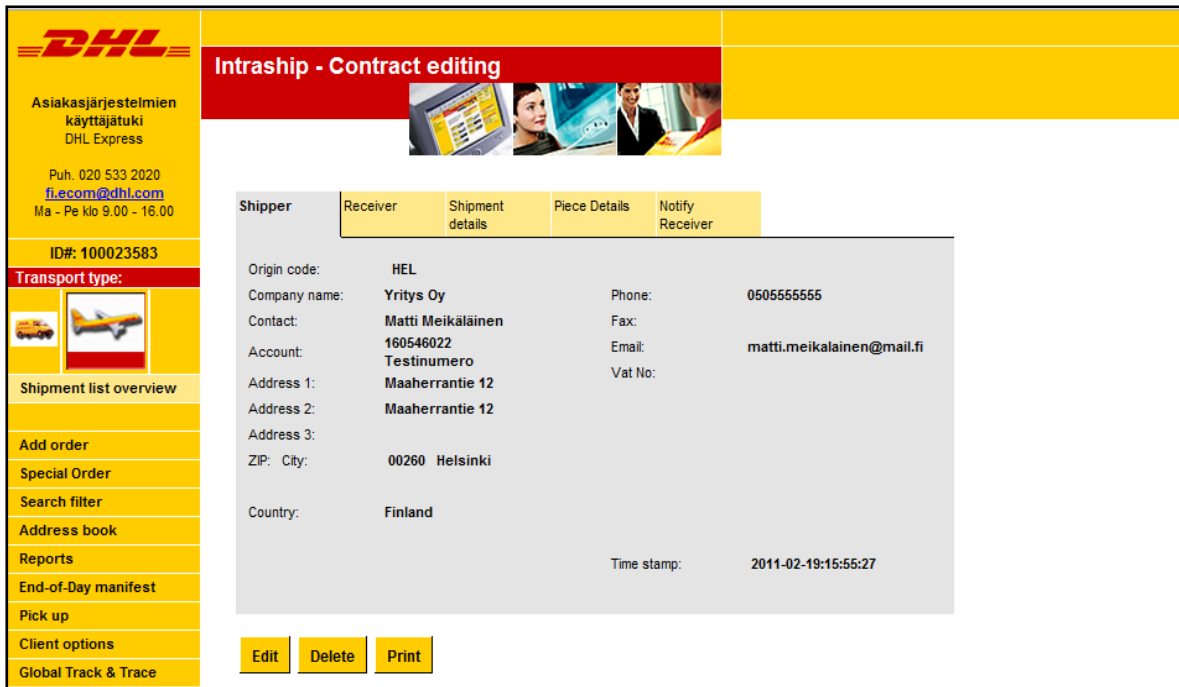


Figure 2-7 Contract editing -screen

Normally large customers, who are sending dozens or even hundreds of shipments per day, have a regular pick up every day and in these cases the pick-up –order is not required separately. However, when the customer doesn't have an automatic order, this is done in the screen, shown below in the figure 2-8.

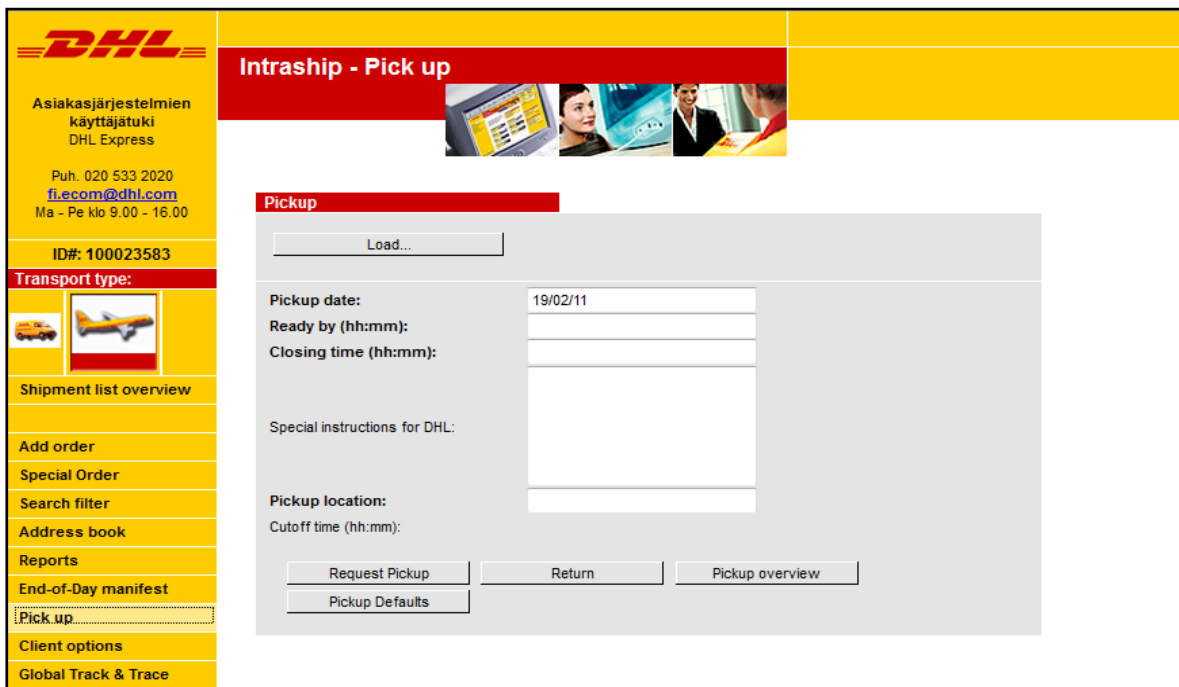


Figure 2-8 Pick-up order -screen

### 3 Technology Acceptance Theories

Information technology has a great potential in improving work productivity and efficiency. However this is possible only if people accept these technologies and use them the way they are supposed to. In the worst case, new technological solutions just prevent productivity increase when people don't want to use them and are still forced to do so involuntarily. User acceptance is defining whether an application is successful or not. Nielsen (1993, 24) has defined it as "if the application satisfies the needs and demands of the users as well as other potential stakeholders and also how useful the application is for the users". While there are various factors which influence user acceptance and usage behavior of technological solutions, the most critical one has appeared to be user's perceptions about usefulness of a system. (Venkatesh 1998, 31). In this chapter, three technology acceptance theories, TAM, TAM2 and UTAUT are presented discussed one by one and in later chapters these ones are revised to consider the particular e-commerce environment.

#### 3.1 TAM

The original and at the same time most popular model predicting user acceptance is the Technology Acceptance Model (TAM) by Davis (1989). TAM is adapted from the Theory of Reasoned Action (TRA) model, which explains and predicts the behavior of people in specific situations. TRA proposes that a person's behaviors are determined by the person's intention to perform the behaviors. This assumption is also applied to TAM. The model explains how determining factors form the user's intention to use a technological solution, which in turn leads to the actual usage behavior, so whether the application is accepted or rejected. The purpose of the model is to explain what causes people to reject or accept information technology. Chooprayoon et al. (2007) defines that the main purpose of TAM is to present an approach to study the effects of external variables towards people's internal beliefs, attitudes and intentions. Davis (1989) states in his study that acceptance is dependent on two important concepts: *perceived usefulness* and *perceived ease of use*. Perceived usefulness depicts user's subjective belief of how much the usage of certain application will increase his or her job performance. Perceived ease of use describes user's expectations of how easy the application is to use. When comparing these two, the research of Davis (1989, 334) showed that although

difficulty of use can discourage adoption of an otherwise useful system, no amount of ease of use can compensate for a system that does not perform a useful function.

TAM assumes that behavioral intention to use a system or application always precedes the actual system use. The relation from perceived usefulness to intention is explained by empirical evidence that in organizational environment perceived usefulness can override negative attitude. User may expect that enhancing performance may bring other benefits to them, like salary increases or promotions, despite the fact whether the user likes the system or not. Venkatesh et al. (2000, 187) adds that the effects of external variables (e.g. system characteristics, development process, training) on intention to use are mediated by perceived usefulness and perceived ease of use. The fundamental conclusion of the theory is that perceived usefulness and perceived ease of use affect a person's intention to use the technology which in turn affects the usage behavior. Davis' study (1989) is based on many previously developed theories, which are going to be discussed next.

### **3.1.1 Theoretical Foundations**

TAM has gotten influences from at least five MIS studies and from few non-MIS ones. Davis (1989) lists the most important ones to be *self-efficacy theory*, *cost-benefit paradigm*, *adoption of innovations theory*, *evaluation of information reports* and *channel disposition model*. Based on these theories, the fundamental factors resulting in high technology acceptance rate were developed and then later revised and streamlined. All the five ground theories as well as the marketing study by Hausser and Simmie (1981) are next presented briefly in table 3-1. Presenting the underlying theories of TAM, the basic understanding to understand the fundamentals of the model can be created.

**Table 3-1** Theoretical foundations of TAM

<b>Theory</b>	<b>Fundamentals</b>
<b>Self-efficacy theory</b>	Stresses the importance of self-efficacy, which is similar with perceived ease of use and defined as “judgments of how well one can execute courses of action required to deal with prospective situations”. (Bandura 1982)
<b>Cost-benefit paradigm from behavioral decision theory</b>	Derived from behavioral decision theory and is relevant to perceived usefulness and perceived ease of use. Explains people’s choice among various decision making strategies in terms of cognitive trade-off between the effort required to employ the strategy and the quality of resulting decision. (Beach et al. 1978)
<b>Adoption of innovations theory</b>	Suggests a prominent role for perceived ease of use like in TAM. Compatibility, relative advantage and complexity have the most consistent significant relationships across a broad range of innovation types. (Tornatzky et al. 1982)
<b>Evaluation of information reports theory</b>	Echoes the distinction between usefulness and ease of use. (Larcker et al. 1980)
<b>Channel disposition model</b>	Explains the choice and use of information reports. Channel disposition is defined as having two components: attributed information quality and attributed access quality. Based on the trade-off between the two concepts potential users choose and use information reports. (Swanson 1982)
<b>Non-MIS studies</b>	<i>Marketing study</i> by Hauser and Simmie (1981) examined use perceptions of alternative communication technologies similarly derived two underlying dimensions: ease of use and effectiveness.

Davis (1989, 323) argues that the accumulated body of knowledge regarding self-efficacy, contingent decision behavior and adoption of innovations provides theoretical support for perceived usefulness and perceived ease of use as key determinants of behavior. However, all of these theories, introduced in the table 3-1, form the foundations for these two vital concepts

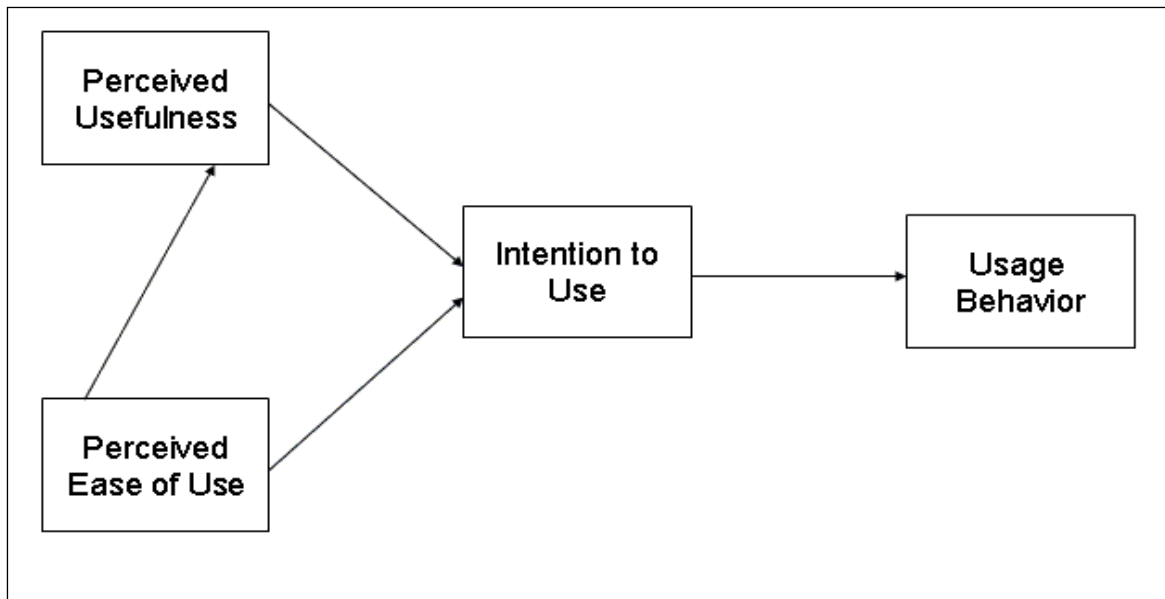


of technology acceptance model. Based on these theories, explicit definitions were stated followed by a theoretical analysis from various perspectives. Next, the two fundamental concepts of technology acceptance are discussed in detail.

### **3.1.2 Perceived Usefulness and Perceived Ease of Use**

Davis (1989, 320) defines *perceived usefulness* as *the degree to which a person believes that using a particular system would enhance his or her job performance*. The definition follows from the word useful: “capable of being used advantageously”. When employees are often reinforced for good performances by promotions, bonuses etc. a system with high perceived usefulness is suited for supporting this kind of organizational culture and the applications may be very popular in these situations. However, *perceived ease of use* is defined as *the degree to which a person believes that using a particular system would be free of effort* (Davis 1989, 320). This definition follows from the word *ease*: “freedom from difficulty or great effort”. Nowadays employees are very busy and they have to allocate their effort between various tasks. An application, which is perceived to require less effort than another, could be considered to be accepted most preferably. These two conceptual determinants, perceived ease of use and perceived usefulness, are the essence of TAM and also the essence of later developed and extended technology acceptance theories. The study of Davis (1989) was originally constituted to develop and validate new measurement scales for these concepts.

Technology acceptance model by Davis (1989) is presented in the figure 3-1 below. It presents that perceived usefulness and perceived ease of use are two components determining person’s intention to use, which in turn contributes to the perceived usage behavior. By usage behavior, it is referred to either the acceptance or rejection of an application use. The figure presents causal interrelations between the concepts. From that perspective, the regression results of Davis’ study (1991) suggests that ease of use may be an antecedent to usefulness, rather than parallel, direct determinant of usage.



**Figure 3-1** Technology acceptance model (Davis 1989)

Davis (1989) stated that one of the most significant findings of the study is the relative strength of the usefulness-usage relationship compared to the ease of use-usage relationship. According to his study, usefulness was significantly stronger linked to usage than was to ease of use. In practice this means that when an application helps the user to achieve desired goals, it is more probably used than when an application is easy to use but not so beneficial for the user. This contributes to the fact that users are driven to adopt and accept an application primarily because of the functions it performs for them, and secondarily for how easy or hard it is to get the application to perform those functions. In a nutshell: usefulness can be considered as more important than ease of use. A major conclusion of the study is that perceived usefulness is a strong correlate of user acceptance and should not be ignored by those attempting to design or implement successful systems.

The study of Davis (1989) found six factors for both perceived usefulness and perceived ease of use, by which the technology acceptance can be evaluated. These factors are presented in table 3-2 below.

**Table 3-2** Evaluation factors (collected from Davis 1989)

	<b>Evaluation factors</b>
<b>Perceived usefulness</b>	Working more quickly
	Job performance
	Increased productivity
	Effectiveness
	Making job easier
	Usefulness
<b>Perceived ease of use</b>	Easy to learn
	Controllability
	Clear and understandable
	Flexibility
	Ease to become skillful
	Easy to use

These factors exhibited excellent psychometric characteristics and the psychometric strength of the scales was mutually confirmed in the study (Davis 1989, 333). In this thesis they are used as a basis for interview questions supported also by other factors found from TAM2 and UTAUT theories. Also the special characteristics of the e-commerce environment are considered when conducting the study. According to Davis (1989), from multiple disciplinary vantage points, the two concepts, perceived usefulness and perceived ease of use are indicated as fundamental and distinct constructs that are influential in decisions to use information technology. Although certainly not the only ones, they seem to be the determinant factors when discussing about the technology acceptance. Davis (1989, 335) mentioned that future research should be conducted about the role of social influence. This means that it should be studied, if other people's opinions or pressure from the user's own company affect the acceptance of technology.

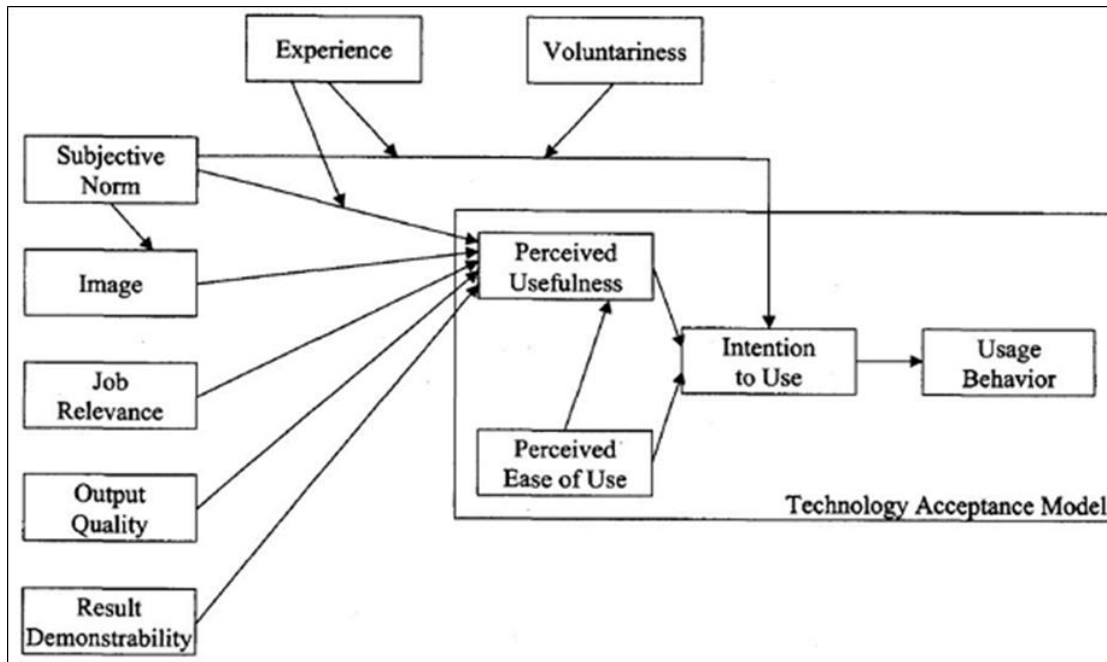
The following sections describe two of the extended models: Technology Acceptance Model 2 (TAM2) by Venkatesh et al. (2000) and Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003). Based on these models some assumptions will be made about which factors should be excluded and which included in the model when

evaluating the acceptance of e-commerce web applications. Also assumptions will be made of the determining forces that moderate the effect behind each factor.

## **3.2 TAM2**

Even though some significant progress was made during the 90s in explaining and predicting user acceptance of information technology at work, in particular thanks to technology acceptance model (TAM) by Davis (1989), there were still some questions to answer. TAM theorizes that the effects of external variables, such as system characteristics, development process or training, on intention to use are channeled by perceived usefulness and perceived ease of use (Venkatesh et al. 2000, 187). The same study states that TAM explains a substantial proportion of 40% of the variance in intentions and behavior, and perceived usefulness is consistently a strong determinant of usage intentions. As the figure 3-1 presents, in the case of TAM, perceived usefulness is also influenced by perceived ease of use. Other things being equal the easier the system is to use, the more useful it can be (Venkatesh et al. 2000, 187). However, if the determinants of perceived usefulness would be known more precisely, it would enable a better design of organizational interventions that would increase user acceptance and usage of new technologies.

The extension of the basic TAM model is called TAM2 by Venkatesh et al. (2000) and the goal of the revised model was to include additional key determinants in to the model, and to understand how the effects of these determinants change with increasing user experience over time with the target system (Venkatesh et al. 2000, 187). Figure 3-2 below shows the TAM2 model, which uses the basic TAM by Davis (1989) as a starting point and includes additional theoretical constructs to the model: social influence processes and cognitive instrumental processes.



**Figure 3-2** TAM2 (Venkatesh & Davis 2000)

According to TAM2 three interrelated social forces are affect a person’s decision to accept or reject a software application: subjective norm, voluntariness and image. Venkatesh et al. (2000) also presented four cognitive instrumental processes that can be considered as influential factors: job relevance, output quality, result demonstrability and perceived ease of use. In addition to those factors, experience is presented in the figure above and assumed to be moderating the effects of subjective norm to perceived usefulness and to intention to use combined with voluntariness. Social influence processes as well as cognitive instrumental processes and their definitions are summarized in table 3-3 below and discussed more detailed in the next section of this chapter.

**Table 3-3** Summary of TAM2 factors (collected from Venkatesh et al. 2000)

<b>Social influence processes</b>	Subjective norm	Perception of other people’s opinion about if the person should use an application or not.
	Voluntariness	The extent to which potential adopters perceive the adoption decision non-mandatory.
	Image	The degree to which use of an innovation is perceived to enhance one’s status in one’s social system.
<b>Cognitive instrumental processes</b>	Job relevance	Perception of how well the system supports one’s job.
	Output quality	Perception of how well the behavior carries out one’s job goals.
	Result demonstrability	The ability to see the direct or indirect results or consequences of performing actions.
	Perceived ease of use	The degree to which a person believes that using a particular system would be free of effort.

Next, the factors of TAM2 model are presented in their own groups (social influence processes and cognitive influence processes) and discussed one by one.

### **3.2.1 Social Influence Processes**

The social influence processes, which are included in TAM2 are subjective norm, voluntariness and image. *Subjective norm* is defined as *person’s perception, which most people who are important to him think he should or should not perform the behavior in question* (Venkatesh et al. 2000, 187). This means that even though a person might not be favorable towards a certain behavior, he or she may perform it if they believe one or more important referents think they should. This concept was already part of the Davis’ study (1989) but it didn’t seem to have a very significant effect on perceived usefulness or ease of use, so it was left out from the final discussion. *Voluntariness* is a moderating variable, which is defined as follows: *the extent to which potential adopters perceive the adoption decision to be non-mandatory*. It seems to have an effect on application acceptance in such a way that when the usage is obligatory, the subjective norm is a great influence. However, when the usage is voluntary, subjective norm does not have a significant effect on the attitude of the user. In a computer usage context, the direct compliance-based effect of subjective norm on

intention over and above perceived usefulness and perceived ease of use will occur in mandatory, but not voluntary, system usage settings (Venkatesh et al. 2000, 188). *Image* is defined by Moore et al. (1991, 195) as *the degree to which use of an innovation is perceived to enhance one's status in one's social system*. It is quite an important factor in social relations because people tend to maintain a favorable image about themselves towards other people in order to maintain their status. As individuals respond to social normative influences to establish or maintain a favorable image within a reference group, TAM2 theorizes that subjective norm will positively influence image. This is because performing an action, which a reference group regard positive, increases also the standing of this person. This increased status will also boost person's power and influence, which further augment productivity. A person thinks that the use of system will improve his or her performance (Venkatesh et al 2000, 189).

### **3.2.2 Cognitive Instrumental Processes**

The four determinants of cognitive instrumental processes (job relevance, output quality, result demonstrability and perceived ease of use) are used to evaluate and map the behavior to higher-level goals. Venkatesh et al. (2000) defined these factors as follows: *Job relevance* can be regarded as a compatibility test, which defines the minimum requirement for new behavior. If these do not match, there is no use to continue evaluation of other determinants of cognitive instrumental processes. Job relevance describes how well a user thinks the system supports their job. *Output quality* goes deeper in evaluating the consequences of performing an action with the application. As job relevance responds to how well behavior matches the job goals, output quality defines how well the behavior carries them out. *Result demonstrability* is a quite logical determinant. It means that if users are not able to see direct or indirect results or consequences of performing actions, it is impossible to justify perceived usefulness. The final determinant of cognitive instrumental processes in TAM2 is *perceived ease of use* as defined already in TAM. The impact of perceived ease of use to perceived usefulness can be motivated with an example, that if any other determinant is equal, a system, which is easier to use, will increase job performance with less effort.

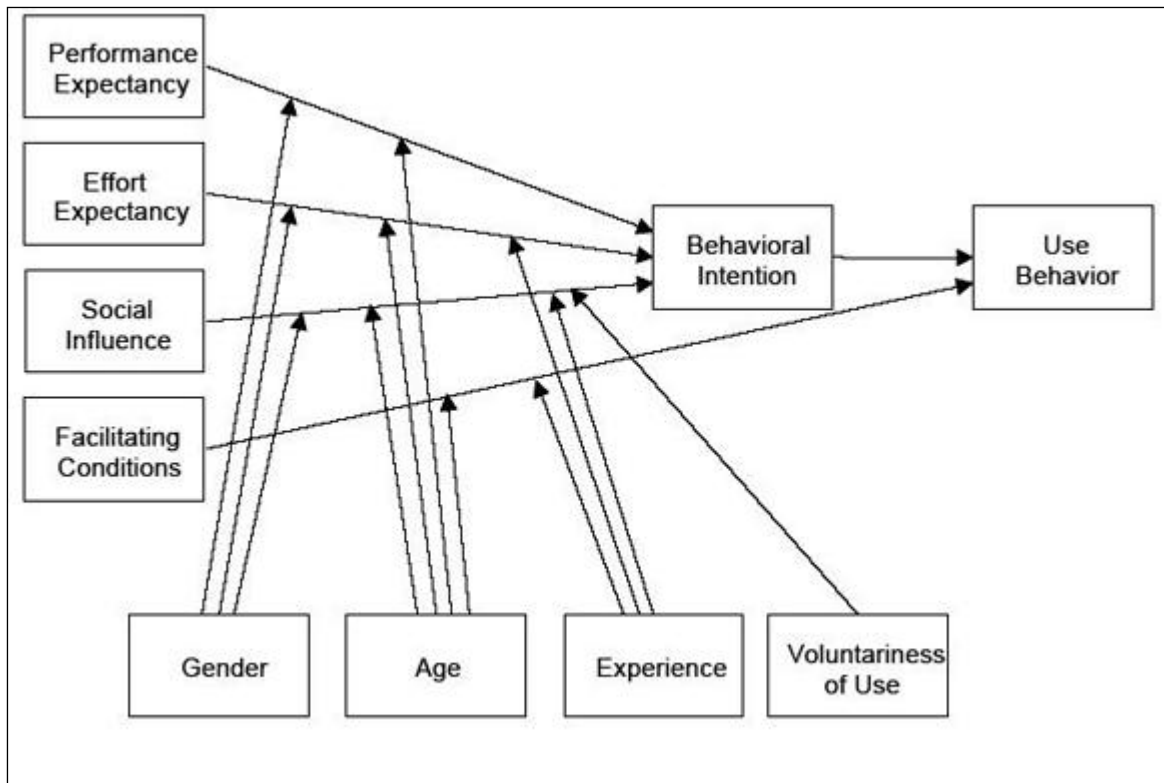
According to Venkatesh et al. (2000) TAM2 extends the basic TAM by showing that subjective norm exerts a significant direct effect on usage intentions over and above perceived usefulness and perceived ease of use for mandatory (but not voluntary) systems. Subjective

norm significantly influenced perceived usefulness via both internalization in which people incorporate social influences into their own usefulness perceptions, and identification, in which people use a system to gain status and influence within the work group and thereby improve their job performance (Venkatesh et al. 2000, 198). The same study also suggests that the effects of cognitive instrumental processes were also consistent with TAM2 and an important finding that emerged was the interactive effect between job relevance and output quality in determining perceived usefulness. This refers that output quality takes on greater importance in proportion to a system's job relevance.

### **3.3 Unified Theory of Acceptance and Use of Technology**

User acceptance of information technologies is an important issue since productivity gains of technology use can be achieved only if certain technology is accepted and also used by target users (Venkatesh 1998). In their later study Venkatesh et al. (2003) presented a new model for analyzing the acceptance of technology. Unified Theory of Acceptance and Use of Technology (UTAUT) model is an enhancement of Davis' (1989) technology acceptance model (TAM) and TAM2 (Venkatesh et al. 2000) introduced above. As shown in the figure 3-3 below, UTAUT consists of four core determinants of intention and usage: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions and also of four moderators of key relationships: Gender, Age, Experience and Voluntariness (Venkatesh et al. 2003, 447). The core constructs are the key factors, which influence directly to behavioral intention i.e. user's thoughts and plans of using new technologies and use behavior. Moderators are factors, which reinforce or weaken the influence of the key factors.





**Figure 3-3** UTAUT (Venkatesh et al. 2003, 447)

Next I will discuss the factors of the UTAUT model (performance expectancy, effort expectancy, social influence, and facilitating conditions) one by one in detail and also discuss how the moderating factors were stated to be affecting them.

### **3.3.1 Performance Expectancy**

*Performance expectancy* is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh et al. 2003). Basically it depicts individual's thoughts or beliefs how well the user will reach the goals with the help of the system. Performance expectancy is the strongest predictor of the result in UTAUT as well as in other related models. In Davis' (1989) technology acceptance model (TAM), the perceived usefulness concept is defined nearly the same way so this can be stated to be a corresponding concept with it. According to UTAUT, there are two moderators, gender and age, that have an impact on intention and performance expectancy. The gender schema theory suggests that the difference between men and women stem from gender roles and socialization processes reinforced from birth, rather than biological gender. Many times men are highly task-oriented and therefore performance expectancies, which focus on task accomplishment, are likely to be especially salient to men. However, further studies have

shown that gender roles have a strong psychological basis and are relatively enduring yet to change over time (Venkatesh et al. 2003). The same way, age is theorized to play a moderating role on behavioral intention and thought to have a negative impact with older people, who tend to be more suspicious about new technologies.

### **3.3.2 Effort Expectancy**

*Effort expectancy* is also a force affecting the behavioral intention (see figure 3-3) and it is moderated by determinants gender, age and experience to work. It is defined here as the degree of ease associated with the use of system. This concept is very close to perceived ease of use, which was introduced when discussing about TAM and TAM2 models. The concept basically refers to how difficult the user expects the application to be to use or how much effort the user expects the application require. According to Venkatesh & Morris (2000) some researchers have shown that effort expectancy is more salient for women than for men and the gender differences here can also be explained by cognitions related to gender roles. It has been proven that increasing age is associated with difficulty in processing complex stimuli and allocating attention to information on the job (Venkatesh et al. 2003). The proposition of Venkatesh et al (2003) regarding effort expectancy is that the influence on behavioral intention will be moderated by gender, age, and experience, such that the effect will be stronger for women, particularly younger women, and particularly at early stages of experience. So a young inexperienced woman who is about to start the use of new technological solution will assume it to require more resources than an experienced male would.

### **3.3.3 Social Influence**

*Social influence*, here defined by Venkatesh et al. (2003) as the degree to which an individual perceives that important others believe he or she should use the new system. Social influence as a construct stems from a conception that the individual's behavior is influenced by the way in which they believe others will view them as a result of having used the technology. It is shown not to be that important in voluntary situations but in mandatory ones it seems to be a major factor. According to Venkatesh et al. (2000) social influence has an impact on individual behavior through three mechanisms: compliance, internalization and identification. The compliance mechanism causes an individual to alter his or her intention in response to the

social pressure whereas the latter two relate to altering individual's belief structure and causing an individual to respond to potential social status gains. Some prior studies suggest also that individuals are more likely to comply with other's expectations when those referent others have the ability to reward or punish nonbehavior (Venkatesh et al. 2003). As a conclusion Venkatesh et al. (2003) make a proposition that the influence of social or behavioral intention will be moderated by gender, age, voluntariness and experience, so that the effect will be stronger for older women, particularly in early stages of experience and in mandatory settings.

### **3.3.4 Facilitating Conditions**

*Facilitating conditions* is defined by Venkatesh et al. (2003) as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. The researchers propose that facilitating conditions will not have a significant influence on behavioral intention but that the concept is modeled as a direct antecedent of usage as can be seen from the figure 3-3. According to Venkatesh et al. (2003) the effect is in fact expected to increase with experience as such users of technology find multiple avenues for help and support throughout the organization. They are also suggesting that the influence of facilitating conditions on usage is moderated by age and experience such that the effect will be stronger for older workers, particularly with increasing experience. More specifically, organizational psychologists have noted that older workers consider it more important to receive help and assistance in their work.

From the figure 3-3 can be seen that three of the four constructs are affecting the behavioral intention and, for one, the behavioral intention, together with facilitating conditions, is proposed to have a significant positive influence on use behavior. The UTAUT model is a very useful tool for managers needing to assess the likelihood of success for new technology introductions and also help them to comprehend the drivers of acceptance in order to proactively design interventions targeted at populations of users that may be less inclined to adopt and use new systems (Venkatesh et al. 2003, 426).

From the theoretical point of view, UTAUT provides a developed view how the determinants of intention and behavior evolve over time. It is crucially important to notice that most of the key relationships presented in the model are moderated. For example as age has prior to this

research received very little attention in the literature, it is still moderating all of the key relationships in the model. The same situation is also with gender and specifically, gender and age seem to be working together in a close relationship (Venkatesh et al. 2003, 469). However, according to the study of Venkatesh et al., the moderating factors seems to be especially strong when considering older people and the effect is smaller with young people, who have been growing up during the Digital Age. Hence, it is a possible that especially the moderating force of age is diminishing when the older generation is about to retire.

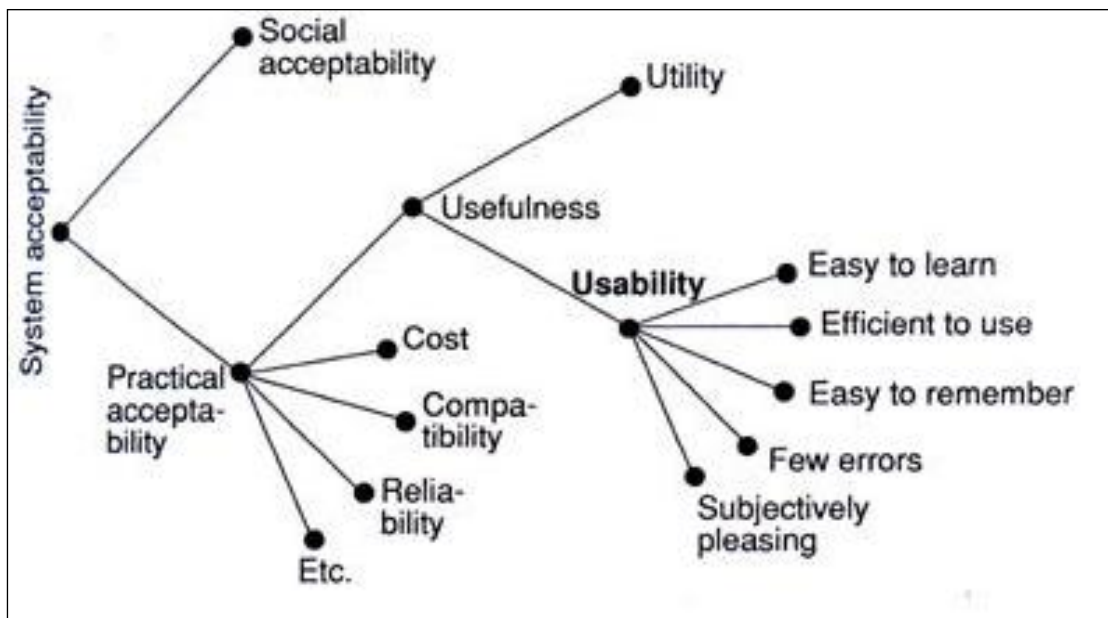
## **4 Usability**

Usability is the main concept when discussing about human-computer interaction. Any system should be easy to learn and remember, effective and pleasant to use. In a study of Hornbaek (2006, 79), different definitions for usability are listed such as “the capability to be used by humans easily and effectively”; “quality in use” and “the effectiveness, efficiency, and satisfaction with which specified users can achieve goals in particular environments”. Hence, usability definitions usually follow the principles that the concept is context dependent and shaped by the interaction between tools, problems and people. In this chapter, I will discuss the definition of software usability introduced by Nielsen (1993). According to him, usability is not an unambiguous, single property of a user-interface. It can be rather seen as a methodology and theory field, which aims at improving and intensifying the collaboration between an application and the user. One of the goals of this thesis is to describe how software usability can be defined and also by which attributes it can be measured. Also the correlations between usability and customer perceived satisfaction towards the services are considered. According to Nielsen (1993) usability is one of the most important factors when defining the acceptability of software. By acceptability, Nielsen (1993) means if the application satisfies the needs and demands of the users as well as other potential stakeholders and also how useful the application is for its users. However, Nielsen (1993) states that usability is an important component when defining the concept of usefulness. It is also related with the interaction between the application and the user. In this chapter, first the concept of usability is discussed as a factor for system acceptability and then the factors that Nielsen (1993) defines as contributing to the usability as a whole are discussed one by one.

### **4.1 System Acceptability**

Above system usability, there is a concept called system acceptability (see figure 4-1), which is even a more complex definition than usability. System acceptability will be discussed here briefly in order to understand how it affects the system usability concept and also because it is closely related to the TAM model. Nielsen (1993) defines system acceptability being constituted of social acceptability and practical acceptability. An application can be considered as highly practically acceptable but if it lacks social acceptability, the overall

system acceptability might still be low. Social acceptability is closely related to morale and other people’s opinions. Figure 4-1 shows that practical acceptability consists of various categories including cost, compatibility with existing systems, reliability etc., as well as the category of usefulness. Usefulness is defined as if the application can be used for achieving desired goals and it can be broken down into two concepts, utility and usability (Nielsen, 1993). Utility means whether the application can do what is expected of it and usability whether the users can use the functionalities in order to accomplish the desired tasks (Nielsen 1993, 25). Figure 4-1 shows the model of system acceptability and it is clear from the figure that system acceptability has many components and that usability must trade off against many other considerations in a development project (Nielsen 1993, 25).



**Figure 4-1** Model of the attributes of system acceptability (Nielsen, 1993)

When developing the usability of an application, it is useful to understand the big picture on the field of system acceptability. From the figure 4-1 above can also be seen the various components of usability such as learnability, efficiency of use, memorability, errors and satisfaction. These components are discussed next in detail.

## 4.2 Attributes of Usability

Nielsen’s complete definition of usability is associated with five usability attributes that are learnability, efficiency, memorability, errors and satisfaction. When dividing the concept of

usability to these more precise and measurable attributes, we enable consistent development and improvement of existing applications. In the next section of this chapter the usability attributes are introduced more closely.

By *learnability* Nielsen (1993) means that the system should be easy to learn so that the user can rapidly start getting some work done with the system. This is one of the most fundamental attributes of usability because the first experience most people have with a new system is that of learning and most of the applications need to be easy to learn. Nielsen (1993) suggests that learnability can be observed by learning curves, which describes the efficiency of using the application compared to the time spent on it. When an application is aimed at novice users, the efficiency of using should improve quickly after a short time of using the application whereas applications which are aimed at expert users require more time in the beginning but when the application is “learned”, it offers more efficiency for the users.

*Efficiency* refers to the expert user’s steady-state level of performance at the time when the application is considered as “learned” (Nielsen 1993). However, it may take a lot of time to reach that level and that’s why in order to measure efficiency of use, one should be observing experienced users. In addition to novice and expert users there are casual users of applications who basically use the application every now and then. According to Nielsen (1993) the difference between novice and casual users is that the latter ones do not have to learn to use the application all over again but they have already been using it before and they should be able to use the application based on their previous learning.

*Memorability* is important for these casual users so that even though they are not frequent users of the applications, they can still use them effectively (Nielsen 1993). An application should be easy to remember so that all the users can use them efficiently at all times, even after long breaks in use e.g. vacations. Nielsen (1993) suggests that memorability can be tested for example by conducting a memory test where the casual users are first asked to perform some specific tasks with the application and after that asked to explain the effect of various commands or to name the command that does certain thing.

Nielsen (1993) defines *errors* as any actions which do not accomplish the desired goal, and the system’s error rate is measured by counting the number of such actions made by users while performing some specified tasks. Naturally, users should make as few errors as possible

when using a computer system. Errors which can be corrected right when noticed should be counted separately from those which are catastrophic in nature. Errors can be catastrophic either because users are not able to identify them which lead to a faulty work product or because they will destroy the user's work making them difficult to recover from (Nielsen 1993, 31).

According to Nielsen (1993, 34) *subjective satisfaction* refers to how pleasant it is to use the system and it is especially important in discretionary systems such as home computing, games interactive fiction, or creative painting. Users using that kind of applications are expecting to gain some entertainment value from using them. Nielsen (1993) proposes that subjective satisfaction can be tested for example by to asking the users for their subjective opinion about the application. By using the replies from multiple users together, the results are an objective measure of the system's pleasantness.

In the next chapter, relationships between the factors of the technology acceptance theories and the usability definition, described above, are searched. The main goal is to be able to combine these definitions to some extent, since they are many times described very similarly and still there is very little literature about how these are related, if they are. In the final phase, the usability attributes are to some extent combined with technology acceptance factors, in order to create an extensive understanding of how an application can be evaluated from the user's point of view.



## 5 Technology Acceptance and Usability Factors in E-commerce Environment

In this chapter, first the relationships between the factors of TAM and usability definition are discussed. This is done in order to build a wider picture of how user's perception is formed about a system and also to investigate if it is possible to find connections between usability factors and technology acceptance factors. In the second part of this chapter, technology acceptance is applied to the environment of Web and e-commerce. In that part, specific determining factors, which are peculiar to this specific environment, are searched. In the third and last part of this chapter, the revised e-commerce TAM is constructed and discussed. The model is built up based on the different technology acceptance models, usability definition and the specific determining factors that are essential to this special e-commerce environment. In the empirical part of the thesis, this revised e-commerce TAM will be then discussed based on the interview results and the adequacy of the model evaluated in the case of DHL Express' IntraShip application.

### 5.1 TAM and Usability

Technology acceptance model (TAM) has been widely used when investigating users' perceptions about new or existing software or other technological solution. It gives a good picture about how the users or potential users evaluate the solution and its adequateness in general. Instead, usability definition gives answers when some specific task-based context is under investigation. Since the fundamental perspectives of these two models are dissimilar, there has not been a lot of research about whether these two theoretical models are interrelated. However, Chiou et al. (2009) have validated and compared TAM and usability test through performing E-learning tasks with personal digital assistant (PDA). From their research some essential relationships were found between these two theoretical frameworks and these are discussed next in this chapter.

Chiou et al. (2009) discussed the relationship of perceived usefulness, perceived ease of use and four of the usability attributes, which are *efficiency* (time to complete task), *effectiveness* (task completed ratio), *memorability* (browsing and searching time for non-regular user) and *learnability* (number of errors occurred for novice). Perceived usefulness focuses on measuring end-user's subjective perception of overall job performance improvement,

productivity, or effectiveness when supported by information technology. In contrast, usability attributes of efficiency and effectiveness emphasize measuring system usability of using information technology for performing a specific task. The divergence of measuring these aims may influence tester's perception. From the perspective of perceived ease of use, it stresses on specifying the degree of subjective perception of information technology's overall ease of use and ease of learning. In the contrary, usability attributes of memorability and learnability emphasize on measuring application's ease of learning and ease of use while using information technology for performing a specific task. Herein again, the discrepancy of measuring scopes (general purpose vs. specific task) may influence tester's perception.

In their study, Chiou et al. (2009) classified different variables, which may have an effect on each other in three categories: external factors, TAM-factors and usability factors. External factors consider the user's experience in using the system and in this study they are divided in non-regular and novice users. Experience is also discussed already before in this thesis, when the UTAUT model was introduced. In the context of UTAUT, experience is a moderating factor, which is expected to be having an effect on facilitating conditions, social influence and effort expectancy. TAM-variables are, as already described in previous chapters perceived usefulness, perceived ease of use and intention to use. Their definitions come straight from the fundamentals of TAM models. To usability variables Chiou et al. (2009) have chosen the four attributes that are learnability, memorability, effectiveness and efficiency. All of the definitions and measuring methods of each research are summarized in the table 5-1.

**Table 5-1** Variable definition and measurement (Chiou et al. 2009, 580)

	<b>Variables</b>	<b>Definition</b>	<b>Measuring method</b>
<b>External factors</b>	Using experience	Non-regular and novice	Nominal scale
<b>TAM</b>	Perceived usefulness, perceived ease of use, attitude, intention		Likert 5 points scale questionnaire
<b>Usability</b>	Learnability	The less error, the more learnability	The number of errors occurred to novice
	Memorability	The shorter time, the higher memorability	The searching time for non-regular user
	Effectiveness	The higher ration, the better effectiveness	Task accomplishment ratio
	Efficiency	The shorter time, the better efficiency	The time required for accomplishing a task

In the study of Chiou et al. (2009) the relationships of TAM and usability factors were divided in three separate classes:

- i. Using experience vs. perceived usefulness (PU) and perceived ease of use (PEU)
- ii. Effectiveness & efficiency vs. PU
- iii. Learnability & memorability vs. PEU

These restrictions were made in the research of Chiou et al. (2009) based on earlier literature.

In a nutshell, three reasonable correlations were found according the research:

- i. Using experience has an effect on perceived ease of use.
- ii. Using experience has an effect on usability attributes (effectiveness & efficiency, learnability and memorability).
- iii. Learnability and memorability have an effect on perceived ease of use.

According to these results, a conclusion can be drawn, that perceived usefulness doesn't correlate with usability or usage experience, but that perceived ease of use has correlations with two of the usability attributes (learnability and memorability) as well as with usage experience. This observation will be applied in the empirical research by conducting usability questionnaire and looking for if any connections can be found between usability and perceived ease of use.

## **5.2 Technology Acceptance in E-commerce Environment**

Majority of researchers in the field of technology acceptance such as Turner et al. (2010), Lederer et al. (2000), Castaneda et al. (2007), Han et al. (2009) and Reunis et al. (2006) agree that TAM has demonstrably been a good predictor of perceived use of technology among different technological systems. Many authors have also extended the basic models (TAM and UTAUT) further and investigated how they suit to the context of, for example, World Wide Web or e-commerce websites and applications. Since, the application investigated in this thesis (DHL IntraShip), is a web-based e-commerce tool, specific characteristics which, may have an effect on technology acceptance in this particular environment, have to be considered carefully. In this part of the chapter, Web and e-commerce related TAM researches are discussed and the factors, which may contribute to the acceptance, are picked up and grouped from those previous studies.

### ***5.2.1 Revised TAM and UTAUT Factors in Web-environment***

Lederer et al. (2000) conducted a research, which main goal was to find factors which are behind usefulness and ease of use in the context of Web. According to Lederer et al. (2000, 271) some key ease of use problems, according to different studies, were mentioned to be slow speed of downloading or viewing web pages, being unable to perform such tasks as finding a page that users knew existed, organizing the pages and information they gathered, finding a page once visited and visualizing where they had been and could go to find information. Another study has identified eight usability principles to be causing ease of use problems: speaking the user's language, consistency, minimization of the user's memory load, flexibility and efficiency of use, aesthetic and minimalist design, chunking, progressive levels of detail and navigational feedback (Lederer et al. 2000).

Not so much research has been conducted about the potential predictors of perceived usefulness on the web. This may be because surfing the web is usually more closely related to ease of use factors rather than usefulness. According to Roshanak (2009) e-commerce is no more an alternative but a compulsory option to most businesses and today it is called the most cost-effective way of trading. The interest to make the e-commerce sites more useful and easy to use has increased. The study of Lederer et al. (2000, 271) identified four factors that differentiate good and bad information and which may be providing a basis for usefulness on the web. These factors are accuracy, timeliness, completeness and relevance. According to their study, the usage of websites actually supports TAM and it also suggests that ease of understanding and ease of finding predict ease of use and that information quality predicts usefulness for revisited sites.

The study of Castaneda et al. (2007) examined how TAM helped managers to predict a user's intention to revisit a website and how this changed over time as a user gained experience of the internet and the website. Castaneda's WAM (web acceptance model) model is extended from TAM to three directions: TAM was tested when moderated by experience in a free-content site, both experienced and inexperienced users were considered and only the moderating effect of website experience was considered instead of considering also gender, age etc. Castaneda et al. (2007, 385) also used Motivational Model as an antecedent for the research and divided a person's motivation to extrinsic (when a user is visiting a website with an aim other than mere surfing) and intrinsic (the use of the website is an end in itself and the behavior is driven by hedonistic aspects). The primary motivation for the use of an e-commerce website (such as DHL Express') is extrinsic. According to Atkinson et al. (1997) perceived usefulness is more related to extrinsic motivation while ease of use is more linked to intrinsic motivation. From this, an assumption can be driven that for e-commerce websites perceived usefulness would be a more important factor than for free-content websites.

According to *Web Acceptance Model* (Castaneda 2007) there are three main implications:

1. Perceived usefulness is the main determinant of the intention to continue visiting a website, irrespective of the level of experience of the users of the internet.
2. In users with high experience of the website, the influence of the perceived usefulness on the process of forming the attitude to the website is substantially greater than in users with low experience.
3. In users with high experience of the website, the influence of perceived ease of use on the attitude towards the website is substantially smaller than in the users with lower experience.

However, in a high experience situation, the attitude is conditioned primarily by usefulness, the direct effect of ease of use being practically non-existent corroborating the results of the original TAM. In addition to these three results from the research of Castaneda et al. (2007), the authors stress that the users' opinions about a specific website are of great importance in explaining user behavior, though not of the same significance as other factors such as perceived usefulness.

### ***5.2.2 Revised TAM and UTAUT Factors in E-commerce Environment***

It is commonly accepted by both academia and practitioners that e-ordering systems provide a potential benefit in terms of effectiveness and efficiency. However, these benefits can be only achieved if and when the end-users adopt the tool and apply it successfully in their everyday work using the system as it is supposed to and to its full potential (Reunis et al. 2006). This adoption of intended behavior is not self-evident. People are many times not willing to change their current habits and may be reluctant to change. This is especially the case when employees are forced to change their ways of working and they are not the straight beneficiaries of the more efficient end-results. This definition is called as 'perceived benefit imbalance', which is very common in many organizations when people who are using applications, do not experience the possible improved efficiency gained from the altered working habits. Lu et al (2009, 29) lists various studies that have proved TAM effective to study the e-commerce consumer's attitude toward behavior intention. Their study compared different TAM researches in e-commerce environment and found following factors to be affecting the acceptance of e-commerce software in addition to perceived usefulness and

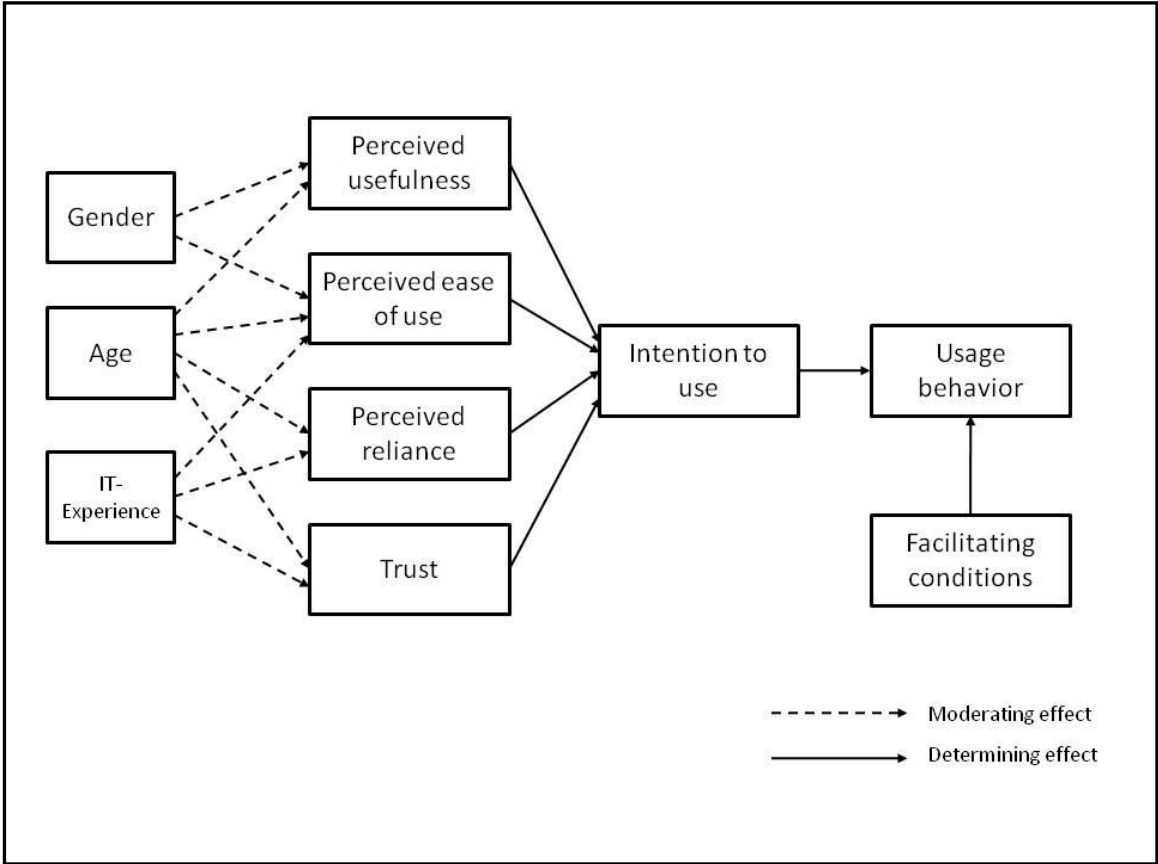
perceived ease of use: perceived risk, belief or trust, Internet experience and perceived reliance. Lu et al. (2009) also stresses that when evaluating e-commerce adoption at least the special characters of the specific e-commerce environment as well as the cultural factors should be included in the study.

Even though there has been a lot of research about the cognitive mechanisms leading towards individual adoption decisions, still these researches do not provide guidance as *how* to influence the cognitions towards adoption. The basis for the research by Reunis et al. (2006) is the UTAUT model presented earlier in this thesis. The leading ideology for the model of Reunis et al. (2006) is the same as with the original UTAUT: a cognitive mechanism (perceived performance, effort expectancy, social influence and facilitating conditions) precedes actual adoption behavior. These determinants are proposed to be mediated by all external factors. The performance expectancy, effort expectancy and social influence lead to behavioral intention, whereas facilitating conditions together with the behavioral intention contribute to use behavior.

### **5.3 Revised E-commerce TAM**

Based on technology acceptance models (TAM, TAM2, UTAUT), Nielsen's (1993) definition of usability and the additional factors spotted from technology acceptance studies made in the Web and e-commerce environments, a revised e-commerce TAM will be built and the model will be tested in context of DHL IntraShip application usage among the company's B2B customers. The case application and its functionalities are already introduced in the second chapter of the study. In the revised e-commerce TAM, the main purpose is to use the basic models of technology acceptance as a starting point and then add certain determining factors to it, which are peculiar to the special environment that is investigated in the thesis. The model's aim is to explain which factors affect the user's perceptions about the quality of a system. The empirical research is done by interviewing DHL Express' B2B e-commerce customers about their satisfaction towards the IntraShip application, so the results of the interviews are mainly qualitative. Hence, the main focus of the revised e-commerce TAM is not to show any accurate correlations of these different factors to the acceptance of the application but imply which factors may have an effect on the perceived acceptance or lack of

it. The constructed model is presented in the figure 5-1 and it is discussed in detail factor by factor next.



**Figure 5-1** Revised e-commerce TAM

In the revised e-commerce TAM the factors affecting the intention to use, which precedes technology acceptance are *perceived usefulness, perceived ease of use, trust and perceived reliance*. The moderating factors, which may have an effect on the importance of the determining factors, are *gender, age and experience of usage*. In addition to these factors, facilitating conditions (defined in context of UTAUT model) are expected to have an effect on the perceived usage behavior. The more precise definitions and also the roles and interrelationships of these factors and are explained next. Also the reasons and the justifications, derived from previous literature, for all of these factors are presented and discussed.



### **5.3.1 Perceived Usefulness**

As was already stated before, the motivation to use a Web e-commerce application in work tasks is mostly extrinsic, which means that the purpose of the application use is somewhere beyond pure pleasure seeking, so rather in accomplishing a work task. According to Atkinson et al. (1997) for this kind of application the *perceived usefulness* is the most important factor, which influences the acceptance of an application. This is why perceived usefulness is considered also here as an extremely important factor, just like normally the technology acceptance studies indicate. As Davis (1989) has originally defined perceived usefulness in TAM to be indicating how far the person using the system believes that it will improve their job performance and in UTAUT the similar factor, performance expectancy, was introduced by Venkatesh et al. (2003), I apply perceived usefulness in the revised e-commerce TAM as well. It has been proved by many authors over decades that perceived usefulness is a factor which affects the intention to use. However, depending on the conditions and the specific environment, the factors from which the concept constitutes of may vary. In the model job relevance as already introduced as one of the UTAUT factors, plays an important role. If the application is not important when performing job tasks, it is almost irrelevant to even continue examining how the other factors affect. The application does not bring enough additional value to the user, no matter how usable it would be.

As Venkatesh et al. (2003) suggested already in UTAUT, the strength of the relationship between perceived usefulness and intention to use varies with moderating factors gender and age. According to the study the effects are more important for men and younger workers. Many times men are highly task-oriented and therefore performance expectancies, which focus on task accomplishment, are likely to be especially salient to men. However, since these effects can be debated, they are marked as dash line in the figure 5-1. This expresses that there are some contributions for sure, but the strength of the effect is unknown.

### **5.3.2 Perceived Ease of Use**

*Perceived ease of use* has been studied extensively in the context of IT adoption and diffusion and it is an important factor contributing to increased user satisfaction, system adoption or IS success (Roshanak 2009, 3). It is basically the measure, how easy the system is to use. There has been a debate whether perceived ease of use has a direct effect on intention to use or not.

In Davis' original TAM model (1989), the factor was proved to have both, direct and indirect effect on intention to use. However, for example the results from the study of Lin et al. (2000) show that perceived ease of use does not have a direct effect on behavior intention. Since the studies that usually indicate none direct relationships, are about intrinsic motivational e-commerce applications, in this research the direct relationship is regardless expected to be found. Lederer et al. (2009) found out in their study that the usability heuristics by Nielsen (1993) have an effect on the perceived ease of use. Especially in a way that, if problems regarding those principles are found, perceived ease of use is decreased. This is why in the model Nielsen's five usability factors are also used to define how easy to use the application is. However, this relationship is only suggestive and the strengths of the relationships are not measured in the study.

The effect of perceived ease of use is moderated by all of the three factors of the model: gender, age and usage experience. Venkatesh et al. (2003, 467) has suggested that the effect is more significant for women and older workers and those effects decrease with experience. The same phenomena of assumedly diminishing effect of the gender and age differences also applies here, which was already stated in the discussion of perceived usefulness –factor.

### **5.3.3 Perceived Reliance**

Based on their study, Lu et al. (2009) mention *perceived reliance* to be one important factor when evaluating the acceptance of an e-commerce system. Here, perceived reliance is defined to be *the measure of how far the user of the system thinks that it is mandatory to use the specific system in order to be able to perform their work tasks efficiently*. When the B2B e-commerce behavior is evaluated here, it is important to also consider the effectiveness factor, since naturally the companies want their employees to be as effective as possible. Perceived reliance is also closely related to voluntariness of use but the definition used here is a bit wider since it also contains other's opinions and their contributions, the practical obligatoriness and the user's own perceptions about how obligatory they evaluate the system usage in their job. The reason, perceived reliance is considered such an important factor here is that, if the user experiences that the perceived reliance to the specific system is very high, the intention to use is likely to be very high as well. When the user feels that they would not manage without the specific system, they will use it despite usefulness or other problems

occurring during the system usage. Also if the company they are working for expects that the employees use the specific system, and no other options are available, the perceived reliance of the system is very high.

The effect of perceived reliance to intention to use is assumed to be moderated by age and experience of usage. Generally older people are not as familiar with technology as younger and this is why they may also be more dependent on the one system they know how to use. Usage experience affects so that the more experienced the user is, the less dependent they are of the one system. However, if the user does not have any other optional applications to use, they must surely use the one available and then they also are very dependent on the system regardless of their skills and experience.

#### **5.3.4 Trust**

According to Lu et al. (2009, 29) *trust* is an important predetermining factor when evaluating technology acceptance in e-commerce environment. Also Ha et al. (2009, 565) have investigated e-commerce acceptance and they found that beliefs about trust are key factors influencing consumer acceptance of online shopping. One key reason why many consumers use the Internet but do not purchase online is because of beliefs about the safety of conducting business over the Internet. For example Shen et al. (2010, 42) claimed that in order to remove that risk a company can employ various tools such as firewalls or strict validation processes to protect internet mischief or fraud and these safety mechanisms may bring out difficulties when using the online service. This perception of risk is definitely related to trust, since if the risk element is eliminated or at least decreased, the trust factor will be in a higher level. However, since in this research the case application, DHL IntraShip, is aimed at B2B customers and the paying happens with invoicing principle, this doesn't have to be considered as a serious threat in this case.

In their study Ha et al. (2009, 566) introduced different definitions for *trust* such as “the extent to which one believes that the new technology usage will be reliable and credible” by McKnight and Chervany (2001). However, Mayer et al. (1995, 712) have defined trust as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party”. Virtual business environment has some unique

characteristics compared to the normal business environment, for example the lack of face-to-face or by phone interactions. Due to this characteristic customers feel easily greater uncertainty and heightened risk in their online buying decisions. This contributes to the fact that customers' trust of e-tailers and internet technology is believed to play a pivotal role in customers' e-tailing behaviors. If the user of the system does not trust that it is safe to perform a business tasks with the application, you may assume that the intention to use decreases.

The strength of the relationship between trust and the intention to use an e-commerce system is assumed to be affected by age and usage experience. Naturally elder people, who are not as familiar with different technological solutions as younger ones, do not trust as strongly to new systems. However, as Venkatesh et al. (2003, 469) suggest the effect of age can be debated since also older workers are nowadays very skillful with computers and since the great generations are about to retire and the new technological generations are taking their place, the effect of age may be diminishing and eventually disappearing. Usage experience is expected to increase trust towards the application. This is because people, who are skillful in IT, also trust their usage silks more and this contributes to decreased fear.

### ***5.3.5 Facilitating Conditions***

Venkatesh et al. (2003, 453) defined facilitating conditions as the degree to which an individual believes that an organizational and technical infrastructure exists to support the system. This is included in the revised e-commerce TAM, because with these kind of e-commerce applications it is important that an online support is available for the users in case of problems during the usage. One issue is also, how the users experience the support manages to help in problematic situations. If the users assume that they can get adequate help when needed, they are more likely to use the system. This factor includes also training of the users, communication about the system updates and other things that are concerned with the usage skills development and maintaining. According to Venkatesh et al. (2003) Facilitating conditions are moderated by age in a way that older workers seem to be requiring more help and assistance in their work.

## 6 Empirical Study

The empirical study consists of questionnaire, semi-structured interview and observation method. According to Nielsen (1993), usability testing with real users is the most fundamental usability method and is in some sense irreplaceable, because it offers direct information about how people use computers and what their exact problems are with the concrete interface being tested. Nielsen lists two important concepts, which has to be considered in usability testing: *reliability* and *validity*. These two concepts are usually raised when conducting any kind of scientific research. They presume that a researcher has an access to the objective truth. Nevertheless, their origin lies with quantitative research and their suitability to qualitative research has been debated amongst researchers (e.g. Hirsjärvi & Hurme, 2009, 184-186; Koskinen et al., 2005, 255-256). In brief, reliability means the reproducibility of a study while validity concerns if the measures chosen measure what they are supposed to. These two concepts are discussed more detailed below.

*Reliability* is the question of whether one would get the same result if the test were to be repeated (Nielsen 1993, 165). It can be a problem in usability testing because of huge individual differences between the test users. For example, the fastest user can easily perform ten times faster than the lowest one. This is why it is difficult and fairly unreliable to make conclusions without adjusting the results in a way that the individual differences between the users are considered. However, since in the research, the speed or efficiency is not measured but only the user's opinions are asked, the results can be expected to be reliable. Even though the interview would be repeated e.g. in couple of weeks, the user's opinions would assumedly remain close to the same.

*Validity* is a question of whether the usability test in fact measures something of relevance to usability of real products in real use outside the laboratory. According to Nielsen (1993, 169) whereas reliability can be addressed with statistical tests, a high level of validity requires methodological understanding of the test method one is using as well as some common sense. Nielsen (1993) claims that typical validity problems involve using the wrong users or giving them the wrong tasks or not including time constraints and social influences. For example, if DHL Express' order placement software would be tested on business students rather than on the real users of the application. The test users of the research are chosen by the company

itself and most of them use the application daily, they can be assumed to be the right test users.

In the empirical part of the study, six B2B customers of DHL Express are interviewed and also a short usability survey is conducted with an observation technique. The application which is tested in the study is called DHL IntraShip. It is aimed at the DHL's regular account holders. The users of the application can make shipping orders with it and also track their shippings while on their way. The application and the ordering process are already introduced in the chapter 2. In the next chapter, DHL Express as a company will be introduced shortly.

## **6.1 Case DHL Express**

DHL is one of the biggest logistics service companies in the world and part of Deutsche Post DHL. It operates under four specialized divisions: DHL Express, DHL Global Forwarding/Freight, DHL Supply Chain and DHL Mail. Today's DHL in Finland was created in March 2003, when Deutsche Post World Net placed all worldwide express and logistics operations under one brand and Danzas and DHL merged. In December 2005, Deutsche Post World Net acquired Exel plc, thus strengthening the logistics operations also in Finland. Today, the DHL companies in Finland employ approximately 1150 people in offices, terminals and warehouses around Finland. ([www.dhl.fi](http://www.dhl.fi))

DHL Express is the global market leader in the international express business. Through a network spanning more than 220 countries and territories and more than 120,000 destinations, DHL Express provides courier and express services to business and private customers. DHL Express' international gateways – Helsinki (Vantaa) and Turku – connect Finland to the worldwide DHL network with daily flights to and from DHL's European Hub in Leipzig and daily departures to and from European road express hubs. In addition, they operate at domestic terminals in Tampere and Vaasa. DHL Express runs 60 national linehubs and has more than 200 courier routes. Their combined domestic network enables shared pickup and delivery for air and road express shipments, for the benefit of their customers. All the operations and locations have quality and environmental certification according to ISO9001 / ISO 14001. ([www.dhl.fi](http://www.dhl.fi)).

At the moment DHL Express offers a range of web-based software tools for the B2C and B2B customers for shipping order making and management. This thesis will investigate how DHL Express' business-to-business customers value one of these software tools and its usability and also whether the users are satisfied with the services, or if there is some room for improvement. The analysis is done based on technology acceptance theories and usability definition. The thesis concentrates on DHL IntraShip application, which is a web based e-commerce solution. Before DHL Express moved into this web-based application, they offered their customers service client software, called DHL Connect, which has been in use for more or less ten years. Now DHL Express is hoping that all of its customers would move to using the web-based applications, since they contain major advantages compared to the ones, which has to be installed to the user's computer and updated by an administrator.

As these software tools are becoming more and more important for the company, since they affect greatly in the quality of service experienced by their customers and more and more customers are using the services only via Web, DHL Express is interested in increasingly developing them. Also to gain the important competitive advantage among their competitors by improving the quality of services through better software applications is important. For example, one of DHL Express' competitors Federal Express has used a computer-based package tracking system already in the 90's, which contributed to important advantages thanks to integration of information technology and TQM. The benefits gained are for example lowered manufacturing costs, improved profitability and improved customer satisfaction (Pearson et al., 1995). As DHL Express receives periodically customer complaints about their shipping tools, they want to find out why these complaints emerge; is the reason more in the tools themselves or in the service experience as a whole.

## **6.2 Methodology**

According to Hvannberg et al. (2007, 225) current research on usability evaluation clearly searches for methods that produce beneficial results both for users and for developers in both low cost and also in an ever-increasing competitive industry. This chapter concentrates on the methods used in DHL Express applications' usability testing, selection criteria and on the implementation of the research. In the study the main goal was to discover the users' opinions about DHL Express' IntraShip application. The problems occurring during the usage are

expected to be detected, in order to develop the applications further and eliminate the major disturbing issues. Since the main point of this research is, however, to collect information about the B2B users' attitudes and experiences, the test users are also interviewed where their perceptions about the application quality is measured. The research was conducted as a qualitative study because the aim was to discover the user's subjective feelings about the application. Basically to aim is to find and expose, not to verify existing propositions, which in turn is seen as the goal for quantitative research. Qualitative research focuses on increasing the understanding of a certain area and it is explanatory in nature. (Creswee 2003, 22)

### **6.3 Data Collection and Analysis**

The main data collection method used was semi-structured interviews. According to Koskinen et al. (2005, 104-105), semi structured interview is the most used qualitative data collection method in business studies. They are also known as thematic interviews because the interview is based on previously set subjects, themes. These themes direct the conversation between the participants of the session. According to Vuorela (2005, 37) interviews are scripted conversation situations, by which user's attitudes and perceptions about the usability issues can be collected, rather than the exact usability problems spotted. This is why in addition to the interviews an observation method is practiced in this research. Both of these methods, interviews and observations, are discussed in this chapter next.

#### **6.3.1 Questionnaires and Interviews**

According to Nielsen (1993, 209), questionnaires and interviews are especially useful in usability testing when user's subjective satisfaction and possible anxieties are under investigation. Also Vuorela (2005, 37) states that interviews measure mainly user's perceptions, attitudes and experiences about the application usage rather than looking for concrete problems in them. According to Nielsen (1993), most of the issues related to usability will appear the easiest by asking the users. They are also very useful methods for studying how users use systems and which features they like or which they do not like. Interviews provide mainly qualitative information about for example the users' fears, satisfaction and enthusiasm, which otherwise would be hard to investigate neutrally (Vuorela 2005, 37).



Vuorela (2005, 38) divides interviews in three different types, based on how strongly the interview questions are pre-defined: *structured*, *semi-structured* and *unstructured*. An *unstructured interview* is the most free form of these three. In these interviews open questions are used where the options to answer are not defined previously. It is a discussion like situation with a certain topic. The discussion can get very deep and the interviewer has the opportunity to ask questions based on the answers given by interviewee. The advantage of this method is to possibility to get very rich material and to find out such things that the interviewer didn't know to ask (Vuorela 2005, 39). However, the analysis of the results is a lot slower and more difficult than analyzing pre-defined answers. A *structured interview* is the most used interview method in usability testing. In this method, the interview proceeds according to completely predefined order and only questions formed in advance are asked. The difference that distinguishes this method from a questionnaire is that in this method the interviewer asks the questions orally and records the respondent's answers. This kind of interview is also the easiest and fastest to carry out. The difficulty of this method is the formation of the questions, since they cannot be changed later or during the interview (Vuorela 2005, 39). The last of the three, *semi-structured interview*, has some characteristics of both of the methods presented above. It proceeds according to previously defined themes, but there are also possibilities to modify some questions if necessary (Vuorela 2005, 39). So semi-structured interviews are more flexible than structured ones but still the results are easier to analyze than those of the unstructured interviews. The point is to cover the same issues with all of the interviewees. In the table 6-1, the interview types are compared, in order to reason the selection of the semi-structured interview for the research method of this study.

**Table 6-1** Comparison of the interview types (Vuorela 2005, 40)

	<b>Structured interview</b>	<b>Semi-structured interview</b>	<b>Unstructured interview</b>
<b>Formation of the questions</b>	Constant	Recommended questions	Free
<b>The scope of the questions</b>	Strongly defined	Broadly defined	Free
<b>Number of the attendees</b>	Large	Quite small	Small
<b>Cost per unit</b>	Quite small	Quite large	Quite large
<b>Amount of work required for analysis</b>	Quite small	Large	Large
<b>Concentration of the researcher</b>	Can be small	Intense	Intense
<b>Information collected</b>	Superficial	Deep	Deep

Interviews fit well for situations where one does not yet know what it is they are looking for, because the interviewer is able to adjust the questions and ask for clarifying explanations when necessary. During an interview, the interviewer is always able to evaluate the user's replies, which makes it possible to reconstruct questions that seem to have been misunderstood (Nielsen 1993, 213). Vuorela (2005) names three major advantages of the interviews as a research method: flexibility, not seeing the questions before answering and freedom of output of the respondents. According to Vuorela's (2005) study, the different types of interviews and also several possible ways to conduct them enable the diverse usage of these methods. Also, the fact that the interviewees do not see the questions before the actual interview situation prevents the latter questions from affecting the given answers. Direct interaction with the respondent also allows such questions to rise that would not have come up if all of the questions were already finalized ahead. For example, when the possibilities for answering are not pre-defined but the respondents can answer freely with their own words, the outputs from the interviews are deeper and more versatile.

### **6.3.2 Observation**

The other method that is used in data collection in the research to find out the quality of DHL Express' applications is observing the test users while they are conducting a basic shipping order with the application that they normally use in their work. Naturally by using this method it can be inspected the easiest, how the users are really using the application by seeing how

they work. Nielsen (1993, 207) states that simply visiting the users to observe them work is an extremely important way of doing usability research because then it is possible to see how the application is truly been used. When weighing up the work load of different usability methods, observation is surely requiring the less from the researcher, since it only requires a visit to the test user and then doing as little as possible in order not to interfere with their work (Nielsen 1993, 207). During the observation, the observer should stay quiet most of the time so that the test users could perform their work the way they also normally do. Of course, it may be necessary to interrupt the test user at some point when some explanation or clarification for some actions is needed or then these explications can be gone through after the observation situation is over.

Normally usability testers are from the development group of a company or at least they have reasonable good skills in using the system. It is very likely that the test users want to ask a lot of questions of the observer right in the beginning of the test occasion. However, it is important to decline from such requests in the beginning so that as realistic picture as possible about the real usage situation is received. In the latter part of the test, the observer should then step out of their role and maybe give some help and new tips to the user so that he or she get some payback from participating the research and also that way the observer will get important information about what the test user would like to know more and why they have difficulties with such tasks (Nielsen, 1993, 208). One significant advantage from the observation research is that many times it is possible to find unexpected ways in which the test users are using the applications.

According to Vuorela (2005), the more research methods are used, the more reliable the results of the research are. Naturally at the same time the work load increases remarkably and the analysis becomes more complex. When using several methods at the same time, it is important to consider that the chosen methods support each other and are as obliging as possible when solving the problem (Vuorela 2005, 43).

## **6.4 Research Framework**

The empirical part of the research was conducted as a semi-constructed interview and a short observation test. The empirical questionnaire framework is based on technology acceptance models, such as TAM, TAM2 and UTAUT, more specifically on the factors related to them.

The interview also contained some Likert scale questions, which based mainly on Nielsen's usability definition (learnability, efficiency of use, memorability, errors and subjective satisfaction). The usability statements as well as the technology acceptance measuring questions are presented in the Appendices C and D.

Before the interview was conducted, a preliminary questionnaire was sent to the respondents and they were asked to fill it in return before the interview session was held. The questionnaire is presented as a whole in Appendix B. In the questionnaire the respondents were questioned their age group (from 18 to 30 years, from 31 to 50 years and +51 years), company that they work for, job title and their primary work tasks. In the preliminary questionnaire they were also asked some tentative questions about their application usage habits. The respondents were for example asked, how long they have been using the application and how often they are using it in their work. Also the importance of the system in the respondent's own words was asked; both for the person themselves and also for the company they work for. The aim of the preliminary questionnaire was to chart the demographics of the test user and also the level of usage experience.

The second part of the interview was based on Nielsen's (1993) usability definition: learnability, efficiency of use, memorability, errors and subjective satisfaction. Each of these factors was evaluated using two separate Likert scaled questions (from one to five). For example, when learnability was evaluated the respondents were asked to rate the statements according to their opinions: (1) I feel that the applications usage is easy to learn. (2) A learnable application is highly important for this work. Based on the scores from these two questions, then the overall grade for learnability-dimension was discovered. When the grades of all of the dimensions of usability are combined, the total grade for their perception of usability can be evaluated. The second part of the interview framework had all together ten separate questions, which measured five separate dimensions of the concept.

The third part of the empirical study was based on the technology acceptance theories, which are covered quite extensively in the theoretical part of this research. The theories are TAM, TAM2, UTAUT and other revised and extended technology acceptance models. In the chapter 5, a revised e-commerce TAM was constructed and the questions based heavily on these assumptions. The construction of the interview was semi-structured and it consisted of both,

open questions and Likert scaled questions. The open questions measured trust, perceived usefulness, perceived ease of use, perceived reliance, voluntariness, job relevance and facilitating conditions. The perceptions about these entities were measured by asking questions from different perspectives and discussing about the application with the user, so that based on analysis, the test user's opinions lying underneath could be found. The participants were also asked to evaluate each of these factors as a complete concept (according to their perception of the meaning) on a scale from one to five. The third part of the interview had all together 26 questions, which are presented in Appendix C.

The fourth part of the empirical study was the observation method. Then the users were asked to perform a basic shipping order with IntraShip application and describe at the same time, which functions they feel being inconvenient and which features of the application could need some improvement. This way, some concrete spots were discovered, which are causing the unpleasantness and annoyance for the users in their daily work. These concrete findings are described more closely in the next chapter.

## 7 Results

To test the proposed revised technology acceptance model, which was developed in the chapter five, six extensive interview sessions were conducted. The participants were B2B customers of DHL Express in Finland, who are using DHL IntraShip application more or less daily in their work. The test users were chosen by DHL Express and they were invited to participate in the research by sending an invitation by email. The interviewees of the research, their age groups, work titles and perceptions about the importance of the IntraShip application for their work are described carefully in the Appendix A. Each interview took from 50 to 90 minutes and the sessions were held in the premises of the customers' company. The interview results are mainly only qualitative data. In few rare questions, the participants were asked to rate some dimensions of the application on a Likert scale (1-Strongly agree, 2-Agree, 3-Neither agree nor disagree, 4-Disagree, 5-Strongly disagree). These questions were used to back up the open questions and the results gathered from them.

As the revised e-commerce TAM was constructed based on the different technology acceptance models, this chapter's main implication is to discuss how the findings fit the new constructed model so to mirror the result gathered from the interviews with the revised e-commerce TAM. The aim is also to be able to draw some conclusions of how certain factor influence the acceptance of the DHL IntraShip application and how these findings could be extended to cover also some other similar applications and their acceptance. Since the data from the interviews is mainly qualitative, it cannot be stated how strongly each factor affects the behaviour. Rather, the point here is to search if those factors are existent and if they seem to be causing satisfaction or dissatisfaction among the users.

In this chapter, first the results from the usability survey are presented. Interesting question rising here is, if usability as a concept defined by Nielsen (1993) has any interrelationship with ease of use. This connection has been discovered from the previous literature, which is discussed in the theoretical part of the research in chapter five. However, not extensive research has been done about the subject.

Second, the participants of the interview sessions are introduced based on demographics (age group, gender) and the experience and habits of the application usage. After presenting the results from the usability questionnaire, the rest of the interview results are grouped, so that

all the factors of revised e-commerce TAM are discussed one by one. The main point is to find which kind of contributions these four factors have to intention to use and eventually usage behaviour. Also the concrete issues that are behind these evaluations are discussed. As already mentioned, no exact figures such as correlations or such measures are presented because of the qualitative nature of the data. The assumptions are made based on the interpretations that are done when analysing the qualitative data. When the factors seem to be affecting technology acceptance, only guesses can be made, how strong the contributions are. However, after the determining factors are covered, the complete model of revised e-commerce TAM is analysed by observing, which moderating factors (age, gender and experience) are influencing the importance of which determining factors. Also these relationships are only descriptive, not giving any exact measures about how strong the effects are.

In the end of this chapter the practical issues are presented, which were found from the application during the interviews and the observation usability survey. The issues found during these sessions are divided in six categories: logic and functionality; buttons, fields and links; updating and saving information; training; communication and instructions; printing issues and others. These groups and the issues found are described carefully and then the effects of the errors analysed.

## **7.1 Usability Ratings**

Usability of an e-commerce application is a highly important factor. Nielsen (2000) has made the following statement:

“Usability rules the Web. Simply stated, if the customer can’t find a product, then she or he will not buy it. The Web is ultimate customer-empowering environment”.

Also Shacklett (2001) has mentioned that, “twenty-eight percent of Web site transactions result in consumer failure and frustration and six percent of the users who leave an e-commerce site with a frustration says that they will never return to the site.”

According to the statements presented above and the literature presented before, usability can be seen as a major influence on how an application is rated and evaluated by the users. A high-quality application can lead to improved customer satisfaction and better revenues. In

order to be able to form a wider picture about the quality of the DHL IntraShip application, also a usability questionnaire was conducted. Usability definition is the most related to the perceived ease of use, so the goal in this was to discover the perceptions about the usability factor of the application. In the usability section, the participants were asked to rate the different features of the usability definition by Nielsen (1993) in a scale from one to five, as described below:

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

The five dimensions, which the participants rated, were learnability, efficiency, memorability, error free and subjective satisfaction. The statements that were presented for the participants are presented in the Appendix C.

There were two statements per each factor, so each interviewee rated all together ten propositions. These results are summarized in the table 7-1. The findings are shown in two lines for each of the factors, because the first statement is always evaluating how the participant finds the factor in question and the second statement evaluates the perceived importance of the factor.

**Table 7-1** Summary of the usability questionnaire results

(1-Strongly agree, 2-Agree, 3-Neither agree nor disagree, 4-Disagree, 5-Strongly disagree)

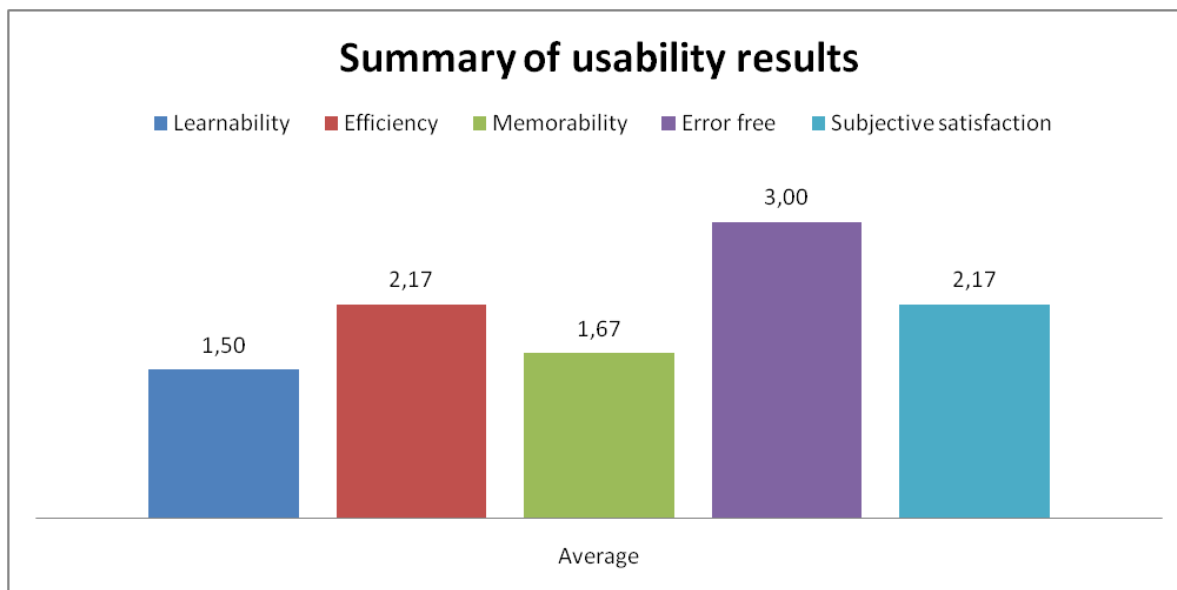
<b>Interviewee</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>Average</b>
<b>Learnability</b>	1	2	1	1	2	2	<b>1,50</b>
	1	1	1	1	4	4	<b>1,50</b>
<b>Efficiency</b>	1	2	5	1	2	2	<b>2,17</b>
	1	1	1	1	4	4	<b>1,50</b>
<b>Memorability</b>	1	2	1	1	4	4	<b>1,67</b>
	1	1	2	2	4	4	<b>1,83</b>
<b>Error free</b>	1	4	5	2	2	2	<b>3,00</b>
	5	1	1	2	4	4	<b>2,33</b>
<b>Subjective satisfaction</b>	1	2	5	1	2	2	<b>2,17</b>
	1	2	5	1	2	2	<b>2,17</b>



Since one is the best grade that it is possible to get, it seems that learnability and memorability are scored pretty high in the questionnaire (learnability 1.5 and memorability 1.67). This implies to the fact that the application is not very complicated to use and hence also learnable and memorable. Some of the interviewees even stated that when the application is built in a way that there is only one possible way of using it, it is almost impossible to do mistakes. Not all of the respondents thought this way, though. The importance of both of these factors scored pretty high as well (1.50 and 1.83), which implies that in order to use the application efficiently these dimensions have to be in order.

Based on the grading, efficiency and error free are in a worse condition than memorability or learnability (grades of 2.17 and 3.00). However, in the case of efficiency, it scored otherwise pretty high, but the interviewee C gave the worse possible grade for the factor: 5. Most of the interviewees thought that after the implementation difficulties, it is rather efficient to use the application. However, more people thought that the application has many errors in it. Also as the second statement inquired if the errors are disturbing during the usage and the dimension scored 2.33 implies this that there are severe dysfunctions on the application. These are discussed and classified more closely in the practical implications –section.

In the figure 7-1, can be seen the average grades for each dimension of Nielsen's usability definition. The figure is based only on the first statement about each factor, because those are the ones referring to the actual subjective perception about the dimension in question.



**Figure 7-1** Summary of usability questionnaire results

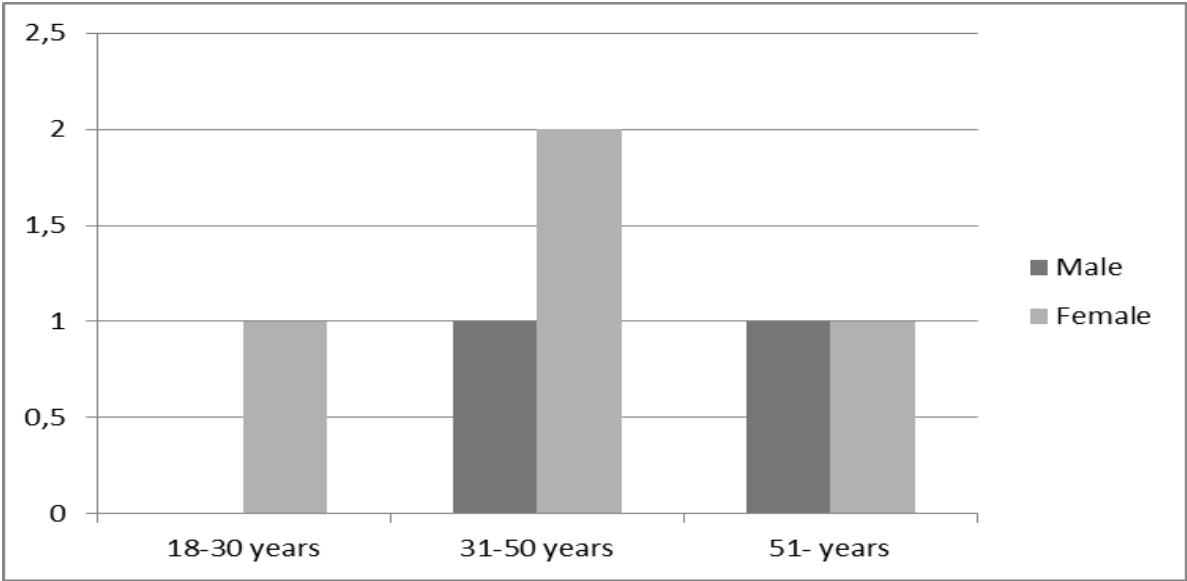
As already stated, from the figure 7-1 can be seen that learnability and memorability score pretty well in the questionnaire. Efficiency and error free seem to be doing worse and subjective satisfaction falls in the middle of these four factors. This is probably because all the other four factors can naturally be seen as affecting the subjective perception about the applications usability. The total average of usability grades falls to 2.1, which is a pretty overall result. However, the biggest problem seems to be the errors occurring in the application. This statement is also backed up by the fact that in the end of this chapter, there are several errors and issues found from the application. According to the results of usability survey, TAM data and also the observation method, they seem to be annoying the users remarkably.

## 7.2 Demographic Factors

In the preliminary questionnaire (see Appendix B) the respondents were divided to three age groups: 18-30 years, 31-50 years and over 51 years. The groups were divided based on the assumptions of how actively these different age groups can be assumed to be adopting new technologies. In the research the assumption is that people from 18 to 30 years are very active and feel comfortable when using technological solutions. People who belong to the 31 to 50 years, have seen the radical changes that have happened in IT industry and this way they have been forced to change their habits but still they have a long experience with technological

solutions. People older than 51 years old have been using technological solutions for some time but still they might be many times so called “late adopters” and slower in absorbing new technological solutions. This is because they were already on the job markets when the IT started evolving and when at some point it came part of the daily work, these people had already got used to working in a certain way. As a consequence of technological development, they were forced to change their working habits, which may have caused some change resistance.

One out of the six respondents belonged to the 18-30 year group, three of them to the 31-50 year group and two to the over 51 year group. Two of the respondents were male and four female. The distribution of the gender and age groups can be seen in the figure 7-2 below. Both, age and gender are classified as moderating factors in the technology acceptance theories and that is why they are important to consider when interpreting the results from the interviews. According to the technology acceptance models by many authors, age and gender are assumed to have a contribution to the factors which are for one’s part affecting intention to use and usage behaviour.



**Figure 7-2** Gender and age groups of the interviewees

Age is assumed to be affecting all of the four determining factors: trust, perceived reliance, perceived usefulness and perceived ease of use. However, since the younger generations are starting to be more and more comfortable with computers and information technologies overall, the affect may diminish after all when these “technological generations” become part

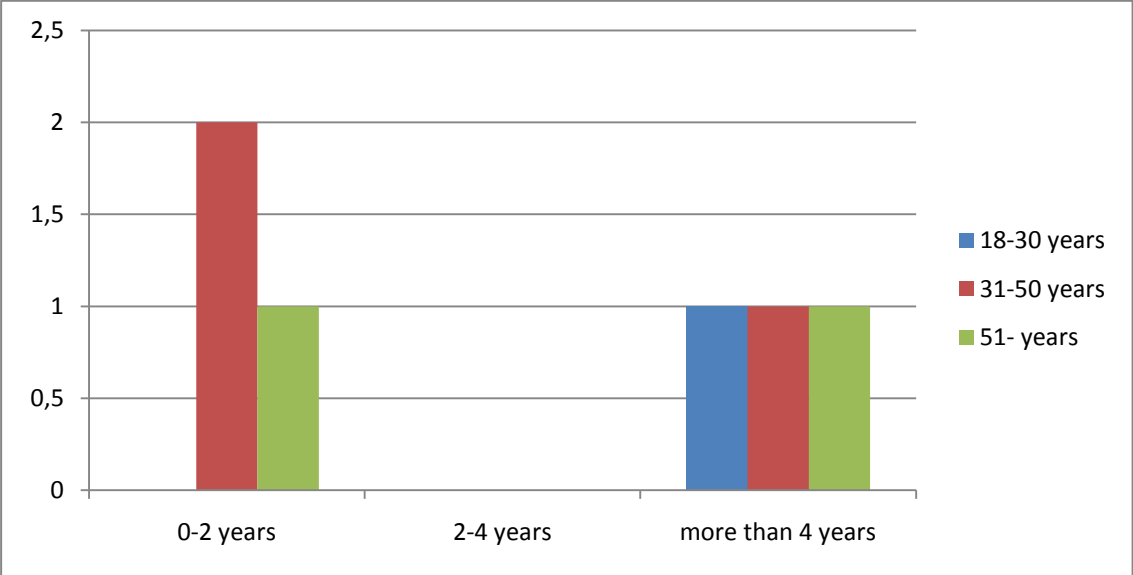
of the elder age groups. Still, in this research, it can be assumed that there are gaps between the levels of expertise in information technology usage in a way that younger people are normally more comfortable and more experienced in using and probably also accepting new technologies. Also, because of the higher experience level, the trust for information technologies may be higher. Since the younger generations are used to be always using technological solutions, the perceived reliance may increase with age. According to the study by Venkatesh et al. (2003), the level of perceived usefulness has more effect in the case of younger people and men. Age also moderates the effect of ease of use, because it has been stated by Venkatesh (2003) that the factor influences more greatly women than men.

Hence, also gender might be affecting intention to use and the actual usage behavior, since they are stated to have a contribution to the model when combining with age. Especially older women tend to be more rejective towards new technologies and they might also be struggling with the implementation of a new solution because they might feel they are hard to learn and use.

### **7.3 Experience and Usage Habits of Participants**

For all participants of the interviews, DHL IntraShip was one of the primary tools in making shipping orders. When it comes to the orders made for DHL, IntraShip –application was definitely the number one application. However, all of the participants had at least sometimes been using other companies’ corresponding applications too and this lets me to assume that all of the respondents had some kind of comparison basis against the functionalities of IntraShip. In all of the companies that were involved, shipping orders are a very important part of the daily operations and all of the respondents stated that high level of usability in the application is extremely important for them. The experience in using the application varied all the way from six months to seven years. However, as can be seen from the figure 7-3 below, the test users had either been using the application less than two years or more than four years. Even though there are a bit more users in the over four year group, there were two of the interviewees that had changed to using the IntraShip application just recently. Both of them changed from another service provider to using DHL Express’ service offerings and it should be denoted that neither of these users were completely satisfied with the changed situation. They thought that it is not unproblematic and smooth to begin to use IntraShip. This implies

that there are some issues regarding the learnability of IntraShip and assumedly something with facilitating conditions, such as training and manuals. However, these issues are covered more closely later in this chapter.



**Figure 7-3** Usage experience of the test users

The application seemed to have some features that are harder to learn, but the majority of the respondents still thought that the application is so simple that it does not require a lot of time to get used to at the implementation phase. However, the overall technology and Internet experience seemed to have a bigger effect on the perceptions about the functionality of the application. As one participant worked as a Systems Specialist in an IT company, it was to be seen that the person had more skills on the issue and concentrated on the stated usability problems more than the ones, who had no special IT background. This implies that the experience with different applications and technologies can be considered as a more remarkable issue than the experience with a specific application. However, because the two users, who are total newcomers in the use of IntraShip, had lots of improvement ideas for it, the results may imply that there are some features, which make the application hard to adjust to in the beginning. These concrete errors are discussed one by one in the last part of this chapter.

## **7.4 Revised E-commerce TAM Results**

The interview framework measuring, which different factors are affecting the intention to use and usage behaviour were constituted using TAM, TAM2 and UTAUT models. The framework was semi-structured, so that all the questions, which were planned ahead, were asked from all of the participants of the survey. However, this kind of interview leaves room also for clarifications and additional completing questions and answers, whenever the interviewer thinks it is necessary or the interviewees want to complement their answers. This way, I was able to spot some pointers about the “new revised e-commerce” factors that were not part of the original technology acceptance models. By asking open questions and making clarifying remarks, people tend to tell more than what the questions by themselves are trying to reveal

This part of the empirical study consisted of all together 26 questions. The entire framework is presented question by question in the Appendix D. Two of those questions were Likert scale questions (1-Strongly agree, 2-Agree, 3-Neither agree nor disagree, 4-Disagree, 5-Strongly disagree) about in which level users felt that usefulness and ease of use determinants occur in DHL IntraShip application. As stated before, the other questions were open, so the interview sessions can be described as conversation occasions with a semi-structured framework.

### **7.4.1 Perceived Usefulness**

The questions from number one to number four, presented in Appendix D, are measuring the perceived usefulness of DHL IntraShip application. The questions are searching, if the IntraShip application improves job performance and productivity and eases the test users work burden overall. In the fourth question, the interviewees are asked to grade the usefulness of the application as a whole on a scale from one to five (1-Strongly agree, 2-Agree, 3-Neither agree nor disagree, 4-Disagree, 5-Strongly disagree).

In the first and the second question the users are asked if DHL IntraShip –application improves the work performance and raises the productivity of the users. Five out of six participants stated that the application improves their performance as well as productivity at work. Almost all of the respondents referred to the fact that it is much easier to fill in the bills of freight with IntraShip than what it would be without it. This would mean doing it manually

by hand, if there would be no technological solutions like this available. Many of the respondents also stated that, since the shippings must be made no matter what, IntraShip certainly improves the job performance because its functionalities. The users commended especially the fact that the usage of IntraShip is not place-dependent; you can use the solution as long as you have an Internet connection available. The users mentioned also that since it is possible to save contact information and descriptions of content in the application, it makes working with the shippings easier than what it would be without the system. For example, the participant A (a male with 5 years of usage experience) replied to the first question as follows:

***Participant A:** “Since the shippings must be shipped no matter what, the application is certainly improving my work performance. If the shippings would be done manually, by hand, it would make my job extremely frustrating due to the large amounts of shipments.”*

When the test users were asked if the application eases their work, once again, five out of six respondents answered that it does. However, two of the respondents stated that in the beginning the application takes some time to learn and according to them at that point the application is not making the job easier. Both of these users still admitted that once they learned how to use the application efficiently, it eases their job. Here is how interviewee F (young female) answered when inquiring this matter:

***Participant F:** “The application even complicated my work in the beginning. However once you have learned how to use the application, the solution makes my job easier.”*

In the fourth question, where the respondents were asked to rate the usefulness of the application on a scale from one to five (1-Strongly agree, 2-Agree, 3-Neither agree nor disagree, 4-Disagree, 5-Strongly disagree), DHL IntraShip got a grade of 4.17. There were two respondents that did not give the best grade for the application; the first user thought that the application is making their work more complicated, because it is so rigid to use and the second one thought that the application is too complicated in the implementation phase and gave a lower grade because of that. These results about the perceived usefulness imply that this factor is at sufficient level in order the application to be easily accepted. However, since some issues were found regarding the inflexibilities in the application, some thought should be given to that in order to improve the usefulness of the system even further.

#### **7.4.2 Perceived Ease of Use**

In Appendix D, the questions from 5 to 11 are measuring perceived ease of use. The original definition for the concept was developed by Davis (1989, 320): *the degree to which a person believes that using a particular system would be free of effort*. In practice this refers to how effortless and smooth an application or a technical solution is to use. This dimension also covers the logic of the system, so that the communication between the application and the user is understandable and clear. The questions about perceived ease of use covered frustration and confusion occurring while working with the application, possible inflexibility and lack of logicity and also learnability and memorability factors of the application. As the latter two belong very closely to the usability definition by Nielsen (1993), it can be assumed that usability of an application has an effect on perceived ease of use. In the last question about the perceived ease of use, the users were asked to rate, on a scale from one to five (1-Strongly agree, 2-Agree, 3 –Neither agree nor disagree, 4-Disagree, 5-Strongly disagree), how easy the application is to work with overall.

When inquiring the participants, if they ever get confused when working with the application, two out of six respondents stated that they do. However, five out of six respondents stated that IntraShip –application frustrates them at times. Also four out of six participants thought that they have sometimes difficulties in understanding the logic of the application and that the system is sometimes rigid and inflexible to use. The main reason that was discovered to be causing this great dissatisfaction was the logicity of the system. The users thought that, since the application can be used in only one way and every interleaf has to be always filled in before it is possible to move to the next phase in the process, it makes the solution very rigid and inconvenient

Another thing that the test users perceived difficult is the existence of interleaves, which have to be processed one by one in order to complete a shipping task. Almost every user questioned why all the necessary information could not be seen on one single page instead of those separate steps. They thought that there are too many unnecessary levels in the shipping order process and that by bringing the information to one page, the process would appear to be a lot smoother and easier. The participant E (an older female with relatively low experience) commented the interleaves as follows:



*Participant E: “Yes, the application makes me frustrated sometimes. It is annoying that you always have to proceed in a certain order and that it takes so many clicks until you can move forward...”*

Memorability and learnability -dimensions were evaluated by the test users quite high, so this is evidently supporting the results from the usability questionnaire, discussed already before in this same chapter. This may have connection with the simplicity of the application; you can only work with the application in one single way, so the chance that the user would not remember how to accomplish tasks is low. Also even though the difficult structure of the application annoys users at first, the simplicity still makes the time to learn how to accomplish tasks quite low. The participants of the interviews evaluated the ease of use of DHL IntraShip application to be 3.5 when five is the maximum value. This clearly results from the matters already discussed above.

### **7.4.3 Perceived Reliance**

Perceived reliance refers here to how dependent the user thinks he or she is of the specific application. This concept is a combination of the user’s own opinion, company’s other people’s opinions and the true practical reliance, which occurs in its maximum when there are no other options available to perform a specific work task. In this kind of a situation perceived reliance might have the role of the most determining factor when reviewing usage behaviour and technology acceptance. If there are no other options, people are willing to accept minor or even bigger impracticalities or dysfunctionalities easier. If there are a lot of options available, people would naturally choose more carefully their service provider, because they have the opportunity to do so. However, it is hard to estimate how greatly the logistics company’s shipping order application affects the decision, which company to use. Probably the total service offering is the major influencer, however, one dimension of it must be the application available.

In Appendix D, the questions from number 12 to 16 are measuring perceived reliance. The questions are about the support and also pressure from the users own organization to use the specific application and also about the users’ own perceptions about the obligatoriness of the application. One important question is also, if a person thinks that their work tasks require the usage of the solution.

All of the test users stated that the application usage is important and relevant for their company, especially because of the improved efficiency in the company. All of the respondents were representing quite big companies, so shifting back to manual shipping documents, would be impossible. Naturally in a problematic situation, an optional solution would be to use some other service provider and their application, but the fact that such large companies, as covered in the research, have remarkable service agreements with their current service providers. This prevents or at least partly hinders these kinds of quick changes and adjustments on a short run. However, some of the interviewees told that they are also using other companies' services so in such situation the dependence on one logistics service provider is not as significant.

All of the respondents replied that the application use is mandatory for accomplishing their work tasks. They stated that the amount of the shipments that is done daily is so huge that in practice it would not be possible to handle all of them manually with recent resources. The participant F (young female with high experience) commented to this as follows:

***Participant F:*** “Yes, the application is mandatory for my work. We would not survive without it anymore.”

According to the answers, the perceived reliance is not very strong. This might be a consequence of the fact that several of the respondents stated that they are simultaneously using also other service providers. When the participant D (a female with high experience) was asked if they are using other service providers as well, the answer was as follows:

***Participant D:*** “Yes, we are also using all other possible logistics companies for shipping. However, I find that IntraShip is the easiest application available and the new-comers usually start working with this. “

However, since many of the companies have fixed service agreements with DHL Express, this constricts the usage of other available options. Also, usually the top management of those companies had given the order to use primarily the specific company's services, so the reliance can be considered to be medium.

#### **7.4.4 Trust**

Trust could be defined as the belief that the system will perform what is expected of it in a way that the actions that follow do not harm the user or hinder their working. Since e-commerce environment involves no face-to-face connections, trust has to be considered little differently. In some of the interviews it was discovered that the trust between the customer and DHL Express was not what it was supposed to be. For example, one of the participants seemed very suspicious about the DHL Express in general. When the reasons for the lack of trust were questioned, lack of communications rose as a leading factor. When the user was asked, how the relationship could be improved, the answer was that they are hoping to get a person from DHL to visit them regularly in order to create a better customer relationship. During those visits they were hoping to create a more personal relationship between the parties and at the same time improve the skills in the system usage for all of the users in the company. They were also hoping to be informed about the possible new services and other possibilities.

Since in the case of DHL IntraShip application, the users are B2B customers, the risks involved with for example e-payments are not relevant. When comparing to B2C e-commerce, these matters should be considered carefully, though. Here we can assume that such risks are non-existent and that the trust is created more based on the functionality of the application and also based on how well the service is provided in general; in this situation trust measures how fully the company is able to keep its promises. The questions from number 24 to 26 are evaluating how the participants perceive trust. These questions are about if the users ever get scared that by hitting a wrong button or a key they would lose some critical information, if they ever hesitate to use the system for fear of making mistakes they cannot correct or if the system is somewhat intimidating to them.

Two out of six respondents stated that they are afraid that by hitting a wrong key they could lose some critical information. Other of those respondents also could name a spot in the process where the user gets kicked out of the system every time a wrong button is hit. For example participant (a female with high experience) F commented the matter as follows:

**Participant F:** *“Yes, I am afraid that I will lose some critical information by hitting a wrong button. For example at one point, the application throws me out every time. For example*

*when you are working on Pro Forma and you are supposed to click “More” but accidentally you click “Update”, it always kicks you out. And the system does not warn you about the error that is going to happen...”*

Another issue that was raised concerning this matter was that the system does not update the information about the made shipments real time. Many of the respondents stated that when they were using the system for first times, they got in situations where they had been making several shipments and when they tried to search for them in the “Shipment history” –list, they could not find them in there. However, when they logged out from the application and then later logged in again, all of the sudden the shipments appeared there as supposed to. This is not a matter, which causes fear after all, but for example participant E (a female with low experience) told how some of the other employees have called her in a confusion wondering the issue:

***Participant E:** “I don’t consider it to be causing fear, but sometimes people might call me and ask for help, because they are confused about if they have lost the shipments they just made. I don’t know what happens but when we sort things out, the shipments finally appear where they are supposed to be.”*

When the users were asked if they ever hesitate in using the application for fear of making mistakes that they cannot correct later, all of the respondents replied that they do not. This great trust is explained by the fact that as long as the manifest is done (so the information sent to DHL Express), the shipments are correctable in the system. The users commended that it is extremely great functionality that the orders can be modified or erased later on. Neither the user stated that the IntraShip application would be intimidating in any way. Some of the users stated that the solution can be said to be annoying, but not exactly intimidating.

#### **7.4.5 Facilitating Conditions**

Facilitating conditions is defined already when discussing about UTAUT model and in practice it consists of training, customer service availability, usage manuals, communication about updates, changes or service breaks and other quarters that could assist with the use of the application when the user runs into some problems or errors. Since, the users don’t always have the real time knowledge about the supporting facilities, this factor measures the perception of how much of these the user thinks there is available. However, when the usage

experience increases, the user also learns to know where the help can be gotten, so this is an antecedent that increases with experience. Still, this factor seems not to have a very strong connection with the intention to use the system, but it is more closely related to the actual usage behaviour. In the revised e-commerce TAM, this factor is depicted to be affecting straight usage behaviour without any influence on the intention to use.

The questions from number 17 to 23, in Appendix D, are covering different aspects of facilitating conditions. The questions are about if the user thinks that he or she has the necessary knowledge to use the system, if they have gotten enough training related to usage, if system updates or new versions are confusing the users and if they are necessarily informed about them. The questions considered also if the DHL Express' IT-Support is adequately helping in problematic situations and if the users feel that they have enough knowledge to be able to train other users. The last questions related to the fact that many of the participants of the research had the responsibility of communication and training in their own companies.

Two of the respondents thought that their knowhow on the IntraShip –application could doubtless be improved. According to their opinions it is not on a satisfactory level. Still, the other four users felt that they have the necessary knowledge about the application. The dissatisfaction for the two discontented users was mainly caused by lack of information about the different features and functionalities in the system. For example, there is a module called “Reports” in the application, but only one of the six users knew why the module is there and was actually using it in his daily work.

When inquiring about the training provided by DHL in the application usage matters, half of the respondents thought that it could have been more intensive in the starting phase. The users thought that the difficulty in implementation is the illogicality of the application. However, once they learned how to use the system they felt that they have the necessary knowledge also to train others in their own company. Two of the respondents still thought that it would be nice that someone from DHL would occasionally arrange some training and info sessions about for example some specific features, developments in the applications or system updates. This way, DHL Express could also collect some regular feedback from their customers so that they would be able improve their solutions in order them to be more carefully tailored for their customers.

All of the interviewees agreed that the IT-Support and customer service provided high class service. Every one of the respondents had called there at least few times and none of them had anything negative to say about the support. According to the interviewee's opinions, the response time is really short, the customer servants are professionally skilled and the problems had been solved every time. Participant E was very satisfied with the support services and commented:

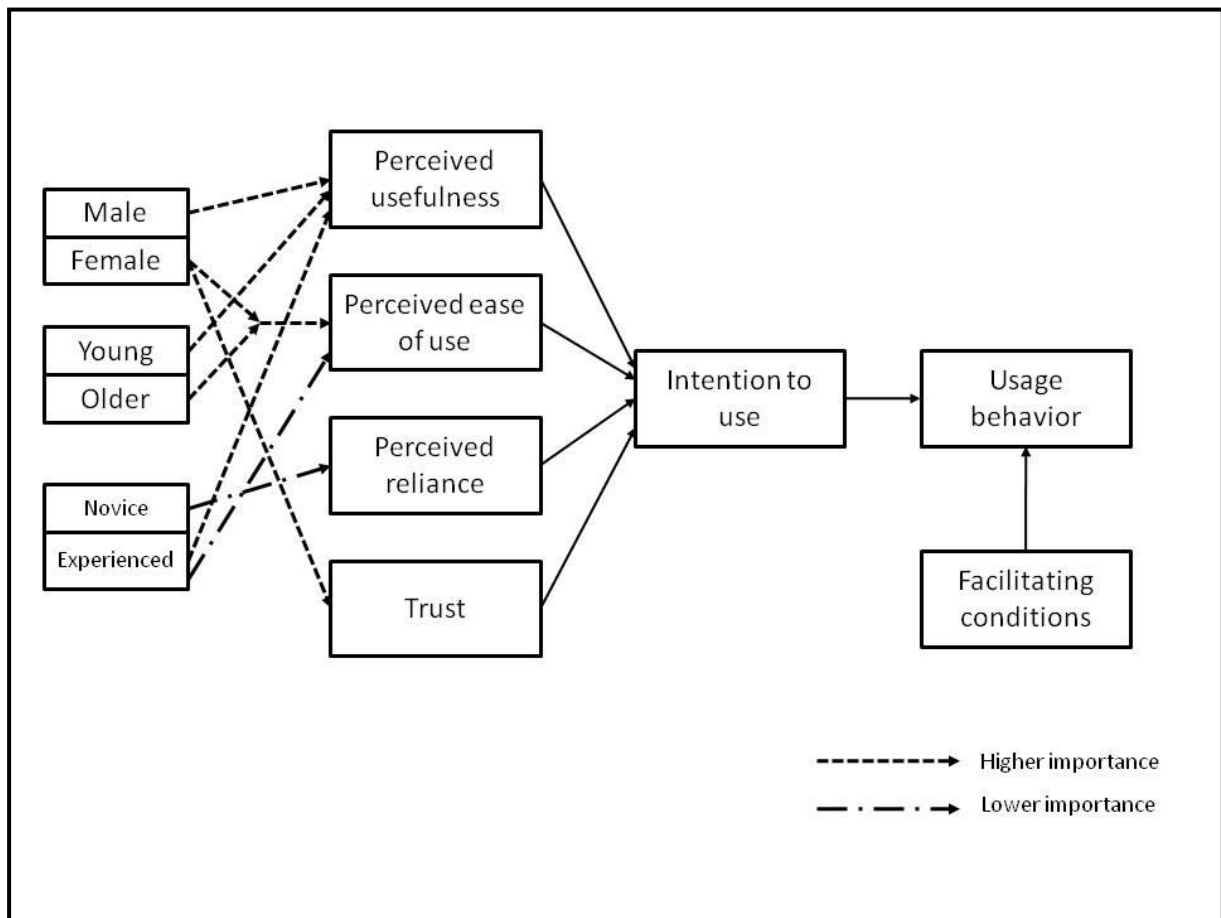
***Participant E:** "I have called the IT-support and they have always solved my problems. I give them full points!"*

However, one issue that was found from the interviews was the lack of written instructions, or at least the lack of knowledge about its existence. Some of the users had received a written manual when they first started using DHL IntraShip, some remembered that there could be something like this available in the website of DHL Express and some had no idea that this kind of help could be available. A common opinion was that a short manual about the different functionalities would be greatly helpful. Especially when a user doesn't have any specific problem but they would like to find out what certain functionality or module could offer, they would be interested in using this kind of help. The easiest way for DHL Express to improve this is to have the instructions available on their website, inform their customers about this opportunity and update the instructions regularly. This way there would always be an up-to-date instruction manual available.

## **7.5 Testing the Model and Concluding the Results**

By interpreting the results from the perspective of moderating factors (gender, age and IT-experience), the relations between them and determining factors are next presented. In the figure 7-4 detected effects of moderators to the importance of the determining factors are presented. The main goal of the picture is to describe which moderating factors effect which determining factors and if the influence is increasing or decreasing the factor's importance. Each moderating factor is divided in two groups: gender to male and female, age to young and older and IT-experience to novice and experienced. This was done in order to draw clear lines if the factor has an effect on the determining one or not. Some of the effects found are supporting the expected results of the revised technology acceptance model, however,

distinctions were discovered as well and next these will be relationships between the factors will be presented.



**Figure 7-4** Detected relationships between moderating and determining factors

Even though it was assumed based on the theoretical research, that a lot more relations appear between the factors, in this empirical research, not all of these were discovered. This issue can be assumed to be caused by the nature of the application and also by the small amount of interviewees, which disables an extensive analysis of the possible results. The small amount of respondents also causes the phenomena of one remarkably distinctive answer influencing the average values greatly.

1. **Perceived usefulness is affected by gender, age and experience.** According to the interview results three observations were made: men and younger users perceive usefulness as more important and also if the user has a lot of experience in using technology.

2. **Perceived ease of use is affected by combination of age and gender and experience.** Older female users tend to put a higher importance on the ease of use aspects. This may derive from the fact that they are many times more careful with technology so they expect applications to be easy to use, so that they feel they are more in control of the situation. Another observation that was made according to the interviews is that experienced users don't evaluate ease of use so high in importance. Since they have the skills to use more complicated systems as well, they don't find it threatening when the system is not so easy to use, they prefer usefulness more important.
3. **Perceived reliance was discovered to be moderated only by experience.** According to the interview results, if the user is novice, perceived reliance of the application tends to be lower. This may stem from the fact that when they have not been using the system for that long, they think that they could survive without it as well, by using some other solution to proceed with the task. However, the longer the users experience, the more dependent they seem to be of the solutions, since they for example stated that they would not survive without the system anymore.
4. **Trust was discovered to be affected by gender.** Female users seemed to put more importance on the trust, which means that the importance of a trustworthy application increases for them.

The relationships listed above are only discovered based on the interviews on DHL IntraShip application. The sample size of the research was only six interviewees and the data received from the study was qualitative, so no assumptions can or is wanted to make about how strong these effects might be and if they will remain the same when the circumstances change. This is why the original revised model, presented in chapter five, is not modified based on these results. However, because these factors are considered to affect in the case of DHL IntraShip, the results may be used in developing the particular solution or when considering how different kinds of users can be considered and the usage experience improved.

## **7.6 Practical Issues in the DHL IntraShip Application**

According to the interview results, technology acceptance towards DHL Express' IntraShip application is at quite a satisfactory level. However, based on the interviews and the



observation test, which was conducted in the end of the interview session, various practical issues were discovered. These findings are divided in six categories: logic and functionality; buttons, fields and links; updating and saving information; training; communication and instructions; printing issues and others. Next these problem areas and the specific issues in them are described one by one. In the figure 7-5 you can see how many errors were detected from related to each category. Logic and functionality and information saving and updating seem to containing the most issues.

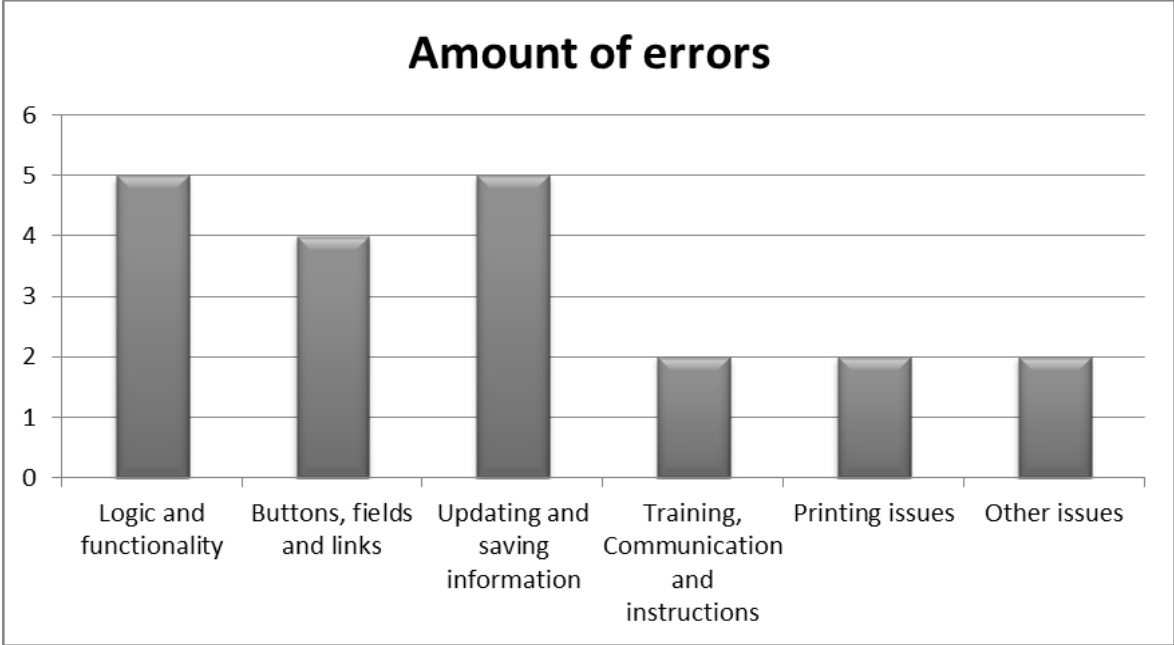


Figure 7-5 Amount of errors detected in each category

**7.6.1 Logic and Functionality**

The issue that was raised most when talking about logic of DHL IntraShip are the interleaves and moving between them when conducting a shipping order. After each stage, the user has to move to the next interleaf, which is considered as complicating the process. If there is some information missing from the previous one, it is not possible to move to the next one. The users felt that it is hard to get used to the “sectionality” of the application and also that it would be a lot easier if all of the information could be entered on one screen because then all the necessary information would be seen at a glance.

Other functionality problem that was raised in almost all of the interviews was the tracking of shipments. The biggest problem with tracking is concerned with the information needed in

order to be able to find the shipment; you need the search by date or shipping number. The desire of the customers would be that they could search with other criteria as well and also be able to see a list of all of the shipments when needed.

The three-phase process of shipping also raised questions. Some of the participants of the survey thought that it is complicated and burdensome to conduct all of the phases. They questioned why these steps could not be decreased to one or two. There were also some problems with the contract of carriage, since one customer told that even though they have been printing it and tried to give to the courier during the pickup, it is not accepted by the courier. Naturally, the customers don't understand what the function of the document is. The last concern about logic and functionality is about the pro forma. Customers felt that it is complicated to fill out and they also encountered lots of problems with printing the documents. For example, when conducting the usability survey with one of the users, even though the pro forma was filled in properly, the user did not get any prints out. This unfortunate occasion forced the user to fill in the pro forma manually.

### ***7.6.2 Fields, Buttons and Links***

There were several issues raised in the interviews about the text fields in DHL IntraShip. When entering the receiver's information, there isn't a field for the mobile phone number available. Another issues raised about the text fields was that there are way too many unnecessary and still mandatory fields for receiver's address. For example, it is frustrating to fill in the address line 2 as well, since it is mandatory, even though the address would fit nicely to the one line. The users questioned if it is really mandatory to have that many fields there. Another issue concerned the field descriptions, which some of the users found disruptive, since in part of the descriptions the first letter was with capitals and in some with small letters. The users stated that even though it is a small issue and has no effect on the usability or functionality of the application, it makes the software to impress as homespun.

Many interviewees mentioned the buttons and more specifically their descriptions to be causing confusion. In the receiver's information -interleaf, for example, the descriptions of buttons were stated to be unclear and also misleading. The users were wondering, why there have to be an "Update page"-button or a "Global Mail"-button. None of the interviewees could figure out, when they would really be using those functions. Also, the "Add address"-

button could be clearer, for example “Add receiver’s information”. “Search”-button does neither tell precisely what it is supposed to do, so a better description was suggested to be “Search from address book”. Overall, the users desired that the descriptions of the buttons would be more clearly explaining what the functions behind them are. Also they stated that the unnecessary buttons and fields should be removed, which would make the screens look clearer. Default buttons were also stated to be a big issue in IntraShip. Many users were complaining, that they felt it is frustrating to be forced to use mouse all the time and “click” in order to proceed. If the right fields would be set as default buttons, the users could just proceed on the screen by using enter, which would contribute to saving of time and nerves.

### ***7.6.3 Updating and Saving Information***

Based on the interviews, many issues were found regarding saving and updating of information. One of the biggest is that when the shipping orders are made and even all the documents printed out, the information does not get updated to the shipment list. This has caused confusion many times among users and sometimes the customers even have to fill in the whole bill of freight again. However, usually when a user signs out and in again, the information appears to the list. This implies that the problem might be with updating the screens. Another issue is that sometimes during the usage of IntraShip, a bug occurs and the application throws the user out of the system. If the user was almost finished with a specific case and the error occurs, the entered information does not remain on the screens when the user re-opens the application. The feedback about this was that first, it is totally annoying that IntraShip has those bugs, which cause the throwing out and second, it is even more irritating that the user has to redo the whole case after the incident.

The feedback about saving information in the application was good and bad alike. All of the users liked the fact that there is a possibility to save as many contact information to the address book as necessary. However, the users felt that saving information there could be a little bit more straightforward process. When they type in new contact information, they desired that they could just click on a small box, for saving the contact info. At the moment they have to click on a button “Add address”, after which they still get a check screen, which asks if they really want to save the information and after they have clicked once again “Yes”-button, it is finally saved. The users thought that this is a pretty complicated process for quite a simple function. One issue that was raised several times when discussing about saving

information, was that the users did not know, how they could modify or delete the default information. For example the users did not how to modify “Content descriptions” when necessary. They were hoping that they could do it on the same screen, where it appears in the application otherwise, so then they didn’t have to remember separately from where it would be done.

The last critical issue about this topic is that some users thought that the timeout -time is too short. The explanation for this was that even though making the shipping order does not take that much time, if there will be any interruptions and the user has half-finished the case, all the information already filled in will disappear when the application throws the user out. One user was even wondering, how confidential the information is when the time-out is so short.

#### ***7.6.4 Training, Instructions and Communication***

The first issue here is that majority of the users did not know if there were instructions available for IntraShip usage. They thought that some kinds of instructions could be helpful in minor problems. However, some of the users had gotten such instructions from DHL Express when they started to use the application, and especially with new users they were stated to be helping. One thing that got a lot of compliments from all of the users was the IT-support, where the users can call whenever they encounter problems with the applications of DHL Express. They stated that every time they have called the IT-support and asked for help, they have gotten all the necessary information, even though sometimes they cannot even clearly explain, what the exact problem is.

The biggest issue concerning this topic was the lack of training, especially when first starting to use the application. Some of the users got some training from DHL Express in the beginning, but there were even some companies who did not get any. In addition to better training at the outset, some users were hoping to get some perpetuating training as well. One suggestion was that, each company would have a person in charge from DHL Express, who would then take care that the know-how of the users in the “key company” would be at the sufficient level. The users were even hoping that the person would come and visit the “key company” regularly, to make sure that everything is ok and answer any questions about the applications or services overall.

### **7.6.5 Printing Issues**

There are two main concerns about printing issues. The first one is that the users don't know how they can modify the printing settings. For example, one user told that never get the correct amount of printed documents, but they have to copy manually one or two bills of freight more in order to get the necessary amounts. Same problems occur with the Pro Forma. Sometimes the users can't print them at all, but they have to manually fill in the information to their own excel sheet and then use it instead of DHL's one. Naturally these issues cause unproductivity and irritation among the users.

### **7.6.6 Other Issues**

Problems that cannot be included in any of the categories above include compatibility issues and server or connect issues. Based on the interviews, compatibility is not an important factor for DHL IntraShip. However, one problem was raised, which is causing discomfort for the usage. When a user tries to utilize two programs at the same time, which both are using Internet Explorer interface, whenever the user opens the other application the other shuts down. This causes problems when the employee wants to compare information from both of the applications or needs to check something quickly from the other and wants to return to back to the first one then. This problem is surely concerned with training issue as well, since it is highly likely that the issue could be solved by training the user.

Another issue is about the connections and servers availability. Many of the respondents stated that they have sometimes had problems with the manifesto, when they try to send the information around three o'clock. However, it cannot be stated for sure if these problems occur because of DHL's connections or servers or is the problem in the clients own connections. Still, this is a concern that could also be taken into account when a web-based application is in use.

## **8 Conclusions**

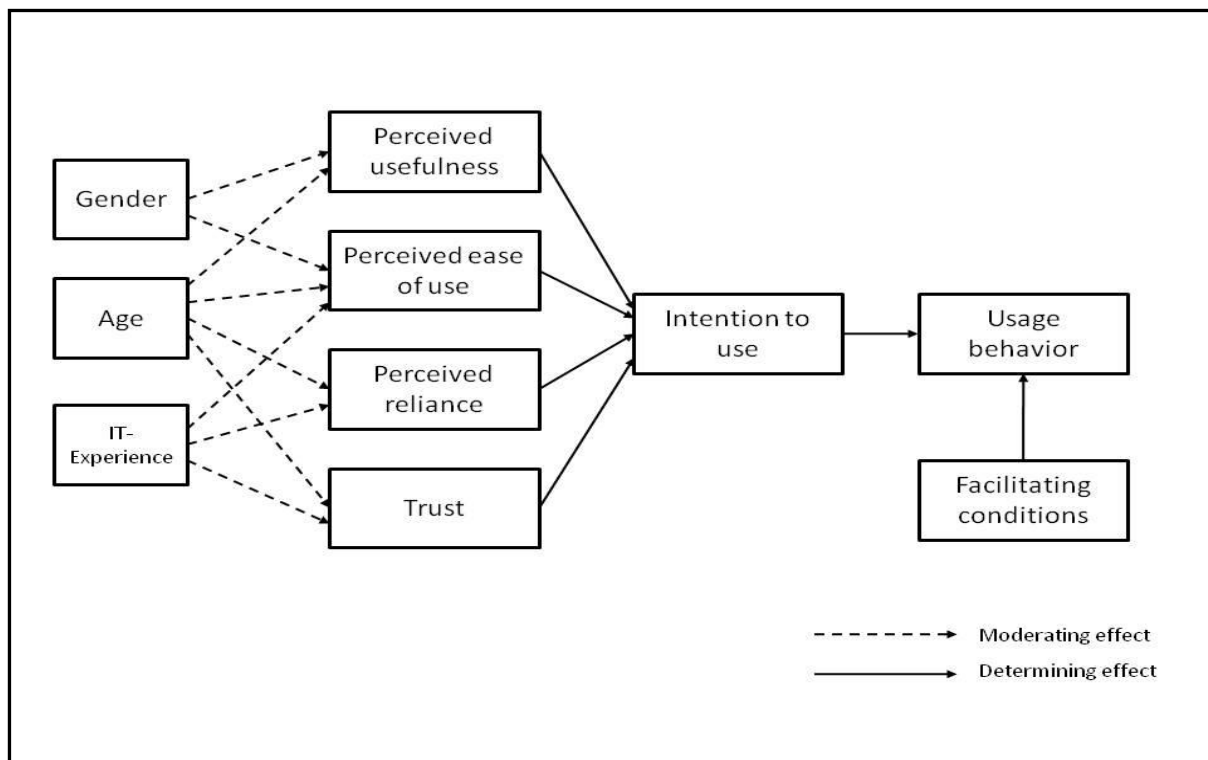
The theoretical goal of the study was to discover which factors can be detected to be affecting the acceptance of an e-commerce application and which moderating factors are behind those discovered. Technology acceptance is defined as whether an application is successful or not. More accurately, if the application satisfies the needs and demands of the users as well as other potential stakeholders and also how useful the application is for the users. In the study, a revised e-commerce technology acceptance model was constructed based on an extensive literature review and analysis. Also the factors affecting behind the determining ones were detected. These results imply that the theoretical objectives of the study were accomplished. The research was accomplished for DHL Express and the case application was a shipping order tool, DHL IntraShip, with which DHL's customer companies are handling and tracking their shipping orders. The empirical goals were to be able to test the revised e-commerce model in practice and discover which practical issues are causing dissatisfaction among the users of DHL IntraShip application. Also, these goals were reached. The study produced both theoretical and managerial contributions, which are covered here. After these, the limitations of the study and further research proposals are briefly presented.

### **8.1 Theoretical Implications**

The theoretical model was constructed by investigating different technology acceptance studies and the definition of application usability. Particularly, the factors presented in these models were discussed and chosen to the revised model based on literature and also considering the specific circumstances of the case application's e-commerce environment. In the theoretical part of the thesis the basic and the most used technology acceptance models were widely discussed. TAM, which is originally introduced by Davis (1989), is the most popular model predicting user acceptance and it is originally adapted from the theory of reasoned action (TRA). The purpose of TAM is to explain what causes people to reject or accept information technology. Davis (1989) states in his study that acceptance is dependent on two concepts: perceived usefulness and perceived ease of use, which are also in latter studies proved to be important determining factors in predicting technology acceptance. TAM2, introduced by Venkatesh et al. (2000) includes additional key determinants to the

original model: social influence processes (subjective norm, voluntariness and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability and perceived ease of use). The goal of TAM2 was to be able to explain in more detail, why an application is rejected or accepted by its users. UTAUT is also a study by Venkatesh et al. (2003) and it adds up to the model even more factors and also some moderators of key relationships: gender, age, experience and voluntariness. The goal of UTAUT was to unify more theories and to create a consistent picture of the determinants affecting used acceptance.

After discussing the technology acceptance theories, the usability definition by Nielsen (1993) was introduced, in order to build a wider picture of how software can be evaluated from the point of the actual user. Primarily Nielsen's (1993) definition is being used, because he has stated that usability is not an unambiguous, single property of a user-interface but it can be rather seen as a methodology and theory field, which aims at improving and intensifying the collaboration between an application and the user. This comprehension about the purpose of the definition backs up the goal to get a wide picture of how an application can be evaluated and improved. TAM and usability seem to be connected at least in some loose ways. According to the literature analysis, the usability definition seems to connect the closest with ease of use -factor (Lederer et al. 2009). Based on technology acceptance models, usability factors and special e-commerce characteristics of technology acceptance, discussed in chapter five, a revised e-commerce TAM mode was constructed. The model is presented below in the figure 8-1.



**Figure 8-1** Revised e-commerce TAM

The main theoretical implication of this thesis was the constructed revised TAM model (figure 8-1), which is aimed to predicting the acceptance of e-commerce application. It should be also taken into consideration that the expected contributions are valid only in applications that are used in B2B environments. According to the model, there are four factors that have an effect to the intention to use the system which for one's part is contributing to the usage behaviour, so whether the user is willing to use the application or not. The four determining factors that were detected based on the literature are *perceived ease of use*, *perceived usefulness*, *perceived reliance* and *trust*. In according to those, a fifth element that affects straight the usage behaviour is called *facilitating conditions*. Furthermore, three moderating factors, that may influence the four determining factors described above, were found: *age*, *gender* and *IT-experience*. This model is tested in the empirical part of the study. The practical findings related to this model are discussed next.

## 8.2 Managerial Implications

To test the revised technology acceptance model and the contributions founded in the literature research, six extensive interview sessions were conducted among DHL Express'



B2B customers. The interviewees were DHL IntraShip's regular users and each session took from 50 to 90 minutes. The participants of the survey are described in Appendix A. In this part of the thesis, the managerial implications are presented and also the practical issues, which were found based on observation method during the interviews, are described in brief.

Based on the interviews, the factors detected for the revised e-commerce TAM seemed to have at least some sort of contributions to the satisfaction towards the DHL IntraShip application. The model was tested by asking questions about a specific factors that revealed how the specific dimensions of the total acceptance is handled at the moment. DHL IntraShip seemed to be pretty useful according to the test users of this research. At this point the application got feedback from the inflexibility and the illogicality again. Perceived ease of use is closely related to usability definition in the previous literature. The same issues, which were raised in the case of usability ratings, were also raised in this part of the interview. This implies that the interconnection between those entities remain and is confirmed. Perceived reliance of the application did not seem to be very strong, which might be caused by the fact that many of the users were also using other service providers, so basically they are not entirely related to DHL's services. If they feel like they don't want to use the application, they don't necessarily have to. The last factor, Trust, seemed to have a negative effect on the total acceptance of the application, because many of the users stated that they don't trust that the application will function always as expected. This is also caused by the bugs, which were described in detail in the previous chapter. In according to the factors described above, also facilitating conditions were detected to be affecting the acceptance of DHL IntraShip application. Since, DHL Express has such great IT-support and customer service, which was mentioned by majority of the customers, these are contributing to increased acceptance of the application. However, in this part the issue of lack of written manual raised. Part of the users did not know if one existed and other had received one but thought that it is not necessarily adequate.

After discussing the determining factors of the revised model one by one, the moderating factors were tested. The results gathered from the interviews differed from the theoretical model and are listed next and they moderating effects can also be seen in the figure 7-4 in chapter 7.

1. **Perceived usefulness is moderated by gender, age and experience.** According to the interview results three observations were made: men and younger users perceive usefulness as more important and also if the user has a lot of experience in using technology.
2. **Perceived ease of use is moderated by combined effect of age and gender and experience.** Older female users tend to put a higher importance on the ease of use aspects. Experienced users don't evaluate ease of use as high in importance.
3. **Perceived reliance is moderated only by experience.** If the user is novice, perceived reliance of the application tends to be lower. However, the longer the users experience, the more dependent they seem to be of the solution.
4. **Trust is moderated by gender.** Female users seemed to put more importance on the trust, which means that the importance of a trustworthy application increases for women.

Lastly in the practical part of the thesis, the actual errors in the application were detected, classified and described. These issues were found from six different categories: logic and functionality; buttons, fields and links; updating and saving information; training, communication and instructions; printing issues and others. These errors are seen in detail in last chapter in section 7.5. However, there were five issues found in both logic and functionality and updating and saving information -groups, four errors in buttons, fields and links -group and two issues in all of the rest groups. By concentrating on these, DHL Express could improve the acceptance of the DHL IntraShip application.

### **8.3 Limitations of the Research and Further Research Proposals**

In order to promote a solid foundation for future reference, there are various limitations in the study that should be considered. The first and furthermore the most significant limitation is surely the research methodology. By this is meant that the empirical study was conducted by semi-structured interviews. Normally, when TAM models are tested, questionnaires are used in which the participants are asked to give grades to different factors of the model. This way, correlations can be calculated and some quantitative proofs about how much each factor is contributing to the acceptance of an application, can be presented. However, since the main point of the research was to be able to spot concrete issues in DHL Express application,

qualitative data was used in majority of the interview questions. This also hinders from drawing conclusions about how strongly each factor, presented in the revised TAM model, affects the total acceptance. Only guesses can be made about the strengths.

Another issue that should be considered as limitation of this study is that since there are various TAM models available in the literature, it is not obvious if the right factors were chosen to the revised model presented in this research. However, the reasoning for the chosen factors is presented so this at least they should be somewhat suitable for their purposes. Anyhow, also some other factors could be added and some of the chosen ones removed from the model in order it to be strongly supportive with the expected results. When the second of the theoretical research questions contained also the search for the connections between TAM factors and usability, only some loose connections were found. There is not very extensive literature on the issue to be found, which was surprising as well. However, since some interrelationships were found, they are also used in the study.

Another issue that have to be considered as limitation of this study is related to the participants of the study and their availability. When the research plan of the study was first constructed, the goal was to interview more than ten users. However, it came as a surprise how hard it is to get the right participants to take part to the study. A list was given from DHL Express about the possible interview candidates but when they were invited to participate two problems occurred: only few of the invitees replied to the emails and some of the people that did reply, stated that they are only using the application couple of times a year, so they did not belong to the target group, which were the frequent users. Since, this research was made by only interviewing and observing the participants working, the statements that are presented here are only their subjective opinions. This means that according to this study, no conclusions can be drawn whether the errors presented are actual ones or just occurring because of the incorrect usage of the application. However, since they are real for the users, they should be taken into consideration.

Technology acceptance is a pretty widely researched area. However, one further research proposal is to test the revised e-commerce TAM with a large population by using qualitative interview data. This way the strengths of the relationships between the moderating and determining factors could be detected as well as the correlations of the determining factors to

the intention to use. Then it would be possible to state which factors are affecting the technology acceptance more and which less with numerical values. Also another issue is to research the relationships between usability factors and technology acceptance factors more closely. Also this should be done with a large population and with qualitative research data. This way a more complete picture of how the perceived quality of an application forms in the user's minds could be revealed. The third research proposal for the future is to extend the constructed model of this research to be covering other applications. This way the model could be either modified to be more accurate or confirm to be consisting of appropriate factors.

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## Appendices

### Appendix A: Descriptions of Interviewees

Interviewee	Description
<b>A</b>	Over 51 years old male, Forwarding Manager, who is using DHL IntraShip daily and has been using the application for seven years. Minds the application highly important for his work tasks. Works in a broadcasting company and there are total of three people using DHL IntraShip in his unit.
<b>B</b>	Over 51 years old female, Registration Assistant, who is using DHL IntraShip nearly daily and has been using the application for one year. Previously used another service provider for shipping. Minds the application somewhat important for her work tasks. Works in a pharmaceutical company and there are total of ten people using DHL IntraShip in her unit.
<b>C</b>	From 31 to 50 years old male, Systems Specialist, who is using the application few times a week and has been using it for less than couple of years. Minds the application somewhat important for his work tasks. Works in an IT company and there are total of five people using the application in his unit.
<b>D</b>	From 31 to 50 years old female, Team Leader in Forwarding, who is using DHL IntraShip daily and has been using it for five years. Minds the application very important for her work tasks and names it to be the primary for courier services. Works in a company that produces scientific laboratory and other products. There are total of seven people using the application in her unit.
<b>E</b>	From 31 to 50 years old female, Communications Manager, who is using DHL IntraShip for shipping weekly and also training new users for it when

	<p>necessary. Has been using the application for few months and states that the application is highly important for the people that are using it daily in her company, but since shipping is not very important for her, the importance is lower. Works in a platforms and cranes renting company, where there are total of 15 people using the application.</p>
<b>F</b>	<p>From 18 to 30 years old female, Team Coordinator, who is using DHL IntraShip daily and has been using it for five years. Minds the application highly important for her work tasks. Works in a company that produces technical sports equipment, where there are total of five people using the application in her unit.</p>

## **Appendix B: Background Questionnaire**

### **Questionnaire for background information:**

The purpose of this questionnaire is to map the background information of the participants of study about DHL IntraShip usage. Please, answer the questions below shortly and return this questionnaire to me by e-mail at latest two days before the interview date.

Name:

Age:            18-30 ( )      31-50 ( )      51- ( )

Name of the company:

Job title:

Primary work tasks:

Which DHL applications are you using in your work?

If many, which one do you use the most?

In which kind of work tasks do you use the applications?

How long have you been using the applications?

How often do you use these applications in your work?

How important is the application for your work?

How many people in your company/department are using these applications?

**Thank you for your answers!**

If you have any questions about the interview or the study in general, or if there will be changes in your schedule, please contact me by email or phone.

Best regards,

## Appendix C: Usability Questionnaire Statements

Usability dimension	Statement
<b>Learnability</b>	I find the application easy to learn.
	A learnable application is highly important for my work.
<b>Efficiency</b>	I find the application usage efficient.
	An efficient application is highly important for my work
<b>Memorability</b>	I find the application easy to remember.
	A memorable application is highly important for my work.
<b>Error free</b>	I find the application error-free.
	The errors occurring during the usage disturb me greatly.
<b>Subjective satisfaction</b>	I find the application is pleasant to use.
	I am highly satisfied with the application.

## Appendix D: Technology Acceptance Interview Questions

Nr.	Question
1	Does the application improve your work performance? How?
2	Does the application increase your work productivity? How?
3	Does the application make your work easier? How?
4	Do you find the application very useful to your job? (Scale 1-5)
5	Do you get confused often when using the application? Why?
6	Is it often frustrating to work with the application? Why?
7	Do you feel that the application is sometimes rigid or inflexible to interact with?
8	In your interaction with the application clear and understandable? Do you have difficulties to understand the logic of the application?
9	Is it easy for you to remember how to perform tasks using the application?
10	Is it easy for you to become skillful at using the system?
11	Do you find the application easy to use? (Scale 1-5)
12	Has the organization supporter the use of the system? How
13	Do you like working with the system?
14	Is your use of the system voluntary?
15	Do your work tasks require you to use the application?
16	Is the usage of the system important and relevant in your organization?
17	Is the quality of output you get from the application high? Any problems?

18	Do you have the necessary knowledge to use the system?
19	Is the training for the system sufficient?
20	Have you discovered system updates? Does DHL Express inform about them? Is it necessary to inform?
21	Is the system compatible with other applications you use? Would it be necessary?
22	Is the DHL IT-support adequately helping in problematic situations?
23	Do you think you would be able to communicate to others the consequences of using the system? Would you be able to train the others?
24	Does it scare you that you could lose a lot of information using the system if you would hit the wrong key? Have this happened to you?
25	Do you hesitate to use the system for fear of making mistakes you cannot correct? How likely do you think this is going to happen?
26	Is the system somewhat intimidating to you? Why?