

Evaluation of User Assistance in Graphical User Interface Software

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Abstract

When using different software applications, the user will end up in situations where some form of help is a necessity in order to continue - that is, User Assistance. There exist at least ten common User Assistance methods, such as: Contextual Help, Procedural Help, Tutorial etc. The Help features facilitates the comprehension and the use of a program and contributes of making it more user friendly.

With this Master Thesis we have investigated which Help feature that is to prefer in different situations - through the eyes of our testers. Also, we face the problem from the developer's point of view, concerning the maintenance cost of each help feature: Are there help features associated with some sort of load that makes it less attractive compared to others?

We conducted a usability test consisting of questionnaires, video recording and interviews. After carrying out the tests and analysing the collected data, we came up with the conclusion that the tutorial is the most preferable User Assistance. This does not constitute a problem regarding maintainability, because our consultation with the developers revealed that all help features have about the same grade of maintenance time, where a correction is implemented with ease.

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1 Introduction

The main objective of this master thesis is to evaluate suitable User Assistance methods, in various situations, for the user when working with software applications. But, the evaluation is not only for the user, but also for the developer. For that reason, there are two essential concepts: Usability, which just involves the user and Maintainability, which refers to the designer. In other words, is it of great interest to collect data both of the User when working with the Help features and the Developer when supporting/updating the same.

1.1 Background

The main reason for paying so much attention to User Assistance, is that without help applications it would almost be impossible for the user to work in the software environment. After working with the user interface for some time, it is most likely that the user takes all these different guide functions for granted. They exist and constitute a very important part in the software tool and contributes in the highest degree to make the user interface user friendly. So, it is very important to evaluate these help applications, in order to find out the various situations the different help applications are to prefer. Questions like: What sort of user is the help applications intended to? Is it the novice category, the experts, or maybe all users? However, to balance these just mentioned questions, another viewpoint leads to questions like: How much does it cost in time to develop, examine and update the help applications? All these issues of great importance are investigated through the usability and maintainability concepts.

1.2 User Assistance

User Assistance is “*the information channels that help users evaluate, learn, and use software tools*”[BCS01]. User Assistance exists in graphical user interface

software as various Help features, for example as simple status bar messages, ordinary help menus and advanced wizards, with purpose to facilitating the work for the user. Nevertheless, the help features provide the user necessary help in several different situations, everything from literally helping the user when a problem occurs, inform the same about ongoing processes and finally to guide him/her in the graphical user interface software.

1.3 Usability

Usability is “*the measure of the quality of the user experience when interacting with something -- whether a Web site, a traditional software application, or any other device the user can operate in some way or another*” [Nielsen01]. In other words, it is the measure of a product’s potential to accomplish the goals of the user. Some ways to improve usability includes [IEEE90]:

- Shortening the time to accomplish tasks
- Reducing the number of mistakes made
- Reducing learning time
- Improving the users’ satisfaction with a system

The Usability concept is a necessary aid when the purpose is to have an assessment in how user friendly various help applications are. This is done by observing individual users, when performing specific tasks with the user interface. The observation ends in collecting data on how the user is doing, everything from how long time it takes for the user to perform the task, to how many errors he or she makes. In this way it is possible to grade the help applications from the users’ point of view

1.4 Maintainability

Maintainability is “*the ease and speed with which any maintenance activity can be carried out on an item of equipment. It is a function of equipment design, and maintenance task design*” [IEEE90]. By analogy to reliability, it can be defined as “*the probability that a specified maintenance action on a specified item can be successfully performed within a specified time interval by personnel of specified characteristics using specified tools and procedures*” [Marion00].

The Maintainability concept is a necessary aid in order to get satisfactory opportunities to estimate the maintenance of the various help applications. In this way it is possible to grade the Help applications from the perspective of the designer.

2 User Assistance

This chapter provides an introduction to the concept of User Assistance, and it is a presentation of the most common techniques to help and guide a user working in a graphical user interface software. It covers to a great extent the organization and classification of the most common Help features. The Help tools will be analysed and compared with the purpose to give a more comprehensive knowledge of this essay topic. There will also be a good looking into Telelogic Tau software products, to acquaint oneself with its chosen User Assistance.

2.1 Introduction

As mentioned earlier in 1.1, it is of very great importance that the existing Help applications give the necessary aid to the user, when working in GUI software. Above all, is this aid needed in situations that require help, support, minor tips and guiding matters. For a beginner it would almost be impossible working in GUI software, if this aid was not available.

It is both in the interest of the designer and in the interest of the user that this matter works out properly. The better Help applications (in the correct situations) that the actual product offers, the more user friendly the user thinks of it. In its turn, this results in satisfied users.

2.2 Definition of User Assistance concepts

With intent to shed some light on concepts which are used in the selection procedure of the various User Assistance techniques, the used Classification model with belonging concepts, have to be reviewed. See 2.2.1 and 2.2.2.

2.2.1 Definition of Executive

Executive: The User Assistance actually executes something for the user, for example helping him/her accomplish tasks of great complexity (see 2.3.6 and 2.3.7).

2.2.2 Review of the Help question model

The Help question model is a model which is used to classify User Assistance techniques [BCS01].

The model comes in handy in the selection procedure of the various User Assistance methods (see 5.2). After the classification it is possible to grade the different User Assistance methods that are presented in section 2.3.

The classification is accomplished thanks to five different question types. Each question type refers to a special question, which may be asked when the user is working with the user interface. See *Table 1*.

Table 1: Question types and their related help questions

Question type	What the user wants to know
Goal-oriented	What kinds of things can I do with the program?
Descriptive	What is this? What does this do?
Procedural	How do I do this?
Interpretive	Why did that happen? What does this mean?
Navigational	Where am I?

2.3 Common User Assistance methods

The following bullets describe the most common techniques used to guide or help a user to work in GUI software. The User Assistance techniques are.

- Contextual Help
- Reference Help
- Procedural Help
- Conceptual Help
- Html Help
- Wizards
- Coaches
- Tour
- Tutorial
- Manual

All these techniques are reviewed in subsection 2.3.1 to 2.3.10, where every subsection is ended with a classification of the actual User Assistance technique.

In the following subsections, 2.3.1 - 2.3.6, most of the information is collected from Microsoft Windows User Experience [Wash99].

2.3.1 Contextual Help

This help feature gives the user immediate assistance, without leaving the current and specific working area. It gives information about a special object and its context. This help and guide method can be divided into:

- What's This? Help
- Help buttons
- Status bar messages
- ToolTips

“What's This? Help” is a context-sensitive Help command. It is basically used to get contextual Help information on the screen and from controls, for instance in property sheets, error messages and pop-up dialogue boxes. **Help buttons** on the other hand are suitable to use in the following occasions:

- Displaying an overview
- Summary
- Explanatory topic for a page
- Explanatory topic for a window

The Help button is activated by clicking the Help command button. This sort of help option should provide more general assistance to the user than just strictly information referring to the control that has the current input focus. The next Help command in order are **Status bar messages**. This help option, is often used as a more supplemental guide method to the others just mentioned. It should be considered as a secondary help form. Status bar messages can be used, among other things, to enlighten the user about ongoing processes such as printing or saving a file. Status bar messages can be used to give different sorts of feedback, for instance it can behave as a progress indicator control. The status bar messages appear at the bottom of the active window. The fourth and last Contextual Help command is **ToolTips** and it appears as a pop-up window, displaying the name of a control, for example a toolbar button, when the control has no text label. The ToolTip is first displayed, when the pointing device remains over the control for a while. There are three ways of making the ToolTip vanish:

- Pressing a mouse button
- Move the pointer off the control
- A time-out

Classification with the Help Question Model gives the following result (see *Table 2*):

Table 2: What sort of Question types the Contextual Help includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Contextual Help	No	Yes	No	Yes	No	No

2.3.2 Reference Help

This help feature serves as an on-line reference book. If the intention is to document a programming language or programming interface, the Reference Help is an alternative. Another way to use this feature is to provide a user's guide to a product, where the use determines the balance of text and graphics in the reference Help file.

Reference Help can provide information that is similar compared to contextual and procedural Help, but this does not mean that they are competing - on the contrary, using these three help features together is the best way for the user to get help.

Classification with the Help Question Model gives the following result (see *Table 3* on page 14):

Table 3: What sort of Question types the Reference Help includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Reference Help	Yes	Yes	No	No	No	No

2.3.3 Procedural Help

Procedural Help provides the steps for carrying out a task. When dividing the help information into "why", "what" and "how", this help feature focus on the latter. The way to provide access to Procedural Help is by defining contents and index entries for the HTML help Viewer.

This Help feature is designed to help the user to complete a task, not to document everything there is to know about a subject. If there are multiple choices of taking on a task - the simplest, most common method is usually chosen. Sometimes - if there are alternate methods - the information about them is included in a Notes section or in a related topic. Then, a link to Related Topics provides access to other topics that are related in some way.

Classification with the Help Question Model gives the following result (see *Table 4*):

Table 4: What sort of Question types the Procedural Help includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Procedural Help	No	No	Yes	No	No	No

2.3.4 Conceptual Help

This is a Help feature that to its nature provides much greater detail than a procedural topic. It provides “what” or “why” information beyond which is required to complete a task, such as:

- Background information
- Process overviews
- Feature overviews

Background information may be a description of a specific concept or feature, for instance how information is stored on the computer, and also include links to one or two procedures. **Process overview** however, may be a description of several separate procedures needed to complete the process. It can describe one task, for example, an overview about sending an e-mail message. It can also describe several tasks, for example, specifying recipient, composing message and sending message. Finally, **Feature overview** may highlight features and provide links to tasks associated with using each feature.

Classification with the Help Question Model gives the following result (see *Table 5*):

Table 5: What sort of Question types the Conceptual Help includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Conceptual Help	Yes	Yes	No	No	No	No

2.3.5 HTML Help

This specific type of User Assistance utilizes ordinary Web conventions to make it easy for a user to navigate in a few different ways with the purpose of achieving

the applied Help information. When the user opens the HTML Help, he/she provides primary access to Help topics through the following tabs:

- Contents
- Index
- Search

By clicking the **Contents** tab, the user gets access to a page showing the list of topics organized by category. A book icon represents a category group of related topics, and a page icon represents an individual topic. If the user on the other hand selects the **Index** tab, the linked Index page of the HTML viewer appears. This page organizes topics by keywords in an alphabetical order. The user can type in a keyword to find the topic or just look for topic directly from the list and then select it. If multiple topics use the same keyword, another window pops up that allows the user to choose between the different available options. The last page of the three mentioned is the Search page which is reached by clicking the **Search** tab. It provides a full-text search capability in order to help the user to search for any word or phrase in help.

A great advantage with the HTML help is the existing links to related topics, that permits the user to move from one topic to another within the same window.

Classification with the Help Question Model gives the following result (see *Table 6*):

Table 6: What sort of Question types the HTML Help includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
HTML Help	No	Yes	No	No	Yes	No

2.3.6 Wizards

A Wizard is a special form of User Assistance that steps users through completion of tasks that have clear structures [Marion00]. This is done through a dialogue with the user. The Help tool is preferable, when the task is of a complicated matter or when particularly skills is required to solve future problems or executing the task. Wizards are not suitable for tutorials - they should operate on real data, and not be considered for instructional User Assistance. A great drawback with wizards is their linearity. But since many tasks are of a linear kind, the wizards can be very useful; above all when tasks are performed infrequently.

Classification with the Help Question Model gives the following result (see *Table 7*):

Table 7: What sort of Question types the Wizard includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Wizards	No	Yes	Yes	No	No	Yes

2.3.7 Coaches

A coach is a more comprehensive help tool than the wizard. It is a very powerful Help feature, that /assists the user in tasks of great complexity that are not necessarily of a linear kind. Coaches can, for example, provide essential forms of support such as task structuring, knowledge, navigation support, and other support elements to help users accomplish tasks, which are more complex than the tasks Wizards can support [Marion00].

Classification with the Help Question Model gives the following result (see *Table 8*):

Table 8: What sort of Question types the Coach includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Coaches	No	Yes	Yes	No	No	Yes

2.3.8 Tour

The Tour is a Help feature where the user gets a demonstration in pictures and texts of the program that is offered, and some of its potential. The user is shown a variety of functions that the software environment provides and at the same time as he/she gets a general view of the functionality. All this can be summarized by the question: What does the program offer the user?

Classification with the Help Question Model gives the following result (see *Table 9*):

Table 9: What sort of Question types the Tour includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Tour	Yes	Yes	Yes	No	No	No

2.3.9 Tutorial

This form of User Assistance consists of written exercises which purpose is to get the user to acquaint himself/herself with the software environment and above all to get an overall picture by working with the tool. In other words:

-Practice makes perfect!

That is the reason why a Tutorial at first should be easy for a user to follow and then gradually be described in a more complex way, adapting to the users increasing knowledge and experience of working with the software tool.

The Tutorial is a help feature that can be presented in book form and in software tools as in Word and Framemaker, where it can be reached via the HTML Help.

Classification with the Help Question Model gives the following result (see *Table 10*):

Table 10: What sort of Question types the Tutorial includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Tutorial	Yes	Yes	Yes	Yes	No	No

2.3.10 Manual (in book form)

A manual is a handbook that mostly is presented in book form. It is a well-presented description of the actual subject, which in this case is synonymous with basic knowledge of the software tool. It usually consists of two different access mechanisms [Hsu97]:

- Table of contents
- Index

A drawback with a manual is that it is not context-sensitive. But on the other hand it is a great tool in browse purpose.

Classification with the Help Question Model gives the following result (see *Table 11*):

Table 11: What sort of Question types the Manual includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Manual	Yes	Yes	Yes	No	No	No

2.4 Alternative guiding methods

Are there suitable methods in addition to the User Assistance techniques that were presented in chapter 2.3. Methods that actually happens to be more preferable to the user than the ordinary help features are. Such questions and similar are answered in the following subsections.

One way to categorize these complementary methods is:

- E-learning
- Classroom training
- Distance training
- Phone/E-mail support

2.4.1 E-learning

E-learning is a very popular and comprehensive IT term, often used in media and in software context. E-learning is the on-line delivery of information, communication, education and training using audio, video or computer technologies (such as the internet, ordinary CD-ROM and DVD-ROM) [Cisco01]. E-learning is a complement to traditional classroom learning.

Consequently, is it possible to train a user through E-learning.

2.4.2 Classroom training

The user is learning the software tool through traditional classroom learning. This is a complement to User Assistance, because removing the other Help features would put the user in a very odd situation when actually working with the software tool. A great advantage with this technique is that a communication between educator and user can occur to straighten things out, for example emerged problems of the user. One drawback is that this sort of aid is only available for a short time. It is not available when the user actually is working with the user interface at his/her own work-station.

2.4.3 Distance training

This is a variant of Classroom training where the user gets a distance tuition of the software tool. Instead of having lectures in real-time and then having opportunities of asking the responsible educator questions related to the user interface, the user has to rely on, that the available material is of such good quality, that no obscurity occurs that cause any questions that require immediate answers.

2.4.4 Phone/E-mail support

This form of aid comes in handy, when emerged faults of severe character must be attended to. Above all in situations that require an expert opinion.

This form of aid is not just a complement to the ordinary User Assistance methods (presented in chapter 2.3), but a necessity when the user runs into serious problems which have to be taken care of immediately (problems that requires help from an expert). One drawback is that this expertise may only be available at certain times.

2.5 Telelogic Tau SDL Suite User Assistance

Telelogic Tau is an industry-proven, visual software engineering tool for real-time programming and other advanced software development. It enables simulation and testing in the development environment, as well as complete, automatic code generation, leading to early error-detection and minimizing post-development maintenance. Telelogic Tau provides specialized tool sets for every phase of a project: Telelogic Tau UML Suite for analysis, modelling and OO design, Telelogic Tau SDL Suite for design and implementation of real-time software, Telelogic Tau TTCN Suite for comprehensive testing, Telelogic Tau Logiscope for detection of coding errors, identify and locate error-prone modules, provide code coverage analysis, Telelogic Tau SCADE for the cost and time effective development of safety critical software.

The Telelogic Tau SDL Suite uses the following Help features:

- HTML Help
- Tour/Tutorial
- Contextual Help
- Wizard
- Procedural Help
- Reference Help
- Manual

Actually, Telelogic Tau uses a mix of the **Tour** and the **Tutorial** as an Help feature. That is the reason why both these aids are summarized in one bullet. In the following subsections (2.5.1 - 2.5.6) are all the existing User Assistance Techniques in the Telelogic Tau SDL suite described (except the Manual).

2.5.1 Tau HTML Help viewer

The Telelogic Tau SDL Suite uses a HTML Help viewer, which can be entered through a help menu in the primary Organizer window. A modified toolbar button

bar is used, then with the addition of a button named “Forward” (displays the topic viewed before the user selected “Back”).

See *Figure 1*.

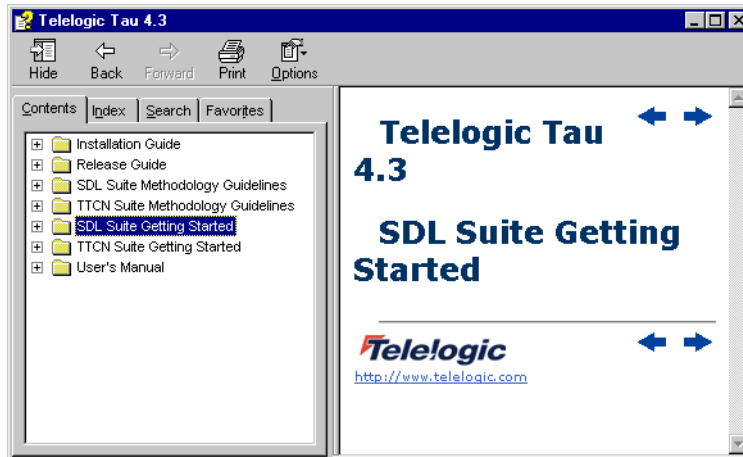


Figure 1: HTML Help

2.5.2 Tau Guided Tour and Tutorial

In the catalogue “SDL Suite Getting Started” is a tutorial designed as a guided tour through the SDL Suite (See *Figure 2*).

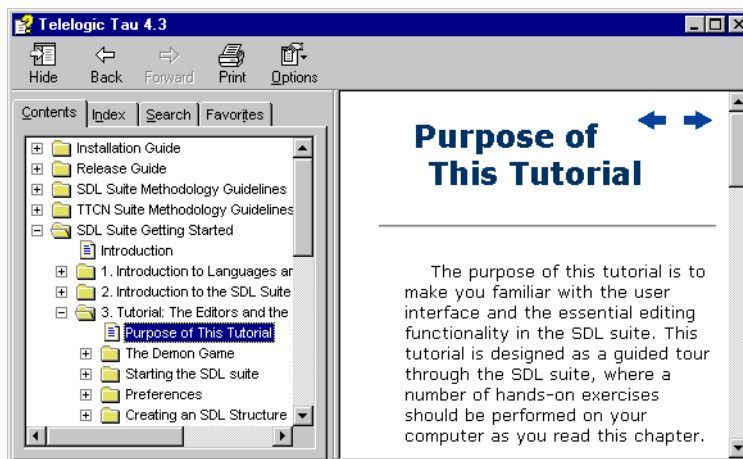


Figure 2: Guided Tour and Tutorial

2.5.3 Tau Contextual Help

The SDL Suite offers the Contextual Help as **status bar messages** and **tooltips** (see *Figure 3*). It also exists as the common **help command button** (see *Figure 4*).

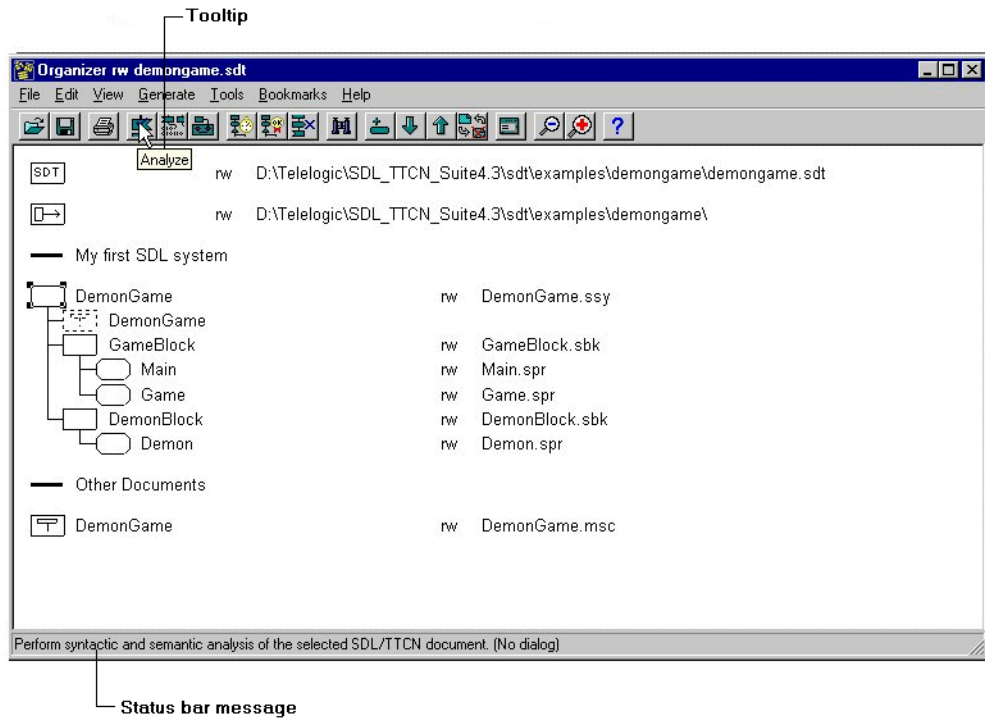


Figure 3: Tooltip and Status bar message

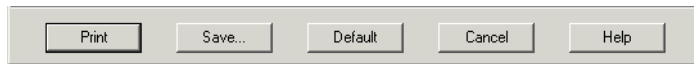


Figure 4: Help command button in a secondary window

2.5.4 Tau Wizard

Wizards are rare, but one is accessible through the tool “Targeting Expert” (see *Figure 5*).

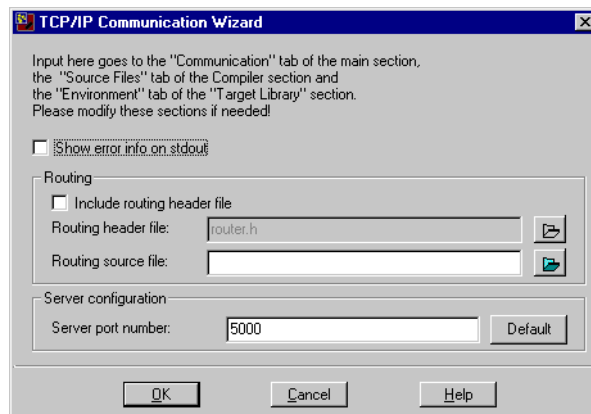


Figure 5: Wizard

2.5.5 Tau Procedural Help

This form of User Assistance can be reached through the HTML Help (see *Figure 6*).

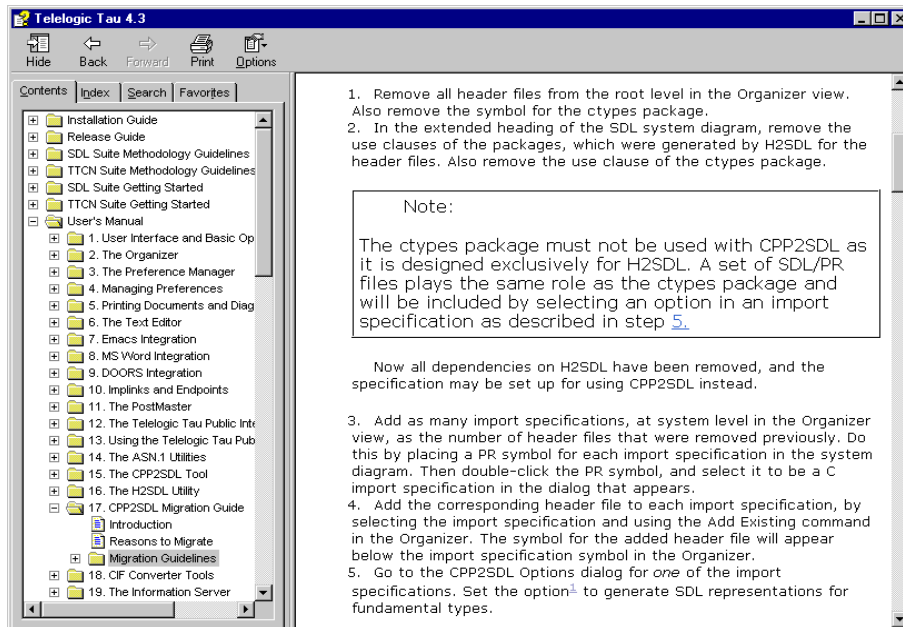


Figure 6: Procedural Help

2.5.6 Tau Reference Help

The Tau Reference Editor Help exists in the way of providing a users guide to a product (see *Figure 7*). Just like the Procedural Help, this sort of User Assistance can be reached through the HTML Help.

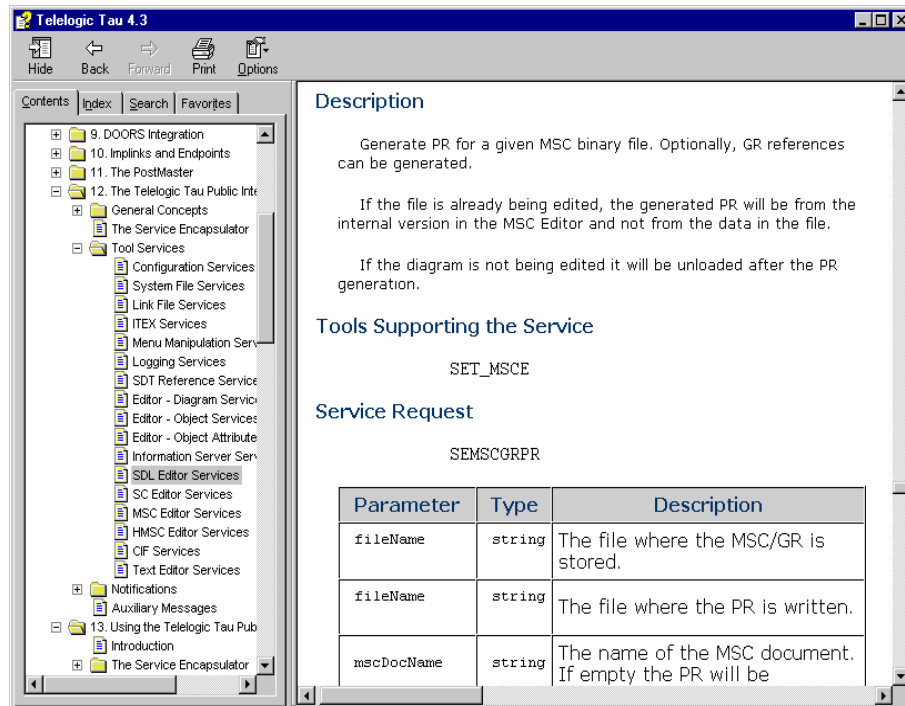


Figure 7: Reference Help

2.6 Classification of User Assistance

There are quite many ways to classify the Help features mentioned in section 2.3. One way to do this, is by analysing their different characteristics. Another classification model is based on the user, when having the following question in mind: Are the various help features intended for different sorts of users? In this master thesis, the classification is done with the Help question model, which is reviewed in subsection 2.2.2.

The model has already been used separately in every subsection in section 2.3 *Common User Assistance methods* on page 12. A compilation of this classification is presented in the next subsection (see 2.6.1).

2.6.1 Summary of the classified User Assistance methods

When having the Help question model and the Executive concept in mind, the Help features included the following question types.

Table 12: What sort of Question types the User Assistance includes

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Contextual Help	No	Yes	No	Yes	No	No
Reference Help	Yes	Yes	No	No	No	No
Procedural Help	No	No	Yes	No	No	No
Conceptual Help	Yes	Yes	No	No	No	No
Html Help	No	Yes	No	No	Yes	No
Wizards	No	Yes	Yes	No	No	Yes
Coaches	No	Yes	Yes	No	No	Yes
Tour	Yes	Yes	Yes	No	No	No
Tutorial	Yes	Yes	Yes	Yes	No	No
Manual	Yes	Yes	Yes	No	No	No

2.7 Classification of Alternative guiding methods

Of all the Alternative guiding methods that are reviewed in Section 2.4, it is only one that really is measuring up:

- The Phone/E-mail Support

As mentioned in subsection 2.4.4, this guiding method is a very good alternative and complement to the ordinary accepted User Assistance. For that reason, it seems like an good idea to classify the method with the Help question model.

Classification of Phone/E-mail Support

The Phone/E-mail Support includes the following question types (see *Table 13*):

Table 13: What sort of Question types Phone/E-mail Support includes

Alternative guiding methods	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Phone/E-mail Support	Yes	Yes	Yes	Yes	Yes	No

The information from *Table 13* is unambiguous. If Phone/E-mail support had been an “ordinary” User Assistance technique, this one had been outstanding, when it comes to high amount of Question Types that are being covered. But, as mentioned before in subsection 2.4.4, the main drawback is that this Guide method, presumably, is not available for the user all the time.

Another thing is, that this support is mostly designated help cases of a more difficult sort. Hence, this form of aid is very expensive for the responsible company of this service.

Unfortunately this leads to a certain conclusion:

Phone/E-mail support should not be used as a common Help feature.

3 Usability evaluation

A general aspect of basic research methodology is accentuated in this chapter in order to acquaint the reader with some empirical strategies.

The chapter also provides a description of methods, regarding the usability evaluation. This is important, because the knowledge will be used later to gather information from the future test groups.

The following questions can and will be answered thanks to the usability evaluation:

Is it easy or complicated to use the various Help features for the users?

In what situations are the different User Assistance approaches to prefer?

3.1 Introduction

The main reason for usability evaluation is in the first place to grade the various Help applications from the user's point of view. By doing the evaluation in a correct and serious way, the outcome will most certainly point out a direction, of which help feature that is preferable for the user. One problem is, that there exists plenty of different usability evaluation techniques. Unfortunately, it is not possible to test them all, during a shorter period of time. Hence, it is quite possible that some of these techniques are more suitable in practice, regardless to all existing theories in the usability matter.

3.2 Definition of Usability concepts

In order to explain some elementary concepts (see subsections 3.2.1 and 3.2.2), and in reason to understand the later choices of the usability methods and techniques (see subsections 3.2.3 and 3.2.4), various important features, must be explained.

3.2.1 Definition of Basic Research Concepts

Subject: A person that participate in an experiment evaluating an object.

Object: The actual issue that the evaluator tries to gather information about.

3.2.2 Role definitions in the Usability evaluation

User: *Designated and observed role who uses and tests the user interface in the usability evaluation methods.*

Usability expert: *The person who conducts the usability investigation and who is responsible of collecting necessary data that underlies the entirely survey, sometimes referred to as Evaluator.*

3.2.3 Definition of data collecting concepts

Effectiveness: *“How well the user achieves the goals they set out to achieve using the system”.*

Effectiveness measures the degree of accuracy and/or completion. In this investigation the user’s opinion of the issue is graded from 1 to 7. Where grade 1 means that the user thinks he/she completed the task making many errors and grade 7 means that the user solved the task without making no errors at all, whatsoever.

Efficiency: *“The resources expended in relation to the accuracy and completeness of goals achieved” [ISO98].*

With resources means: Time, effort and cost. This investigation emphasizes the Time resource. The user’s opinion of the issue is graded from 1 to 7. Where grade 1 means that the user thinks he/she completed the task during a very long period of time and grade 7 means that the user solved the task very fast.

Satisfaction: *“How the user feels about their use of the system” [EUSC98].*

Satisfaction measures: Likes, dislikes and attitudinal response for the applications.

Quantitative data: *“Objective performance information” [Mayhew99].*

Such as: Time-for-task, number of errors and words-per-minute.

3.2.4 Development Stages of a Software Tool

All usability evaluation techniques, belong to one of the three existing usability evaluation methods: Testing, Inspection and Inquiry (see subsections 3.4.1-3.4.3). All of them can be used at different stages of a software development life-cycle.

Thus, a software tool can be evaluated in the following Development Stages [Mayhew99]:

- Requirement
- Design
- Code
- Test
- Deployment

The selected User Assistance techniques, which are evaluated in this master thesis, have already been designed and coded and passed on to the Test stage, in the described software development life-cycle.

3.3 Basic Research Methodology

In this chapter (3.3), the information is collected from the book “*Experimentation In Software Engineering*” [Usability First01].

The purpose of conducting empirical studies, is that someone is interested in collecting different sorts of data. Owing to what sort of information that is looked for and wanted, the investigator can choose between two different types of **Research Strategies** (which are complementary):

- Quantitative research
What is the effect of a treatment?
- Qualitative research
Why the outcome of the Quantitative research turned out as it did.

Regardless above mentioned research strategies, there exist three major different **Research Methods** of collecting the desirable information/data.

- Survey
- Case Study
- Experiment

The Research Strategies and the Research Methods are described in the next two subsections (3.3.1 and 3.3.2).

3.3.1 Research Strategies

The **Qualitative research** strategy is preferable when it is desirable to obtain information of an object and evaluate the same (see 3.2.1) in its own environment. Already from the beginning of a research, the investigator must understand that the

collected information is not always of an unambiguous kind; mostly the data can be interpreted in several ways. The main reasons with this research strategy is:

- To locate different sorts of consequences that is experienced by the subject (see 3.2.1).
- See the problems from the subjects' point of view.

However, when it is desirable to obtain data which can determine a connection or a comparison of various group sizes, **Quantitative research** is the research strategy to use. The collected information underlies the identification of an imaginable relationship based on cause and effect. There are particularly two occasions where this research strategy comes in handy:

- When evaluating the result of a manipulation.
- When evaluating the result of an activity.

3.3.2 Research Methods for collecting data

Survey

This sort of Research Method is useful in practically any developing stage of the examined object both before and after designing it. The main reason for choosing a Survey, is to get valuable information about the objects current status, regardless to its developing stage. The data is usually collected through interviews and questionnaires, where the data can be both quantitative and qualitative.

There are basically three ways of conducting a survey:

- Descriptive
- Explanatory
- Explorative

The **Descriptive** alternative, is a survey technique that is preferable when the goal is to find answers to the question; *what is?* **Explanatory** surveys, at the other hand, is useful when explanatory aspects about the examined subject and object are set in focus, for example explaining *why* developers are choosing a specific technique. Finally, the **explorative** alternative, comes in handy when the purpose is to conduct a more thorough investigation; an investigation that are supposed to give data regarding all imaginable important issues.

Case Study

When the desired data should emphasize a special occurrence, involving the subject and object within a certain period of time, the Case Study alternative is the main choice. The obtained data in this Research Method, should be used in statistical analyses. Furthermore, the Case Study is appropriate for evaluation of software engineering methods and tools. Like the Survey alternative, the obtained data can be both of a quantitative and qualitative kind.

There are generally three different sorts of case study arrangements:

- Comparing the results of a new method against an already accepted and used company method.
- Choosing a sister project, which purpose is to examine an accepted and used company method. This sister project handles the old and current method and the main project focuses on the new alternative method.
- Randomized application, which is to prefer when the examined method just concerns individual product components.

Experiment

An Experiment is an investigation that to its nature is very rigorous. Experiments are usually performed in a laboratory environment, and this generates the possibility of a very strict and detailed control factor. The Experiment reminds a lot of the Case Study, but unlike the Case Study, the Experiment strategy obtains data from manipulated variables and the data is only of the quantitative kind.

There are two ways of manipulating an experiment; either on-line or off-line. A **off-line** situation takes place e.g. in a laboratory, and is a simulation of the real world. The **on-line** situation, on the other hand, takes place under normal conditions.

Different aspects where Experiment investigations come in handy:

- Confirm theories
- Confirm conventional wisdom
- Explore relationships
- Evaluate the accuracy of models
- Validate measures

The main steps to carry out an experiment:

- Definition
- Planning
- Operation
- Analysis and interpretation
- Presentation and package

3.3.3 Comparing Research Methods

In order to compare the various Research Methods, a few factors have to be presented and reviewed.

Execution control is the control factor of the entire research. **Measurement control** tells how much of the various measures that can be selected, and included or excluded when executing a project. **Investigation cost** is closely related to the just mentioned research method factor, and differ depending which research method is chosen. It involves, among others, the size of the investigation. At last, **Ease of replication** shows the degree of how much the outcome of an experiment is valid in general point of view in real life.

The factors and data that underlies the comparison of the various Research Methods are presented in *Table 14*.

Table 14: Factors and Data of the various Research Methods

Research Method	Execution control	Measurement control	Investigation cost	Ease of replication	Qualitative data or/and Quantitative data
Survey	No	No	Low	High	Both
Case Study	No	Yes	Medium	Low	Both
Experiment	Yes	Yes	High	High	Quantitative

The Qualitative and Quantitative concepts in *Table 14* are reviewed in subsection 3.3.1.

3.4 Usability evaluation methods

There are generally three types of usability evaluation methods:

- **Testing**

A collection of usability techniques that are meant for testing user interface which already are designed. All these techniques are of dynamic kind.

- **Inspection**

The various techniques assigned to this method are very suitable when considering usability issues before designing the user interface. All these techniques are of static kind.

- **Inquiry**

Interrogation and conversation techniques that can be used before and after the user interface has been designed.

3.4.1 Testing

Usability testing involves designated participants representing future users of the help applications, who use the user interface in order to solve various given tasks. The evaluators studies the result with purpose to figure out how the Help features promote, benefit, and help the user to solve the problems.

Testing methods include the following :

- Coaching Method
- Co-discovery Learning
- Performance Measurement
- Question-asking Protocol
- Retrospective Testing
- Teaching Method
- Thinking Aloud Protocol

Various testing Methods

In the **Coaching method** the participants performing the user test have the possibility to ask any system-related questions directly to an expert coach. This technique is preferable when the purpose of the usability test is to collect information that can provide better training and documentation for the user of the interface and reduction of the number of questions when redesigning the interface. In **Co-discovery learning** two users solve the given problems together, while being observed by the usability experts. The users are encouraged to explain what they are thinking when working with the user interface. During the usability test, the usability experts should also pay attention to the conversation between the two cooperating users in order to gain necessary information. **Performance Measurement** on the other hand, should be applied in a usability laboratory in order to collect all available data from the user test. The technique is aimed at collecting quantitative data. There should be no interaction between the user and the tester during the test which purpose is to optimize the quantitative performance data collection. To get a reliable result from this usability test, at least five user participants are needed. The measurements should among other things concern issues like:

- The time to complete a task
- The number of tasks completed within a give time limit
- The ratio between successful interactions and errors
- The number of user errors

In **Question-asking Protocol** [Zhang00], the user is working with the user interface while the testers affect the course of events by asking the users direct questions about the product. The reasons for this are to:

- Get the user to understand the system
- Get the user to know his/her given tasks
- Inform the users how to use the system when trouble occurs

Besides the direct questioning, the users are allowed to verbalize their thoughts, just as in the thinking-aloud protocol method, but with the advantage that it is coming more naturally in this technique.

Retrospective Testing is a usability evaluation technique, that requires a video camera to document the test phase and it is a very useful method to obtain quantitative data. After the tape session, the evaluators and users reviews the material together so the users can explain what they were thinking when working with the user interface in various situations. The evaluators should ask questions like:

- What is the user doing (in a specific situation)?
- Why does the user act in a particularly way?

Retrospective testing should be used as a supplementary technique to those methods which can not obtain quantitative data. In the **Teaching method** [Zhang00], some users called the test users, acquaint themselves with the functionality of the user interface, in order to get familiar with it and get some expertise in performing tasks using the software tool. Next step is to have a novice user cooperating with the test user. In this method, the test users instruct the “naive” ones about the systems functionality and also demonstrates some pre-determined tasks. The test users should limit their active participation and not be an active problem solver. In the **Thinking-aloud Protocol** the user is interacting with the system and every now and then he or she speaks up, about his or hers personal feelings, thoughts and opinions. The occasions for these statements should take place during the execution of certain predetermined sub tasks. When the task is of a very complex kind, a Periodic Report is to prefer, where the length of interval between comments depends upon the complexity of the task.

3.4.2 Inspection

This Usability evaluation method comes in handy when examination of usability-related aspects of a system is the prime issue. In this inspection method it is not unusual that software developers and other professionals are involved [Mayhew99]. Most of the various techniques available in this method are best used in the design stage of the development.

Because this master thesis is only dealing with techniques applicable to the test stage (see subsection 3.2.4), the inspection family is described in a more concise way than the techniques belonging the former subsection.

Inspection methods include the following:

- Cognitive Walkthroughs
- Heuristic Evaluation
- Pluralistic Walkthroughs

Various inspection Methods

Cognitive Walkthroughs involve a group of evaluators who inspect the user interface by reviewing imaginable tasks in order to form an opinion of the understanding and ease of learning of the GUI software. In this stage, the user interface mostly is presented in paper form or in some other working prototype. When the evaluators want to locate potential usability problems, the **Heuristic Evaluation** technique a very suitable alternative. In order to find these problems, some evaluators, at least five persons, independently evaluate the user interface. First after completing their individual inspections, the evaluators are allowed to communicate with each other. **Pluralistic Walkthroughs** at the other hand are only suitable at the design stage. It should already be used when a paper prototype is available. A lot of persons are involved in this technique, among others, users, developers and human factors engineers. All of them working together reviewing tasks, discussing and evaluating the usability of the user interface.

3.4.3 Inquiry

In this third and last usability evaluation method the main strategy is to obtain all necessary information from the users. This is principally done in three ways:

- Talking to the users
- Observing the users working with the user interface in real work
- Asking the participants questions verbally or in written form

The acquired information in this method deals with the users' satisfactions and understanding of the user interface.

Inquiry methods include the following :

- Field Observation
- Focus Groups
- Interviews
- Logging Actual Use
- Proactive Field Study

Various inquiry Methods

In the **Field Observation** technique, the usability experts observe a variety of representative users in their own home domain working with GUI software. The main

purpose with the observation is to understand in what way the users are using the user interface to solve their given tasks and to find out the users' public opinion about working with the actual system. This technique basically consists of two equal parts:

- **The inquiry part** when interviewing the users
- **The observation part** when noticing the users working with the system

Another data gathering inquiry technique is **Focus Groups**. It requires at least six to nine users that are assembled to debate system-relating issues. Before the gathering, a usability expert in his capacity as moderator, prepares a list of issues to be discussed. Then the moderator tries to collect the desirable information from the discussion. A technique that is purely and entirely based on the concept of asking the participants is **Interviews**. The usability expert formulates a questionnaire concerning the user interface founded on the categories of issues of interest. When the questionnaire is finished, the interviews with the representative users takes place, in order to collect the imaginable information. Interviews acquires above all two types of data:

- Detailed information
- Interactive information, which only can be obtained by the Usability expert when interactive interviewing the user

There are two types of Interview techniques:

- Unstructured interviewing, that is preferable in the earlier stages of usability evaluation and it is closer to a conversation than an interview
- Structured interviewing, that works properly in the test stage and it is a sort of interrogation

Logging Actual Use is the proper technique to use when the purpose is to collect various and several data about the detailed use of the user interface. The collected data shows how the user really interacts with the studied system. Logging Actual Use obtains the following statistics by checking how often:

- The different features are used
- Various events of interest happens, for example error messages
- Different commands are used
- Various error situations occurs
- The on-line help is used

The last technique is called **Proactive Field Study** and should only be used in the early stages of the development life-cycle, where the test stage does not belong (see 3.2.4). In order to acquire the information needed, the usability expert goes to

the users' work place and talk to them. The reasons for the study are basically to understand:

- The users
- The user's tasks
- Their working environment
- The work flow
- What features are needed

3.5 Selection of Usability evaluation methods

When taking into consideration that the evaluated User Assistance techniques already are designed and exist (see subsection 3.2.4), the selection of Usability methods involves only techniques from the Testing method and Inquiry method. The main reason for eliminating the Inspection method from the selection procedure is that its belonging usability techniques are not adequate to use in the test stage of the examined software tool, as in this master thesis. The techniques belonging to the Inspection method are more suitable to use in the design stage.

3.5.1 Selection of Testing techniques

Effectiveness, efficiency and satisfaction are defined in chapter 3.2.3.

Table 15: What sort of information the various Testing techniques gives [Zhang00]

Testing techniques	Effectiveness	Efficiency	Satisfaction	Quantitative data
Thinking aloud protocol	Yes	No	Yes	No
Co-discovery learning	Yes	No	Yes	No
Performance measurement	Yes	Yes	No	Yes
Question-asking protocol	Yes	No	Yes	No
Coaching	Yes	No	Yes	No
Remote Testing	Yes	Yes	Yes	Yes
Retrospective testing	Yes	Yes	Yes	Yes
Teaching	Yes	No	Yes	No

The following techniques from *Table 15* are chosen:

1. Thinking aloud protocol
2. Co-discovery learning
3. Retrospective testing

The three techniques are selected for the following reasons:

The first two techniques are very suitable alternatives when having access to several user groups. Co-discovery learning is in fact a variant of Thinking aloud protocol, but with the benefit, that this technique reminds the users more of a everyday situation when they are working together to accomplish a common goal using this particular product, than actually being part of experimental work. In other words, it is a more natural environment for the users to conduct the usability test in, than having them to verbalize their thoughts directly to the evaluator when working with the user interface. **Thinking aloud protocol** and **Co-discovery learning** also cover Effectiveness and Satisfaction. To cover the Efficiency and to obtain quantitative data, the usability evaluation is complemented with **Retrospective testing**.

One important reason for not choosing more techniques to gather the sought usability information, is quite simply the lack of time.

3.5.2 Selection of Inspection techniques

None of these techniques are selected, due to the information in 3.4.2.

3.5.3 Selection of Inquiry techniques

Table 16: What sort of information the various Inquiry techniques gives [Zhang00]

Inquiry technique	Effectiveness	Efficiency	Satisfaction	Quantitative data	Applicable at Test stage
Field Observation	Yes	No	Yes	No	Yes
Focus Groups	Yes	No	Yes	No	Yes
Interviews	Yes	No	Yes	No	Yes
Logging Actual Use	Yes	Yes	No	No	Yes
Proactive Field Study	No	No	No	No	No

In order to complete the usability evaluation with some dialogue between the evaluator and the user, the **Interviews** technique is selected from the table above. When interviewing the users by asking them questions of not leading characteristics, the evaluators can get information that could not be obtained otherwise. This is done by asking questions to reveal information and encourage the user to reply with full sentences.

Interviews are also useful for identifying possible areas for more detailed analysis. The data gathered provides information on general rules and principles and is faster than observational methods. Interviews are popular, well-known and widely accepted and are useful for investigating events which occur infrequently.

3.5.4 Summary of the selected usability evaluation techniques

To sum up, the chosen techniques are reviewed in *Table 17*.

Table 17: Usability evaluation techniques selected

Evaluation Techniques	Effectiveness	Efficiency	Satisfaction	Quantitative data	Applicable at Test stage
Thinking aloud protocol (Testing)	Yes	No	Yes	No	Yes
Co-discovery learning (Testing)	Yes	No	Yes	No	Yes
Retrospective learning (Testing)	Yes	Yes	Yes	Yes	Yes
Interviews (Inquiry)	Yes	No	Yes	No	Yes

By using all the techniques in *Table 17*, all necessary data can be acquired, everything from obtaining quantitative data to covering the three different usability issues.

4 Maintainability

This chapter provides accepted Maintainability ideas which are suitable to evaluate, verify and handle the actual costs that arise when the developers are supporting and updating the various User Assistance techniques. So, not only the user has to be put in focus. Also the developers more or less efforts of maintaining the various help applications have to be looked into! Hence, is Maintainability an important issue.

The following questions will be answered: What is the time cost for updating the Help features? Is it wise to choose to implement the number one choice for the user if it is difficult to support the same for the developer? Should Maintainability concept carry such great weight as Usability?

4.1 Introduction

The Maintainability concept is necessary and useful when answers are required to the following matters: What is the actual developing and investigation time for designing and updating the various help applications. This has to be accentuated, because if the help application turns out to be very hard to support and update, it is most likely that the final decision about the help application is based on this assessment also. This presumably results in, that there is no reason to design and sell a product that is more or less impossible to support.

A major problem with Maintainability is that it can be estimated in many different ways based on different accepted and known theory. Is it then certain to assume, that the information collected, is the ultimate one?

In this master thesis the Maintainability evaluation is more founded on investigations that relates directly to the question: What is the cost of time to support and update?

4.2 Maintainability Theories

In the following subsections (4.2.1 and 4.2.2), some theories of Maintainability are briefly presented, with purpose to enlighten the reader about some general ideas of this subject.

Finally in subsection 4.2.3, the reader is informed of the evaluation of the Maintainability, which is used to evaluate the maintenance of the selected User Assistance techniques (see 5.2).

4.2.1 Maintenance Activities

As mentioned earlier in the first chapter, Maintainability is defined as the ease and speed with which any maintenance activity can be carried out on an item of equipment.

There are three maintenance activities [BCS01]:

- Corrective maintenance

“Maintenance to correct faults in hardware or in software” [IEEE90].

- Perfective maintenance

“Maintenance to improve the performance, or other attributes of a computer program”[IEEE90].

- Adaptive maintenance

“Maintenance performed to make a computer program usable in a changed environment”[IEEE90].

Corrective maintenance is an activity that focuses to find and fix a problem in a system. One useful aid can be the quantity mean time that is used to diagnose and fix an a known fault. Information that has been obtained through collected metrics (during the course of system testing) and reliability testing metrics, is used as guidelines for this type of maintenance.

The second maintenance activity (**Perfective maintenance**), is used on the effort of improving a system. This can be tested by running a number of similar tests, and on each one of them recording the time it takes to achieve a new piece of identifiable functionality. When this is done, the average time is calculated. This generates the possibility to give an average effort that requires to implement specified functionality. Finally, this can be compared against a target effort and an assessment made as to the requirements are met.

Another way of obtaining maintenance data, is by evaluate the system, regarding the effort required to adjust software to changes in application environment. This is done in the third and last Maintenance activity, **Adaptive maintenance**. One way in doing it, is using the same ideas which are described in Perfective maintenance.

4.2.2 The Coleman-Oman Model

This model uses an advanced formula to form a so-called Maintainability index (MI) [Cisco01]. It is based and calculated on figures which are a combination of widely-used and commonly-available data. The MI is supposed to give the evalua-

tor a hint of the Maintainability of the User interface. The basic MI of a set of programs is polynomial of the following form:

$$MI = 171 - 5.2\ln(\text{aveV}) - 0.23\text{aveV}(g') - 16.2\ln(\text{aveLOC}) + 50\sin.\sqrt{2.46\text{perCM}}$$

where:

- aveV is the average Halsted Volume per module based on calculations on the number of operators and operands.
- aveV(g') is the average extended cyclomatic complexity per module (measures the number of linearly-independent paths through a program module, and is calculated from a connected graph of the module).
- aveLOC is the average lines of code per module.
- perCM is the average percent of lines of comment per module.

The following thresholds for the evaluation of the maintainability index have been determined:

MI < 65 poor maintainability

64 < MI < 85 fair maintainability

84 < MI excellent maintainability

The main reason to present the Coleman-Oman Model is to show that the Maintainability can be estimated in many approaches. And a hard way in doing so, is just using this model. Presumably, is it quite enough with the ideas presented in the next subsection of how to get the proper data from an Maintainability evaluation.

4.2.3 Maintainability evaluation

Due to the fact that maintainability is a very complex matter, regarding all known theories, a direct consequence is that the theories described in subsection 4.2.1 and specially in 4.2.2, are not applied by Telelogic. Therefore, the maintainability evaluation used in this master thesis is based on interviews with the developers of the various User Assistance techniques. The developers which are interviewed, are working at Telelogic, with their respective Help feature. Hence, are the questions asked directly to the designer who are responsible for updating his/her special assigned Help feature.

As mentioned before in the introduction to this chapter, the maintainability evaluation is founded on investigations that relates directly to the question:

What is the cost of time to support and update the Help features?

The Maintainability concept is first used in the next chapter, chapter 5 *Selection* on page 45, with purpose to help out which Help features that shall be analysed in the User Test (see chapter 7).

A more careful Maintainability evaluation is also carried out, for each and every User Assistance technique which participates in the User Test. This is done in section 8.3.

5 Selection

This chapter provides the selection procedure regarding the various User Assistance techniques which were handled in chapter 2. As mentioned before (in section 3.5), the procedure is necessary as a result of lack of time. Among other things the selection is based on the Help question method (see subsection 2.6.1) and on the maintainability evaluation (presented in subsection 4.2.3).

5.1 Introduction

The main reason that this selection procedure acquires a chapter of its own, is the maintainability issue. The used maintainability evaluation method in this master thesis was first presented in chapter 4, while the User Assistance techniques were handled and examined earlier, in chapter 2. The maintainability concept shows to be very important when choosing the User Assistance techniques which are evaluated in the usability test.

Due to lack of time, there is no possibility to test all existing Help features. Hence, there has to be an selection procedure. The selected Help features are thoroughly examined, tested and evaluated in the usability evaluation.

5.2 Selection of User Assistance

The following Help features are chosen for further investigation:

- Procedural Help
- HTML Help
- Wizards
- Tutorial
- Contextual Help

These five features are selected of the following reasons:

The **Procedural Help** is selected while it is a great Help feature when it comes to explaining to the user in detail how a specific task is solved. The **HTML Help**, however, is a necessary aid when for example accessing the Procedural Help via existing links. It also comes in handy when the user intends to access the Help topics by using some of the available tabs (contents, Index and Search) and when moving from one topic to another in the same window. The Procedural Help and

the HTML Help) are evaluated at the same time in the usability test considering the earlier mentioned connection.

Wizards is not be considered for instructional help [Wash99]. But the main reason of choosing this Help feature, is to find out if Wizards can be used in an instructional way. Another reason is, that this is the only Help feature that has executive properties (see 2.2.1) besides the Coaches. Hence, this quality is to be used. The next Help feature, the **Tutorial**, is selected because it is the only User Assistance technique that includes most Question types (see *Table 12*). It has also been chosen because it can be presented in book form.

The last chosen Help feature seems to be the most user-friendly aid of all the listed User Assistance techniques in chapter 2. This is owing to one outstanding characteristic: **Contextual Help** gives the user immediate assistance, without leaving the current and specific working area (see subsection 2.3.1).

The summary of the selected User Assistance techniques are reviewed in table *Table 18*.

Table 18: User Assistance with data selected

User Assistance	Goal-oriented	Descriptive	Procedural	Interpretive	Navigational	Executive
Procedural Help	No	No	Yes	No	No	No
Html Help	No	Yes	No	No	Yes	No
Wizards	No	Yes	Yes	No	No	Yes
Tutorial	Yes	Yes	Yes	Yes	No	No
Contextual Help	No	Yes	No	Yes	No	No

Final conclusion

By using all the Help features in *Table 18*, all Question types can be covered and also the Executive properties can be used.

Definition of concepts in *Table 18* are reviewed in subsections 2.2.1 and 2.2.2.

5.3 Remaining User Assistance

- Reference Help
- Conceptual Help
- Coaches
- Tour
- Manual

The shortage of time is the main reason that the **Reference Help** and **Conceptual Help** are not included in the Usability evaluation. The **Coaches** are not selected due to the facts that this sort of Help feature is not used by the developers in Telelogic and above all, the fact that a coach is very similar to a Wizard.

Finally, the maintainability concept removes with immediate effect the **Tour** and the **Manual** from being included to the Help features in the Usability evaluation. The Tour is usually presented via a demonstration CD, with marketing purpose and for advertising reasons. The course of events with an update of this Help feature is synonymous with producing a completely new CD with the more actual Tour. An update is combined with great costs for the company that develops the user interface. For nearly the same reason is the Manual excluded. Because an update of a manual means publishing an entirely new edition of the Help feature that causes great costs for the responsible company.

6 Implementation Strategies

The chosen tasks and the implemented cases which are used in the User Tests (see Appendix A), are presented and reviewed in this chapter. In the cases used in the Usability Evaluation, the user is testing various User Assistance techniques that exist in either Microsoft Word, Microsoft Excel or in the Telelogic UML Suite 4.6.

Consequently, the tasks that are included in each case, involve solving problems in both Microsoft Word and Telelogic Tau UML Suite.

Also, some strategies of conducting the User Test are provided.

6.1 Introduction

The selected tasks that underlies the Usability Evaluation can be solved by choosing various Help features. In the User Test, the user only faces one task one time, where he or she has to solve it by using a special assigned Help feature. The user has to solve two or three different tasks:

- Making a mailinglist in Microsoft Word (based on Microsoft Excel data)
- Printing a document in A5 in Microsoft Word
- Opening a new Class Editor in Telelogic Tau UML Suite

These tasks are divided into three different User Cases, depending on the assigned Help features to solve them (*see subsection 6.3*). In each Case, the sequence of the tasks can vary in several ways - this is called randomized testing. The reason for letting the user solve the tasks in different orders, is to locate possibly distinctions in the result.

6.2 Selected Tasks with User Assistance

The three tasks (*see 6.1*) that are included in the User test, are of a varying degree of difficulty. The following table shows the tasks “degree of difficulty” and what sort of Help features that are available in the test, to solve the same (*see Table 19*).

Table 19: Reviewing the Tasks

Task number	Task name	Degree of difficulty	User Assistance
1.	Making a mailinglist in Word:	Advanced	Tutorial HTML & Procedural
2.	Printing a document in A5 in Word:	Easy	Contextual Tutorial HTML & Procedural
3.	Opening a new Class Editor in Telelogic UML:	Medium	Procedural Wizard Tutorial

By testing the Help features in different situations with varying degree of difficulty, it may actually be possible to identify the proper occasions where they are preferable to use.

All the Help features besides the HTML Help, are helping the user to solve a special problem. The HTML Help, on the other hand, is used to locate the correct information to solve a specific problem (the Procedural Help).

Hence, the Usability Evaluation checks:

- The locating properties of: HTML Help
- The solving properties of: Tutorial, Procedural, Contextual and Wizard

6.3 Implemented Cases

The tasks are organized, depending on the assigned Help feature, in three different User Cases: Case 1 - Case 3. Regardless of which of these cases that are being tested, the user runs into “problem solving” of shifting character (two or three tasks).

After solving a task in a Case, the user has to answer a Questionnaire concerning the used Help feature. The Questionnaire consists of 20 Statements or 12 statements regarding the HTML Help, where the user grades each statement from 1 to 7, where figure one is synonymous with a total disagree and figure seven means that the user completely agrees with the statement (*see Appendix B*).

Finally the tested Case is concluded with an interview, where the usability expert asks the user 13 questions that concern the whole test (*see Appendix C*).

6.3.1 Case 1

In the first User Case, the user has to solve the following tasks by using the following Help features (see *Table 20*).

Table 20: The contents of Case 1

Tasks	User Assistance
1. Making a mailing list	Tutorial
2. Printing a document in A5	Contextual Help
3. Opening a new Class Editor	Procedural Help

Case 1 can be solved in the following ways (see *Table 21*).

Table 21: Alternatives of Case 1

Case	The first task to solve	The second task to solve	The third task to solve
1.0	Making a mailing list	Printing a document	Opening class editor
1.1	Making a mailing list	Opening class editor	Printing a document
1.2	Opening class editor	Making a mailing list	Printing a document
1.3	Opening class editor	Printing a document	Making a mailing list
1.4	Printing a document	Making a mailing list	Opening class editor
1.5	Printing a document	Opening class editor	Making a mailing list

The material used in Case 1 are presented in *Appendix A*.

6.3.2 Case 2

In User Case 2, the user solves the following tasks by using the following Help features (see *Table 22*).

Table 22: The contents of Case 2

Tasks	User Assistance
1. Making a mailing list	HTML & Procedural Help
2. Printing a document in A5	Tutorial
3. Opening a new Class Editor	Wizard

Case 2 exists in the following Case alternatives (see Table 23).

Table 23: Alternatives of Case 2

Case	The first task to solve	The second task to solve	The third task to solve
2.0	Printing a document	Opening class editor	Making a mailing list
2.1	Printing a document	Making a mailing list	Opening class editor
2.2	Making a mailing list	Printing a document	Opening class editor
2.3	Making a mailing list	Opening class editor	Printing a document
2.4	Opening class editor	Printing a document	Making a mailing list
2.5	Opening class editor	Making a mailing list	Printing a document

The material that were used to perform Case 2 are presented in *Appendix A*.

6.3.3 Case 3

In User Case 3, the user solves the following tasks by using the following User Assistance (see Table 24).

Table 24: The contents of Case 3

Tasks	User Assistance
1. Printing a document in A5	HTML & Procedural Help
2. Opening a new Class Editor	Tutorial

The Case exists as Case 3.0 and as Case 3.1 (see Table 25).

Table 25: Alternatives of Case 3

Case	The first task to solve	The second task to solve
3.0	Opening class editor	Printing a document
3.1	Printing a document	Opening class editor

The material that was used to perform the various Case 2 investigations are presented in *Appendix A*.

6.3.4 Case alternatives

The main reason for arranging the three User Cases in different ways (see Table 21, Table 23 and Table 25) is to find out, if the users power of concentration, is diminishing or fading during the test, which definitely can affect the test result of the Help feature. So, in order to give all the Help features the same evaluation conditions and to study different Usability issues, which can be affected (see subsection 3.2.3), the arrangement of the case alternatives is a necessary precaution.

7 Analysing the User Test

This chapter analyses the collected data from the User Test. It is in this stage where the actual Usability Evaluation of the various Help features is carried out.

The chapter starts with an assessment of each and every User Assistance technique which takes part in the User Test and it is concluded with a more general evaluation of the test, where issues considering the users' way of dealing with the assigned tasks/Case are reviewed.

7.1 Introduction

It is very important to know that analysing the User Test, means dealing with several sorts of Data, which are collected from following type of sources:

- Studying the recorded video tapes where the users solve the Cases (see 6.3)
- Examining the answered Questionnaires (see *Appendix B*)
- Checking all the Interviews forms (see *Appendix C*)
- Reviewing the evaluators experiences when briefing the users before solving a task and inspecting the users when conducting the task

The assembled Data underlies the Usability Evaluation of the various Help features. As mentioned in chapter 1.1, the main reason for the Usability Evaluation is:

- Finding out the various situations where the different help applications are to prefer

So, to find these situations, this chapter will focus in thoroughly assessing the collected Data from the selected and tested User Assistance, which takes part in some of the three existing User Cases (see *Appendix A*).

7.2 Assembled Data

As mentioned in subsection 3.2.3, there exists two different sorts of data:

- Usability issues
Satisfaction, Effectiveness and Efficiency
- Quantitative data
Task time and Errors made

The **Usability Issues** are collected from the Questionnaires (see *Appendix B*), where:

- **Satisfaction** is a calculated average grade of all the statements in the Questionnaires altogether (grade 1 - 7)
- **Effectiveness** is synonymous with statement 5 (grade 1 - 7)
- **Efficiency** is a synonymous with statement 2 (grade 1 - 7)

The **Quantitative data** are gathered from the reviewed video-tapes, where:

- **Task time** is the measured time for completing a task
- **Errors made** is the number of errors made, when completing a task

7.3 The Users

The 24 users who participates in the testing procedures of the Help features are staff from Telelogic in Malmö. Some of these users have a large experience of designing User Assistance techniques, for example Tutorials, Procedural Help and Contextual Help and some of them are quite used to work with the software tools tested. Also users of less experience of working with these tools, novice users, are taking part in the User Test.

7.3.1 The Users General experience

The three following figures show various experience of the users who participated in the Usability Evaluation (see *Figure 8 - Figure 10*).

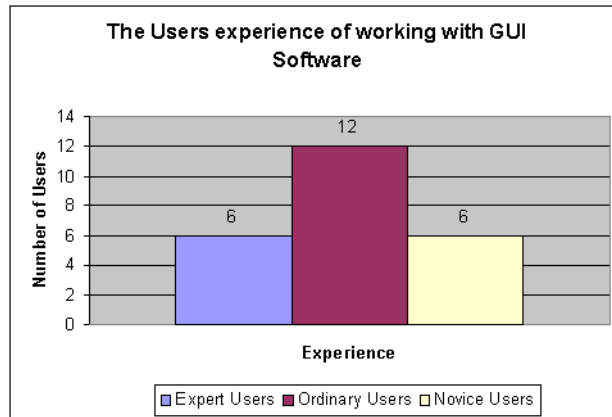


Figure 8: Experience of GUI Software

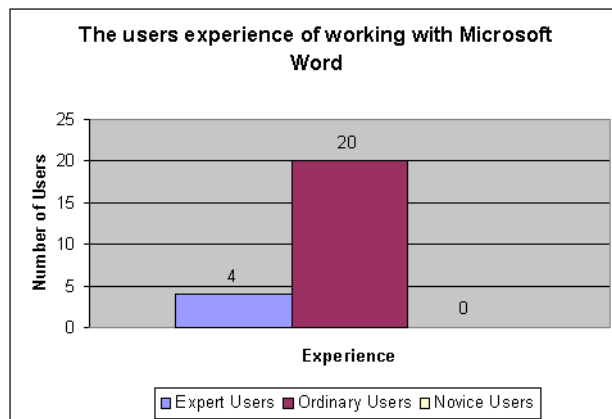


Figure 9: Experience of Microsoft Word

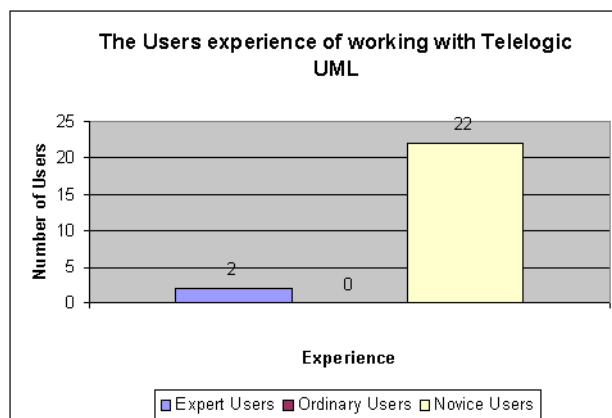


Figure 10: Experience of Telelogic UML

7.3.2 The experience of the Users in Case 1

In the two following figures, the experience of the users who participated in Case 1 are reviewed (see *Figure 11* and *Figure 12*).

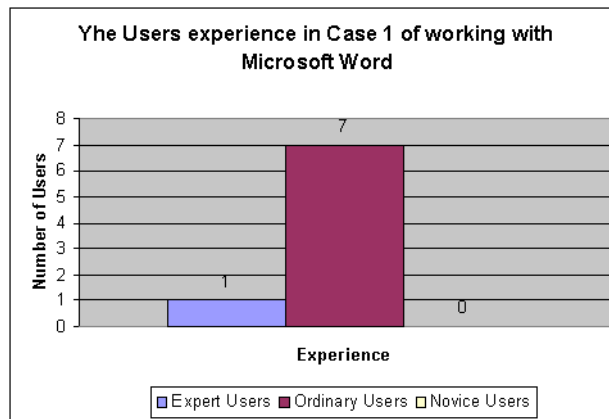


Figure 11: Microsoft Word experience in Case 1

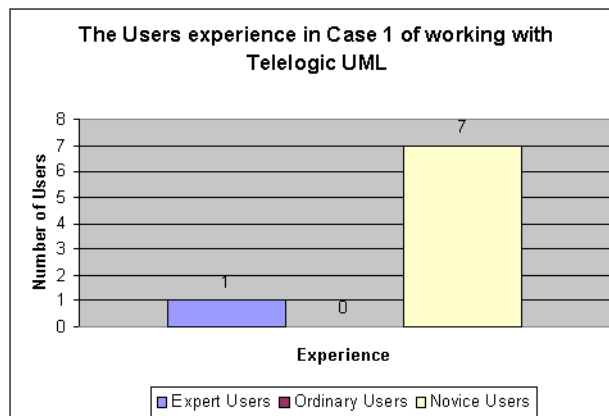


Figure 12: Telelogic UML experience in Case 1

7.3.3 The experience of the Users in Case 2

In the three following figures, the experience of the users who participated in Case 2 are reviewed (see *Figure 13* - *Figure 15*).

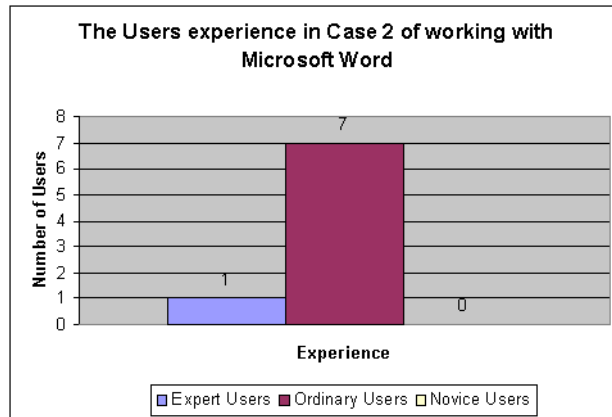


Figure 13: Microsoft Word experience in Case 2

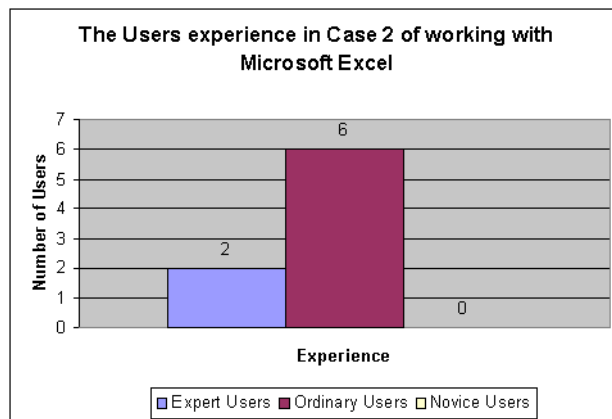


Figure 14: Microsoft Excel experience in Case 2

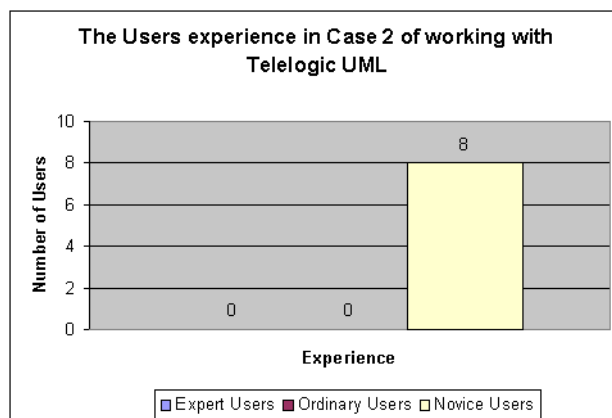


Figure 15: Telelogic UML experience in Case 2

7.3.4 The experience of the Users in Case 3

In the two following figures, the experience of the users who participated in Case 3 are reviewed (see *Figure 16* and *Figure 17*).

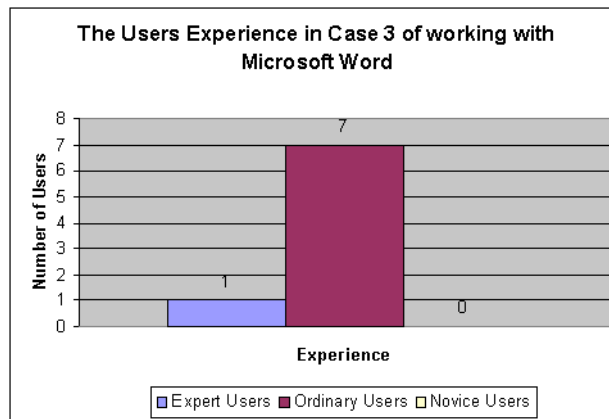


Figure 16: Microsoft Word experience in Case 3

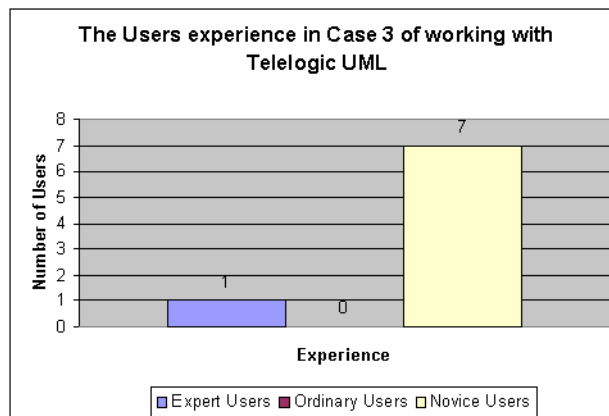


Figure 17: Telelogic UML experience in Case 3

7.4 Analysing the tests of HTML Help

It is important to know that unlike the other Help features, the HTML Help is not an help feature that is used to solve the assigned task instantaneously - it is used to locate the correct information to solve the problem. Hence, the HTML Help does not depend on the degree of difficulty of solving the task. It only depends on the degree of difficulty of finding the right information, where the limit is the user who tries to find that information; he or she must use the correct search tab and find the right search word that leads to the solution.

The HTML Help that is evaluated, exists in two different User Cases (see *Table 26*):

Table 26: Evaluated HTML Help

User Case:	Actual Task	Tool	Degree of difficulty
Case 2:	Making a mailinglist	Microsoft Excel	Hard
Case 3:	Printing a document in A5	Microsoft Word	Easy

In the two following subsections (7.4.1 and 7.4.2), all the collected data from the testing activity of the HTML Help, in both User Cases, are thoroughly analysed and reviewed.

7.4.1 HTML in Case 2

The task, **Making a mailinglist**, is of a very advanced character.

But, the test result of the HTML Help is more or less independent of the Degree of difficulty of the task (*see* the introduction of subsection 7.4).

Information of the HTML Help in Case 2 is reviewed in *Table 27*.

Table 27: Collected Data of HTML Help in Case 2

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Making a mailing list	5.23	5.4	5.4	50 s	1

Information collected from the reviewed video-tapes

Most of the users, located the desired information almost faultless. One problem that emerged every now and then, was which search tab was the better to use in the search for the correct solution. In Microsoft Excel there are three search tabs: Contents, Answer Wizard and Index (see *Figure 18*).

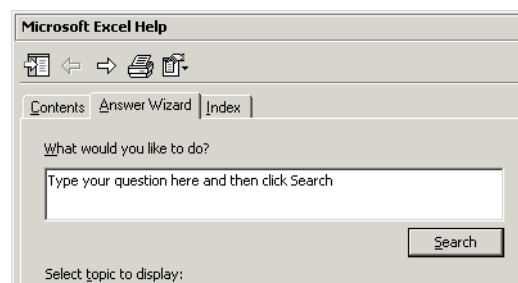


Figure 18: Excel HTML Help

The users who used the Answer Wizard tab, succeeded almost immediately in finding the solution for **making a mailing list**, while these who tried the other search

tabs failed in doing so. But, when they thereafter used the “correct” tab, they also managed to find the proper solution easily.

Information collected from the Interviews (see *Appendix C*)

The general opinion from the users who conducted the HTML test in User Case 2, **Making a mailing list**, is that it is relatively easy to locate the wanted information, despite the fact, that the task is of a complex nature. There was of course a couple of users who thought exactly the opposite.

7.4.2 HTML in Case 3

Information of the HTML Help in Case 3 is reviewed in *Table 28*.

Table 28: Collected Data of HTML Help in Case 3

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Printing a document in A5	5.38	5.2	5.6	27 s	0

Information collected from the reviewed video-tapes

When comparing this HTML Help, which are used to locate a task of an easy character and the HTML Help which are used to find task of an advanced character, it is almost impossible in finding any differences in the outcome.

But, it seems that it was more convenient to search for the task in this case, where the search word was “*print*” than the search words “*mail merge*” or “*mailing list*”, which are preferable words to use in the first HTML case (analysed in subsection 7.4.1).

Information collected from the Interviews (see *Appendix C*)

Most of the users who searched for the solution of **Printing a document in A5**, generally think that the HTML Help is a great tool.

The interviews also reveal that some users are of the opinion, that they occasionally, have problems in finding or using the correct “search word” or “searchphrase” which really describes the task.

7.5 Analysing the tests of Procedural Help

In this User Test there are two types of Procedural Help:

1. Already existing Help in the used tools:
 - Task 1 - Making a mailinglist in Microsoft Word (see *Table 19*)

- Task 2 - Printing a document in A5 in Microsoft Word (see *Table 19*)

2. Written Help of the Evaluators:

- Task 3 - Opening a new Class Editor in Telelogic Tau UML Suite (see *Table 19*)

The Procedural Help that are evaluated, exists in all the three User Cases (see *Table 29*).

Table 29: Evaluated Procedural Help

User Case:	Actual Task	Tool	Type	Degree of difficulty:
Case 1:	Opening a new Class Editor	Telelogic UML	Specially made	Medium
Case 2:	Making a mailinglist	Microsoft Excel	Already existing	Hard
Case 3:	Printing a document in A5	Microsoft Word	Already existing	Easy

In the three following subsections (7.5.2 - 7.5.1) are the collected data of all the testing activity of the Procedural Help, in both User Cases, thoroughly analysed and reviewed.

7.5.1 Procedural Help In Case 1

Information of the Procedural Help in Case 1 is reviewed in *Table 30*.

Table 30: Collected Data of Procedural Help in Case 1

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Opening a new Class Editor	4.82	5.12	5.25	231 s	1

Information collected from the reviewed video-tapes

Unlike the Procedural Help in Case 2 (*see next subsection*), this one is relatively easy for the user to follow. But, some of the various steps in the solution, may have contained a little bit too much of information. So, in order to make it easier for the user, some of these explaining steps should have been divided into several new steps.

Information which are collected from the Interviews (see *Appendix C*)

Some of the users think that the information provided in the Procedural Help is not enough to give comprehension of the actual subject. Sometimes the user feels that he/she does not get sufficient verification, when considering, if the task has been executed correctly.

A general opinion is: This sort of Help feature works out fine, because it provides straight instructions to solve the problem.

7.5.2 Procedural Help in Case 2

Information of the Procedural Help in Case 2 is reviewed in *Table 31*.

Table 31: Collected Data of Procedural Help in Case 2

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Making a mailing list	3.56	2.63	4.13	362 s	4.25

Information collected from the reviewed video-tapes

It is obvious, when analysing the recorded tapes, that this is the task that requires most collaboration between the testing participants. But, despite this intense co-working activity, still many errors were made before completing the task. In other words:

- Solving the task, **Making a mailing list** with Procedural Help, caused definitely most errors in the whole User Test, comparing to all the other cases/tasks.

Information which are collected from the Interviews (see *Appendix C*)

The general opinion of the Procedural Help which is used in solving, **Making a mailing list** are:

It does not provide enough information to solve the task faultless, because there are steps missing in its description, which results in hesitations in what to do. It seems like the designer presumes that the user has major knowledge of the actual subject. To sum up:

- The Help was much too general, which caused confusion leading to errors.

7.5.3 Procedural Help in Case 3

Information of the Procedural Help in Case 3 is reviewed in *Table 32*.

Table 32: Collected Data of Procedural Help in Case 3

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Printing a document in A5	5.67	6.0	6.2	35 s	0

Information collected from the reviewed video-tapes

The Procedural Help suits very well for solving a problem of an easy character. On account of the tasks degree of difficulty, the time for solving it, is not very long.

Information which are collected from the Interviews (see *Appendix C*)

The general opinion of using the Procedural Help is that it provides a great way in solving problems of an easy character.

7.6 Analysing the tests of the Tutorial

The various Tutorials that are evaluated, exists in all the three User Cases (see *Table 33*).

Table 33: Evaluated Tutorials

User Case:	Actual Task	Tool	Type	Degree of difficulty:
Case 1:	Making a mailinglist	Microsoft Excel	Specially made	Hard
Case 2:	Printing a document in A5	Microsoft Word	Specially made	Easy
Case 3:	Opening a new Class Editor	Telelogic UML	Specially made	Medium

In the three following subsections (7.6.1 - 7.6.3) are the collected data of all the testing activity of the Procedural Help, thoroughly analysed and reviewed.

7.6.1 Tutorial in Case 1

Information of the Tutorial in Case 1 is reviewed in *Table 34*.

Table 34: Collected Data of the Tutorial in Case 1

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Making a mailing list	5.53	5.87	5.75	272 s	<1

Information collected from the reviewed video-tapes

This Help feature suits very well for solving advanced problems. When having in mind the tasks degree of difficulty and the outcome, the time for solving the task, is not very long.

Information which are collected from the Interviews (see *Appendix C*)

A general opinion of using the Tutorial, is that it is very suitable for solving problems of a longer and harder character. It is easy for the user to understand and learn something about the actual topic, when he/she is solving the problem.

Here, unlike the Procedural Help, the user feels that he/she gets the sufficient verification that the task has been executed in a correct way. Much thanks to the existing screen shots.

7.6.2 Tutorial in Case 2

Information of the Procedural Help in Case 2 is reviewed in *Table 35*.

Table 35: Collected Data of the Tutorial in Case 2

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Printing a document in A5	6.2	6.88	6.2	30 s	0

Information collected from the reviewed video-tapes

The task is solved at rapid pace, due to its easy character.

Information which are collected from the Interviews (see *Appendix C*)

When the degree of difficulty is of an easy character, such in this problem (**printing a document in A5**), the average user thinks that it is not necessary with all the information, the Tutorial provides. But, generally the user thinks that the Tutorial works properly.

7.6.3 Tutorial in Case 3

Information of the Procedural Help in Case 3 is reviewed in *Table 36*.

Table 36: Collected Data of the Tutorial in Case 3

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Opening a new Class editor	5.82	5.58	6.2	272 s	1

Information collected from the reviewed video-tapes

Some users caused a few errors, due to evident nervousness.

Information which are collected from the Interviews (see *Appendix C*)

The average user thinks that this User Assistance technique provides information that is easy to understand and to follow.

Another common opinion is that Tutorials suit the novice user best. But, nevertheless, regardless of experience working in GUI software, the average user sees the the Tutorial as a great help feature.

7.7 Analysing the tests of the Wizard

The Wizard tested and evaluated, only exist in case 2 (see *Table 37*).

Table 37: Collected Data of the Wizard in Case 2

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Opening a new Class editor	6.5	6.83	50 s	0	6.5

Information which are collected from the Interviews (see *Appendix C*)

The average user thinks that the Wizard is a very convenient technique, mostly thanks to its interactive properties. It is almost impossible for the user to make errors. But, the average user is uncertain, if he or she is able to solve similar tasks without using the Wizard.

7.8 Analysing the tests of the Contextual Help

The Contextual Help that is tested and evaluated, only exist in Case 1 (see *Table 38*).

Table 38: Collected Data of the Contextual Help in Case 1

Task	Satisfaction	Effectiveness	Efficiency	Task Time	Errors made
Printing a document in A5	3.71	3.75	3.25	103 s	2

Information collected from the reviewed video-tapes

It is difficult to classify made errors when solving the task with this Help feature.

Information which are collected from the Interviews (see *Appendix C*)

The ordinary user thinks that the provided information of the Contextual Help is not enough to actually solve the assigned problem. The offered information does not explain how to solve a specific task.

7.9 Statistical Analyses of the Data

Box plots of the Usability issues regarding all the User Assistance techniques are presented in *Figure 19 - Figure 21*. The Standard deviations of the same are reviewed in *Table 39 - Table 41*. The numerals that follow after all User Assistance techniques in the Box plots, refer to the tasks that were solved (see *Table 19*).

In *Figure 19 - Figure 21* the following values are presented:

- q1: First Quartile
- q3: Third Quartile
- max: Maximum value
- min: Minimum value
- med: Median value

The values can only vary between 1 to 7 (see 7.2).

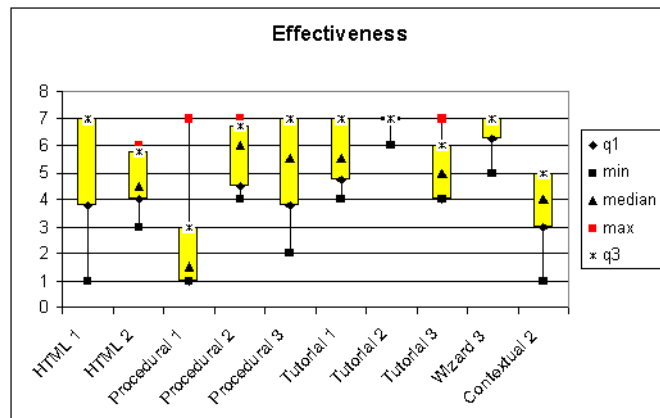


Figure 19: Box plot of Effectiveness

Table 39: Standard deviation of Effectiveness

HTML1	HTML2	Proc1	Proc2	Proc3	Tut1	Tut2	Tut3	Wiz3	Cont2
2.4	1.2	2.4	1.4	2.0	1.3	0.4	1.3	0.8	1.5

Both the Box plot and the Standard deviation reveal that the spread is largest when it comes to the HTML 1 and Procedural 1. These Help features were used to solve a task of hard character.

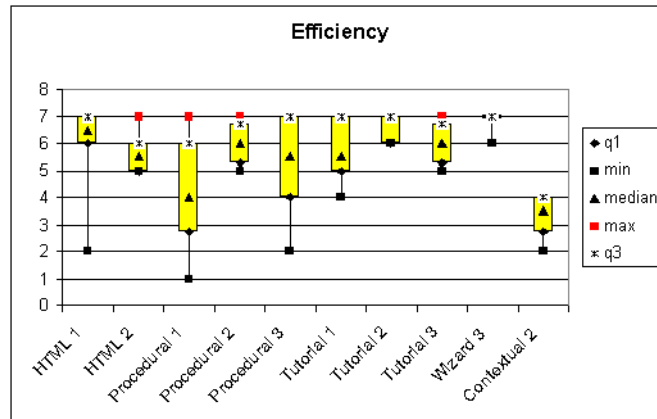


Figure 20: Box plot of Efficiency

Table 40: Standard deviation of Efficiency

HTML1	HTML2	Proc1	Proc2	Proc3	Tut1	Tut2	Tut3	Wiz3	Cont2
1.7	0.8	2.1	0.9	1.8	1.2	0.5	0.9	0.4	0.9

Both the Box plot and the Standard deviation reveal that the spread is largest when it comes to the Procedural 1.

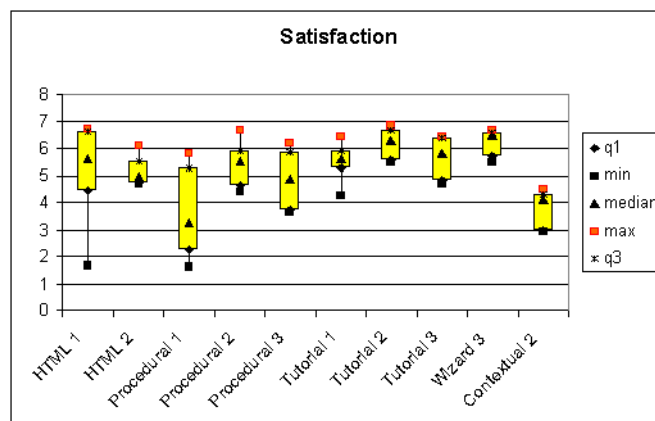


Figure 21: Box plot of Satisfaction

Table 41: Standard deviation of Satisfaction

HTML1	HTML2	Proc1	Proc2	Proc3	Tut1	Tut2	Tut3	Wiz3	Cont2
1.8	0.6	1.7	0.9	1.1	0.7	0.6	0.9	0.6	0.7

Just as for Effectiveness and Efficiency, the Standard deviation is greatest when it comes to solving the task where the degree of difficulty was hard. Hence, solving the task, Making a mailing list in Microsoft Word with HTML Help and Procedural Help caused definitely the largest spread in the Usability Evaluation.

7.10 General Evaluation of the test

This section, among other things, deals with the result of the randomized testing of the three User Cases, where the sequence of the belonging tasks vary (see subsection 7.10.2).

Always before conducting a User Case, the users were handed over all the necessary guiding principles that were needed to get started with each assignment. The Guiding principles covered the following subjects:

- finding the right environment where to test the Help feature
- background information regarding the help feature
- how to get started
- important information regarding the Help features

The **informing strategy** how and when the guiding principles was handed over to the user, changed during the test (see 7.10.1).

7.10.1 Informing Strategies

1. First, the user got the information at just one occasion - when they were assigned the Case in paper-form (see *Appendix A*). So, when the first User Test was conducted, the informing strategy of the test were basically to inform the user shortly about the assigned tasks and thereafter handing over the Case to solve. The Case itself, should provide the information necessary to execute the tasks included.
2. In the next informing strategy, the guiding principles belonging to the assigned Case, were handed over to the user at more than one occasion. Just the information belonging to the actual task, was delivered separately, before the user started solve the task. The user was also given valuable information orally about the actual task.
3. Furthermore, in the third and last informing strategy, the most important and necessary information before conducting a task was underlined in the assigned Case and also pointed out to the user when he or she was briefed with oral hints.

Regardless informing strategy, many of the users had a tendency to ignore the instructions and just experiment on their own. The conclusion is, that the users do not always follow the instructions, independent of the sort of the information - regardless the degree of educational level.

The above mentioned user behaviour, also occurs every now and then, when the users are following the instructions and information which both the Procedural Help and the Tutorial provide. To sum up:

- When the user is solving a task, he or she uses a combination of experimentation and following the information of the Help features, regardless how well the Help features are designed. This behaviour leads to errors.

7.10.2 Randomized testing

As described earlier in section 6.1, the sequence of the tasks in each User Case can vary in several ways - the so-called randomized testing.

When we inspected the users, solving the tasks in different orders, were we not able to find any distinctions in the result, that depended on the tasks being solved in different ways. The users “power of concentration”, was not affected. To sum it up:

- The test result of the Help feature and the order the task were performed is not correlated

Why does not the concept of Randomized testing matter in this case? There are at least two reasonable explanations:

1. The test was executed in a rather short amount of time, with the effect that the power of concentration never diminished.
2. The fact that a video camera recorded the actual test, may have affected the users to be more careful and put them under pressure to do their best.

8 Conclusions

This chapter presents the result of the investigation and gives answers to the following questions:

Which User Assistance technique does the user prefer?

Which User Assistance technique is the easiest to update?

8.1 Introduction

Apart from presenting the result from the users' point of view, which are collected from the data of User Tests, this chapter also provides conclusions from the Maintainability evaluation (see subsection 4.2.3). This later evaluation, is naturally carried out on the same Help features which were selected in chapter 5 to take part in the User Test. This is done in order to grade the Help features from the perspective of the designer (see section 1.4).

8.2 Preferable User Assistance for the Users

In sections 7.4 - 7.8, all collected information from the various Help features in the three existing User Cases (see Section 6.2), are thoroughly presented. A summary of these Data are reviewed in Table 42 and Table 43, where the first table compares the data with respect to the Help feature and the last table compares the data regarding the assigned task.

Table 42: All the evaluated User Assistance with Data

Help feature	Degree of difficulty	Satisfaction	Effectiveness	Efficiency	Task Time/s	Errors made
HTML Help	Hard	5.2	5.4	5.4	50	1
HTML Help	Easy	5.4	5.2	5.6	27	0
Contextual Help	Easy	3.7	3.8	3.3	90	2
Procedural Help	Hard	3.6	2.6	4.1	361	4
Procedural Help	Medium	4.8	5.1	5.3	241	0
Procedural Help	Easy	5.7	6.0	6.2	35	0
Tutorial	Hard	5.5	5.9	5.8	283	<1
Tutorial	Medium	5.8	5.6	6.2	272	1
Tutorial	Easy	6.2	6.9	6.6	30	0
Wizard	Medium	6.3	6.5	6.8	50	0

Usability issues (Satisfaction, Effectiveness and Efficiency)

For each and every User Assistance technique in the *Table 42*, which are tested in different Degree of difficulty situations, the Satisfaction is increasing when the Degree of difficulty is diminishing. This increasing behaviour also concern the other Usability issues, except the Effectiveness, belonging to the Tutorial and the HTML Help.

The Wizard, has for the most part, received the highest degree. Thereafter the Tutorial, the Procedural Help and last, the Contextual Help.

As mentioned earlier, the Usability Evaluation checks different properties regarding the HTML Help comparing to all the other Help features (*see* section 6.2).

Hence, is it not suitable to compare the obtained grades of the HTML Help with the corresponding figures of the remaining Help features from *Table 42*.

Quantitative data (Task time and made Errors)

When executing the hard task with the Procedural Help, resulted definitely in making most errors. The same case also required most time for completing the task.

Table 43: Comparing the solved tasks with Data

Task	Degree of difficulty	Help feature	Satisfaction	Effectiveness	Efficiency	Task Time/s	Errors made
Making a mailing list	Hard	Procedural	3.6	2.6	4.1	361	4
Making a mailing list	Hard	Tutorial	5.5	5.9	5.8	283	<1
Printing a document in A5	Easy	Procedural	5.7	6.0	6.2	35	0
Printing a document in A5	Easy	Tutorial	6.2	6.9	6.6	30	0
Printing a document in A5	Easy	Contextual	3.7	3.8	3.3	90	2
Opening a new Class Editor	Medium	Procedural	4.8	5.1	5.3	241	0
Opening a new Class Editor	Medium	Tutorial	5.8	5.6	6.2	272	1
Opening a new Class Editor	Medium	Wizard	6.3	6.5	6.8	50	0

The figures presented in *Table 43* contributes to a clear answer to which Help feature the average user prefers:

- The Tutorial

Hence, irrespective of the assigned task and the Degree of difficulty, the Tutorial is the users favourite, except for the Medium case, where also the Wizard takes part and is graded higher. But, unlike the Tutorial, the average user is uncertain, if he or she is able to solve similar tasks without using the Wizard.

The interviews of the Tutorials

The following information was revealed when we were interviewing the users regarding the tutorials:

- A general opinion of using the Tutorial is that it is very suitable for solving problems of an longer and harder character. It is easy for the user to understand and learn something about the actual topic, when he/she is working with the tutorial.
- Here, unlike the Procedural Help, the user feels that he/she gets the sufficient verification, that the task has been executed in a correct way much

thanks to the existing screen shots.

- When the degree of difficulty is of an easy character, the average user thinks that it is not necessary with all the information, the Tutorial provides. But, generally the user thinks that the Tutorial works properly.
- The average user thinks that this User Assistance technique provides information that is easy to understand and to follow.
- Another common opinion is that Tutorials suit the novice user best. But, nevertheless, regardless of experience working in GUI software, the average user sees the the Tutorial as a great help feature.

8.3 Preferable User Assistance for the Designers

As mentioned earlier in subsection 4.2.3, the maintainability evaluation used in this master thesis is based on interviews with the developers of the various User Assistance techniques.

The first five subsections, 8.3.1 - 8.3.5, handle, all the selected Help features and is concluded with subsection 8.3.6, which summarizes the gathered data.

8.3.1 Maintainability of HTML Help

When updating the HTML help, for example adding or deleting a topic belonging to a category, the change is carried out in a program called Framemaker. Thereafter the Framemaker document is converted to an HTML file and finally compiled to an CHM file.

The time consumption is usually very small and the changes can often be implemented by one developer.

8.3.2 Maintainability of Procedural Help

The procedure for correcting something in the procedural Help, is almost the same as it is for the HTML help. The first thing to do is to make the proper corrections in the belonging Framemaker document. Thereafter the document is converted to an HTML file and finally compiled to an CHM file.

The time consumption is small, approximately the same as for the HTLM help, and the changes in this case may also be carried out by just one developer.

8.3.3 Maintainability of Tutorial

If the Tutorial exists only in Book-form, an update is combined, both with great time-costs and financial costs from actually printing new copies.

If the Tutorial, however, exists as a pdf-file that can be reached via the net, the update costs are utterly reduced. Because in this way, the Tutorial can be written in Framemaker and thereafter be converted to a pdf-file.

Hence, the time consumption is of a small character. But unlike the former two Help features, HTML and Procedural Help, this Help feature may need two developers. One developer who makes the changes and one who will place the pdf-file on the correct place, so it can be reached properly via the net.

8.3.4 Maintainability of Wizard

Generally, an update of the Wizard can be carried out quite quickly. Though some changes, like adding a new button, demand operations in the code, this will not be of a severe character. This is owing to that the Wizard has its own, detached, small module, where the code can be reached and changed. So, a compilation, which is necessary after working with the actual code, concerns just this module, which then results in a small time consumption.

An update which just concerns a text string, for example adding new text, the change only has to be done in the resource file, which is carried out very rapidly. In this case it is not necessary to compile the code.

In both above mentioned cases, the consumption of time is low and presumably only one developer is concerned.

8.3.5 Maintainability of Contextual Help

In the User Test, when the Contextual help was tested and evaluated, it was above all, the Tool tip that was analysed.

All updates which concern the Tool tip are implemented in an resource file. No compilation of the source code is necessary.

Hence, the time consumption is low and only one developer is involved.

8.3.6 Comparing the Maintainability of the various Help features

In the following table, *Table 44*, the Maintainability of all the tested User Assistance techniques are compared and reviewed.

Table 44: Summary of the Maintainability of the Help features

Help feature:	Alternative	Time cost	number of developers
HTML Help:	HTML file	low	1
Procedural Help:	HTML file	low	1
Tutorial:	Book-form	High	many
Tutorial:	Pdf-file	low	1
Wizard:	GUI-update in the Code Module	medium	2
Wizard:	Text-update in the Resource file	low	1
Contextual Help:	Resource file	low	1

The figures presented in *Table 44* gives an answer to which Help feature the average developer prefers:

- No one!

Because there are no major differences, regarding the time costs of the various tested Help features. The time consumption, is almost the same for all the Help features.

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At the time of publication of this master thesis some of the articles above could be found at the following WWW addresses:

- 1) <http://www.cdf.toronto.edu/~ricks/assist.html>
- 2) <http://www.zdnet.com/devhead/stories/articles/0,4413,2137671,00.html>
- 3) <http://www.usabilityfirst.com/index.txt>
- 4) <http://www.members.aol.com/geshome/wess2000/jrwess.PDF>
- 5) <http://www.viperbilliards.com/~cmarion/PCD/MakeWayforInteractiveAsst.html>
- 6) <http://www.cisco.com/warp/public/10/wwtraining/elearning/educate>
- 7) <http://www.usnews.com/usnews/edu/elearning/articles/glossary.htm>
- 8) http://www.lboro.ac.uk/research/husat/eusc/g_dictionary.html
- 9) <http://www.bcs.org.uk/siggroup/sigist/index.htm>
- 10) <http://www.cs.umd.edu/~zzj/UsabilityHome.html>

Appendix A

User Cases

A.1 User Case 1

Task 1: Making a mailing list in Word (based on Excel data)

The Help Feature to use when solving the problem:

Tutorial

Extra information regarding the Tutorial:

- The **Tutorial** exists in paper form

To start **Word and Excel**, double-click the **Word icon** and the **Excel icon** on the desk top.

Good Luck!

Task 2: Printing a document in A5 in Word

The Help Feature to use when solving the task:

Contextual Help

Extra information regarding the Contextual Help:

- There are two ways to reach the **Contextual Help**:
 1. To get this help regarding **objects in the main window** (see *picture 1 at the other side*), choose **Help/What's This** in the context area. There after, click the object you are interested in.
 2. To get this help regarding **buttons, frames and text lines in a dialogue**, “right mouse button click” the desired object and in the menu that appears, choose **What's This**.

To start **Microsoft Word**, double-click the **Word icon** on the desk top.

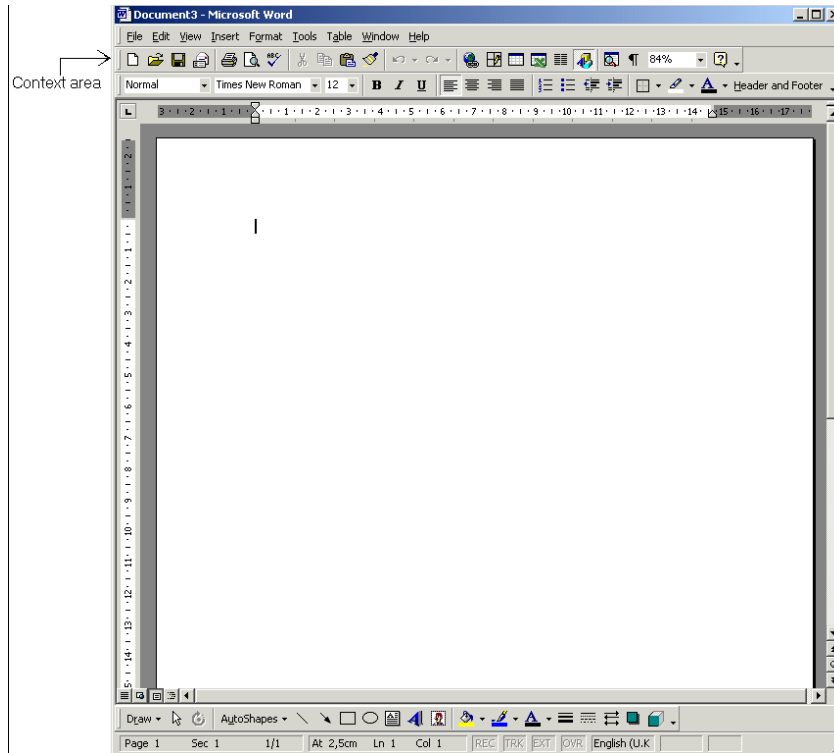
Note: Read this document before you start to solve the task (two pages)!

In this task you shall print a document in A5 format by **using the Contextual Help**.

Even If you can solve this task without the **Contextual Help**, you are supposed to imagine that you do not have this information.

You are not supposed to use the other existing Help forms, as for example the HTML Help.

Picture 1: The Word main windows



Note: When you have done the proper settings in this task, try to avoid clicking the OK button that executes the printing command!!!

Good luck!

Task 3: Opening a new Class Editor in Telelogic UML

The Help Feature to use when solving the task:

Procedural Help

Extra information regarding the Procedural:

- The **Procedural Help** exists in paper form.
- The later selected **Phase**, shall be **Analysis**, because this is the first phase when designing a new system.

To start **UML Browser window**, double-click the **UML icon** on the desk top.

Note: Read this document before you start to solve the task (two pages)!

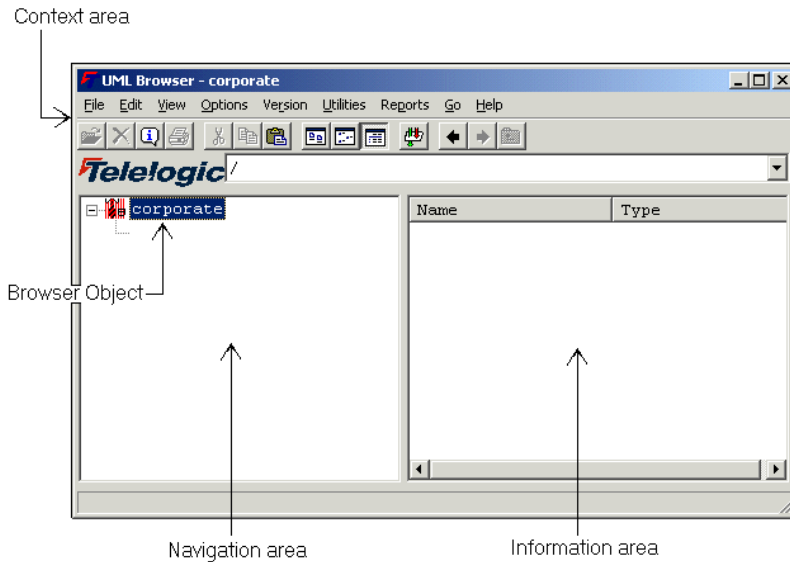
In this task you shall open a new **Class Editor** in **Telelogic Tau UML Suite**, where a new **Class Diagram** can be created. This shall be done, by using the **Procedural Help**.

About the UML suite:

*The UML suite provides a complete environment for developing object-oriented applications. It supports diagramming using the **Unified Modeling Language (UML)** notation, and provides utilities for checking diagrams, reporting on diagram contents, creating formal project documentation, managing development projects, and generating code.*

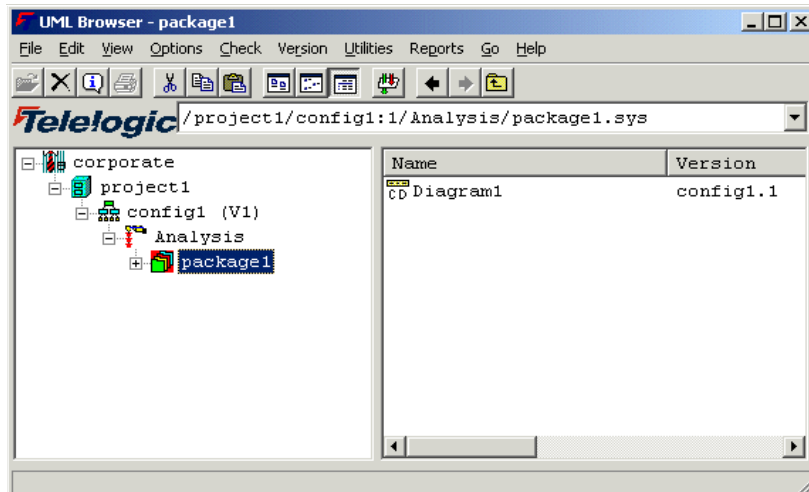
From the beginning the **UML Browser window** consists of three areas and one browser object (see UML Browser window at next side).

1. The **Context** area (top)
2. The **Navigation** area (left)
3. The **Information** area (right)



Before you can open the **new class editor**, the UML Browser Window **shall** look as follows (se picture below):

The final looks of the UML window before opening the new class editor



Good luck!

A.2 User Case 2

Task 1: Making a mailing list in Word (based on Excel data)

The Help Feature to use when solving the task:

HTML & Procedural Help

Extra information regarding the HTML & Procedural Help:

- **Procedural Help**, is a Help feature that describes a solution for a problem in step by step form.
- The Procedural Help is often located via the **HTML Help**; just enter a **search word that describes the task** in the **HTML Help**, in order to **locate** the (Procedural Help) solution of the problem.

The wanted HTML Help for this task exists in:

- **Microsoft Excel** (select **Help/Microsoft Excel Help** command in the context area).

When you have found the correct (Procedural Help) solution via the HTML Help in Excel, it is important to know:

1. **That you already have access to an existing excel file on a diskette called *Book1.xls*, with the required data.**
2. **That you are using the mailing list to *Form letters*.**

To start **Word and Excel**, double-click the **Word icon** and the **Excel icon** on the desk top.

Note: Read the next two pages in the document before you start to solve the task !

Micke Ekenstierna
Skarpskyttevägen 18a
223 12 LUND

Telefon: 046-153321

Kära Micke!

Vi har hört talas om att ni arbetar som CivilIngenjör! Om detta stämmer, så var vänlig att verifiera detta!

Med Vänlig hälsning!

Undersökningsgruppen

Note, before you start to solve the task:

- The **HTML Help in Excel** is only used to *locate the correct data* to solve the problem, which will exist in a Procedural Help form.
- This **Procedural Help**, in its turn, presents a **solution to solve the problem**.

Good luck!

Task 2: Printing a document in A5 in Word

The Help Feature to use when solving the task:

Tutorial

Extra information regarding the Tutorial:

- The **Tutorial** exists in paper form

To start **Microsoft Word**, double-click the **Word icon** on the desk top.

Note: Read this document before you start to solve the task!

In this task you shall print a document in A5 format **by using the Tutorial**.

Note: When you have done the proper settings in this task, try to avoid clicking the OK button that executes the printing command!!!

Good luck!

Task 3: Opening a new Class Editor in Telelogic UML

The Help Feature to use when solving the task:

Wizard

Extra information regarding the Wizard:

- The **Wizard** is started by selecting the **File/New/Diagram** command in the **Context area** (see the first picture).
- The later selected Phase in the **Wizard** shall be **Analysis**, because this is the first phase when designing a new system.

To start **UML Browser window**, double-click the **UML icon** on the desk top.

Note: Read this document before you start to solve the task (two pages)!

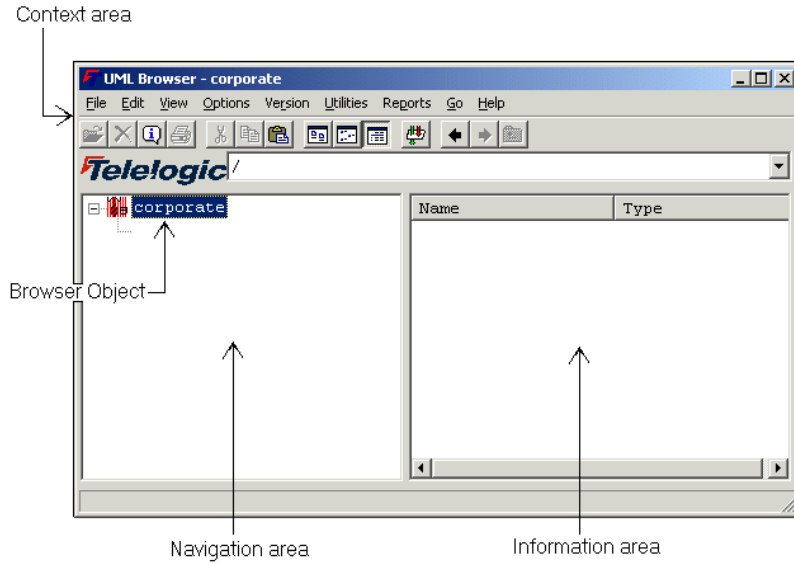
In this task you shall open a new **Class Editor** in **Telelogic UML**, where a new **Class Diagram** can be created. This shall be done, by using the **Wizard** (see the first bullet in extra information presented above).

About the UML suite:

*The UML suite provides a complete environment for developing object-oriented applications. It supports diagramming using the **Unified Modeling Language (UML)** notation, and provides utilities for checking diagrams, reporting on diagram contents, creating formal project documentation, managing development projects, and generating code.*

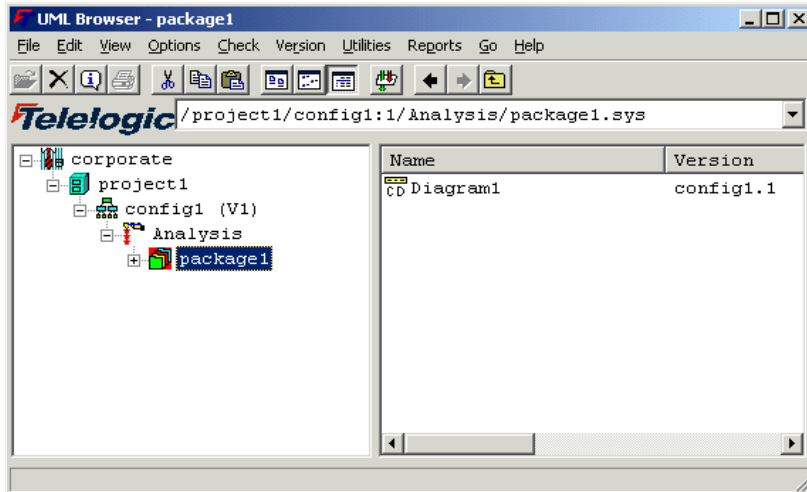
From the beginning the **UML Browser window** consists of three areas and one browser object (see UML Browser window at next side):

1. The **Context** area (top)
2. The **Navigation** area (left)
3. The **Information** area (right)



Before you can open the **new class editor**, the UML Browser Window **shall** look as follows (see picture below):

The final looks of the UML window before opening the new class editor



Good luck!

A.3 User Case 3

Task 2: Printing a document in A5 in Word

The Help Feature to use when solving the task:

HTML & Procedural Help

Extra information regarding the HTML & Procedural Help:

- **Procedural Help**, is an Help feature that describes a solution for a problem in step by step form (gradually).
- The Procedural Help is often located via the **HTML Help**; just enter a **search word that describes the task** in the **HTML Help** (in the correct tab), in order to **locate** the (Procedural Help) solution of the problem.

The wanted HTML Help for this task exists in:

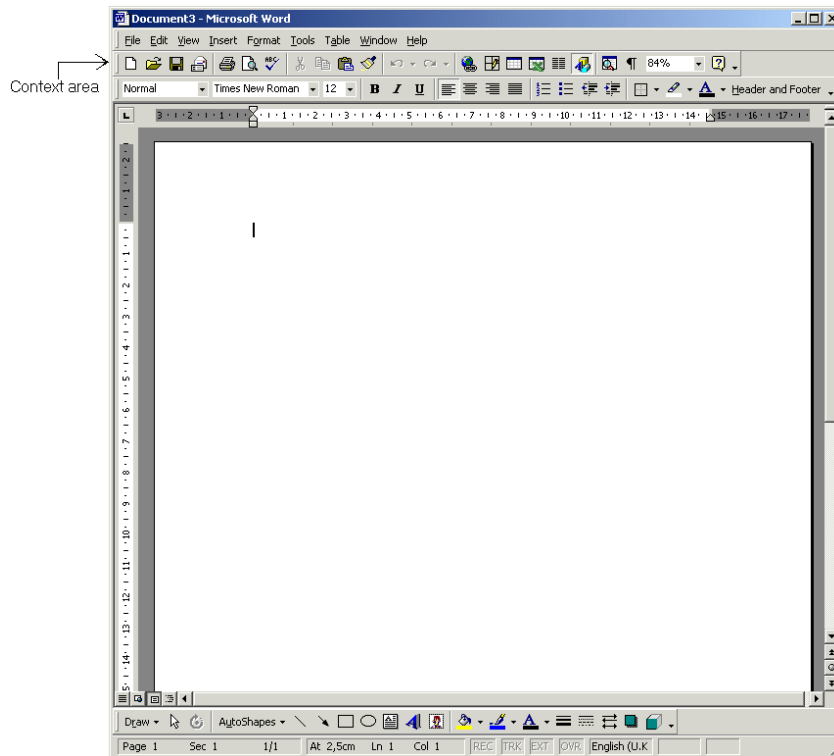
- **Microsoft Word** Select **Help/Microsoft Word Help** command in the context area

To start **Microsoft Word**, double-click the **Word icon** on the desk top.

Note: Read this document before you start to solve the task (two pages)!

In this task you shall print a document in A5 format **by using the HTML & Procedural Help**.

Picture 1: The Word main windows



Note, before you start to solve the task:

- The **HTML Help** is only used to *locate the correct data* to solve the problem, which will exist in a Procedural Help form.
- This **Procedural Help**, in its turn, presents a *solution to solve the problem*.
- **When you have done the proper settings in this task, try to avoid pressing the OK button that executes the printing command!!!**

Good luck!

Task 3: Opening a new Class Editor in Telelogic UML

The Help Feature to use when solving the task:

Tutorial

Extra information regarding the Tutorial:

- The **Tutorial** exists in paper form

To start **UML Browser window**, double-click the **UML icon** on the desk top.

In this task you shall open a new **Class Editor** in **Telelogic UML**, where a new **Class Diagram** can be created. This shall be done, by the **Tutorial Help**.

Good luck!

Appendix B

Questionnaire Form

B.1 HTML Help

Questionnaire regarding the HTML Help

Name:

Telelogic	<input type="checkbox"/>
LTH	<input type="checkbox"/>

(Grades: Disagree -- Agree, 1-7)

Statement	1 Disagree	2	3	4	5	6	7 Agree
1) Overall, I am satisfied with how easy it is to use the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
2) I can effectively locate the Procedural Help by using the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
3) I am able to locate the Procedural Help quickly via the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
4) I feel comfortable using the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
5) I made no mistakes when trying to locate the Procedural Help via the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
6) The information provided with the HTML Help is clear.	1 Disagree	2	3	4	5	6	7 Agree
7) The information provided with the HTML Help is effective in helping me reach the searched information.	1 Disagree	2	3	4	5	6	7 Agree
8) The HTML Help provided enough information to locate the wanted Procedural Help.	1 Disagree	2	3	4	5	6	7 Agree
9) Overall, I am satisfied with the ease of locating the wanted information, when using the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
10) Overall, I am satisfied with the amount of time it took to locate the wanted information, when using the HTML Help.	1 Disagree	2	3	4	5	6	7 Agree
11) Experienced and inexperienced users needs are taken into consideration in the HTML technique.	1 Disagree	2	3	4	5	6	7 Agree
12) Overall, I am satisfied with the HTML Help technique.	1 Disagree	2	3	4	5	6	7 Agree

Test group nr:

Task:

Case:	1						2						3	
Sequence:	1.0	1.1	1.2	1.3	1.4	1.5	2.0	2.1	2.2	2.3	2.4	2.5	3.0	3.1

B.2 Other Help

Questionnaire regarding the «Technique»

Name:

Telelogic	<input type="checkbox"/>
LTH	<input type="checkbox"/>

(Grades: Disagree -- Agree, 1--7)

Statement	1 Disagree	2	3	4	5	6	7 Agree
1) Overall, I am satisfied with how easy it is to use the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
2) I am able to complete my task quickly using the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
3) I am able to efficiently complete my task with help of the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
4) I feel comfortable using this «Technique».	1 Disagree	2	3	4	5	6	7 Agree
5) I made no mistakes when accomplishing the task, when I used the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
6) The information provided with the «Technique» is clear.	1 Disagree	2	3	4	5	6	7 Agree
7) The information provided with the «Technique» is effective in helping me complete tasks and scenarios.	1 Disagree	2	3	4	5	6	7 Agree
8) The «Technique» provided enough information to accomplish the given task.	1 Disagree	2	3	4	5	6	7 Agree
9) Overall, I am satisfied with the ease of completing the given task, when using the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
10) Using the «Technique» would enable me to accomplish tasks more quickly.	1 Disagree	2	3	4	5	6	7 Agree
11) Using the «Technique» would improve my performance when working with a software tool.	1 Disagree	2	3	4	5	6	7 Agree
12) My interaction with the software tool would be understandable, if I had access to the «Technique».	1 Disagree	2	3	4	5	6	7 Agree

Statement	1 Disagree	2	3	4	5	6	7 Agree
13) It would be easy for me to become skilful at using the software tool, if I had access to the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
14) I would find the software tool easy to use, if I had access to the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
15) I actually learned how to accomplish the given task, by using the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
16) By using the «Technique», I remember names, actions and use of commands.	1 Disagree	2	3	4	5	6	7 Agree
17) The task could be performed in a straight forward manner, when I used the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
18) The «Technique» was necessary to accomplish the given task.	1 Disagree	2	3	4	5	6	7 Agree
19) I will now be able to solve similar tasks without using the «Technique».	1 Disagree	2	3	4	5	6	7 Agree
20) Overall, I am satisfied with the «Technique» technique.	1 Disagree	2	3	4	5	6	7 Agree

Test group nr:

Task:

Case:	1					2					3			
Sequence:	1.0	1.1	1.2	1.3	1.4	1.5	2.0	2.1	2.2	2.3	2.4	2.5	3.0	3.1

Appendix C

Interview Form

Interviews

Name:					
Help:	Tutorial	HTML	Procedural	Contextual	Wizard

Questions regarding the test	Answers
1) What did you think about the test?	
2) Do you consider yourself as a novice or expert user?	
3) What do you think of the Contextual Help?	
4) What do you think of the HTML Help?	
5) What do you think of the Procedural Help?	
6) What do you think of the Tutorial?	
7) What do you think of the Wizard?	
8) Did you prefer any of the Help features? And if so is the case, why/(why not)?	
9) Did you learn something by using the Help feature? Which Help feature and why/(why not)?	
10) Do you think that the Help features were a necessity in all situations? If so wasn't the case, why?	
11) Did you solve the given tasks faultless? If not, why?	

12) Did you learn something by using the Help feature? Which Help feature and why or why not?	
13) Do you think that the Help features were a necessity in all situations? If so wasn't the case, why?	
14) Did you solve the given tasks faultless? If not, why?	
15) Do you think the learning threshold did differ, due to which Help feature you were using?	
16) Do you think the complexity of the task, affected your general opinion regarding the Help feature?	

Test group nr:

Case:	1						2						3	
Sequence:	1.0	1.1	1.2	1.3	1.4	1.5	2.0	2.1	2.2	2.3	2.4	2.5	3.0	3.1

