E-learning and usability: integrating the use and user dimension

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1. Introduction

As more organizations embrace e-learning and the availability of editor tools aimed at self production of content increases, so does the need for guidelines on how to plan and develop content and applications according to professional standards. To provide some guidelines we will look at one perspective to improve the quality of learning content: usability. Usability concerns the measure of a product's potential to accomplish the goals of the user.

According to Kevin Kruse (2002)\(^1\), usability and particularly user friendliness is one of the single most neglected areas in e-learning design and implementation. Too much focus on developing the application and not enough focus on the implementation is, according to Viktil (2002)\(^2\), also a major problem. The main problem, Viktil claims, is that people think the job is done when the program is developed. So even if the programs have a high quality the usability can be low. This immediately leads us to the value proposition of usability:

- Increased value for users of e-learning by increasing the quality of both content (presentation and navigation) and functionality (quality and purpose) of the application.
- Increased value by increasing quality (for the user) and cost efficiency (for the buyer) by applying usability principles in e-learning productions.
- Increase value for e-learning vendors by providing them with the possibility to offer customers qualified content according to a set of generic instructional design principles for e-learning productions.

\(^1\) e-Learning and the Neglect of User Interface Design. Available at [http://www.e-learningguru.com/articles/art4_1.htm](http://www.e-learningguru.com/articles/art4_1.htm) (17.11.02)

Firstly, this report will look into usability issues with respect to e-learning in particular. We emphasize usability as a double perspective in e-learning; it concerns the integration of both the use (aspects of use of learning application) and user perspectives (aspects of the person that learns and his/her interaction with the application and the context in which learning happens). Based on detailed analysis of literature and best practice studies, we propose an exploratory methodology for evaluating and improving usability in e-learning application. It can represent a frame of reference for companies or institutions involved in e-learning development and implementation. We focus e-learning in work settings, in public organizations and corporations, not e-learning for marketing purposes, or edutainment.

Secondly, the user – computer interface design issues we describe in this report, has a particular relevance for online learning. This report draws on a large number of usability principles and checklists, and systematizes these principles along with tools for improving usability in the learner – computer interface. We will elaborate on these principles from a pedagogical/didactical perspective to make it more relevant to e-learning than the simple interface design approach.

The report outlines a theoretical and operational framework for usability without providing explicit case studies of use. Such case studies can be found via references listed in this report.

2. What is usability, how do we achieve it?

Below are some definitions of usability with relevance to an e-learning context:

- “Usability is a measurable attribute of a product. Its definition is not standardized in the same way that, for example, some performance measurements have been assigned standard benchmarks. We cannot say something is "96.3% usable" and have people know what we mean. What we can do, however, is specify a user

profile, a set of tasks, and a context of use. Then we can measure and report such metrics as task completion time and rate, error rate, and user satisfaction”.³

• “An integral feature of e-learning design is usability, which refers to the effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments”⁴

• “Learnability” is one of the most important measures of “usability” in e-learning. In other words, learning is usually the use to which e-learning is supposed to be put. Usability, then, is defined by the ability of an object to support or enable a very particular concrete goal. Usability in e-learning is defined by the ability of a learning object to support or enable (…) a very particular concrete cognitive goal⁵

Usability then is about the use (attain a goal or effectiveness) and the process in which this is archived (for example the user – application interface).

The “use” dimension  The “user” dimension

Figure 1 “The use and the user dimension”

The design and the layout of a learning application or program must support the “use” dimension as well as the being user friendly: how to give the learner a proper tool to get the content/information that he/she and the company needs. Usability is about two questions:

• What is it that we want to archive?
• And how should we go about to achieve it?

From the user perspective these questions includes mapping out learning goals. This is a complicated issue because:

³ Mark Notess: “Usability, User Experience, and Learner Experience” http://elearnmag.org/subpage/sub_page.cfm?section=4&list_item=2&page=1
⁴ http://www.jisc.ac.uk/mle/reps/briefings/bp22.html
⁵ Haakon Kobbenes og Kristian Folkman, 2003

- Learners might not have explicit goals (that they are aware of);
- Goals are likely to be multifaceted and situated
- Goal achievement cannot be instantly measured or experienced; and
- The learners themselves do not necessarily decide the goals or determine if goals are attained

If we turn to the second question, how we should go about to achieve it, we need a model in which usability becomes an integrated part of content production at large. We have suggested in Figure 2 below:

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5 Michael Feldstein: “What Is "Usable" e-Learning?
http://www.elearnmag.org/subpage/sub_page.cfm?section=4&list_item=6&page=1

Haakon Kobbenes og Kristian Folkman, 2003
Usability considerations

Development stages

Figure 2 E-learning usability – an integrated approach

This model illustrates how the use and user dimensions can be integrated, within a process model of e-learning development. The two dotted lines separate the three main elements of the model. The vertical separates the use from the user side, and also show how these two sides will be most important in different stages of development of a
learning application. The horizontal line separate elements of usability considerations from the development process, but also indicates how these considerations can be integrated in the process.

In the analysis and development stage of the process, it is essential to:

- Analyze the context; in order to find out what kind of learning and what kind of work environment the learning application is going to support.
- Analyze the tasks and goals for the application.
- Who is the user, make sure that the application is made in order to fit the specific user group.

These three points can work as basic elements for the design and testing phases of the development. The interface design must not hinder the learner and as such inhibit obstacles to make learning happen. Key user interface design principles must be followed, in order to make the application pleasant to use. Whether the application confirms to good principles can also be tested in different ways. The information from usability tests must be fed back to the development process. Most importantly, one should have in mind creating a consistent and logical link between the use and the user side of the application. A well-balanced usability concept can be used to ease the implementation process.

The model should in addition include the diversity of learning tasks, focus groups and environments e-learning applications are used in and for. There will probably never be a standard usability manual for e-learning. What we attempt is to describe is a methodology that enable organizations to analyze learning situations in terms of contexts, tasks and participants, and assess whether a specific application is suitable and usable for that specific situation.
3. Learning as a social process

“Information is not instruction”
M. David Merrill

Before we turn to the specific principles of usability, let us consider learning as a social process and the implication for design principles.

Learning is carried out in social settings, by adopting ideas, ways of thinking and how things are done. Introduction of new learning methods like e-learning will normally alter the existing learning culture. Not only what we learn, but also how we learn becomes a major issue.

In e-learning designers often see learning as a way to remember information, which essentially is a cognitive or a behaviorist approach to learning. Though it is important to remember information, remembering is not learning. According to Bloom there are six levels of cognitive learning, from the simple recall or recognition of facts, through increasingly more complex and abstract mental levels, to the highest cognitive goal, which is classified as evaluation.

- **Knowledge**: arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, and reproduce state.
- **Comprehension**: classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, and translate.
- **Application**: apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, and write.
- **Analysis**: analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, and test.

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6 According to Kruse (2000) “The most profound statement uttered in the learning community in the last 10 years was the simple declaration by M. David Merrill, professor of instructional technology at Utah State University and a respected expert in multimedia training design: “Information is not instruction.”

7 [http://www.officeport.com/edu/blooms.htm](http://www.officeport.com/edu/blooms.htm)

- **Synthesis**: arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, write.
- **Evaluation**: appraise, argue, assess, attach, choose compare, defend estimate, judge, predict, rate, core, select, support, value, evaluate.

When you are using information you have received to perform a task, you have learnt; information becomes a tool for learning.

![Diagram](#)

Figure 3 Learning by the use of tools

To reach higher levels in the taxonomy, the importance of the social context of learning increases, especially at the three highest levels of the taxonomy. Learning cannot occur in a social vacuum at these levels and the design of learning applications has to apply to this fact. So what is the difference between e-learning and learning? In this perspective there are no significant differences between technology enabled learning and learning through other means: e-learning is just a medium, which provides content/information or learning situations with the help of internet, SMS, CD, or other applications. Learning is a personal experience that happens in a social setting.

Henschel⁸ provides seven basic principles of learning in a social context:

- Learning is fundamentally a social activity. Successful learning is often socially constructed, you learn and think much of the same things as the people that surround you.
- Knowledge is integrated in the life of communities. When we develop and share values, perspectives, and ways of doing things, we create a community of practice.
- Learning is an act of participation. The motivation to learn is the desire to participate in a community of practice, to become and remain a member. This is a key dynamic that helps explain the power of apprenticeship and attendant tools of mentoring peer coaching.
- Knowing depends on engagement in practice. We often glean knowledge from observation of and participation in, many different situations and activities. The dept of our knowing depends, in turn, on the dept of our engagement.
- Engagement is inseparable from empowerment. We perceive our identities in terms of our ability to contribute and affect the life of communities in which we are or want to be a part.
- Failure to learn is often the result of exclusion from participation.

E-learning as a goal in it self have low value for the employee using it, and it has no value for the company spending money on it. Learning for the sake of learning has low value for the adult learner. This is why content retention, as a measure on effectiveness, can be a poor measure of goal achievement in many cases. The focus must be on what the employees as individuals or as a group are capable of doing after having undertaken a course. These concerns have to be a principal guideline for achieving usability as well.

In the usability definitions quoted above, we see that usability considerations are seen related to user groups, specific goals, and learning environments or contexts.

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⁸ Henschel, P “Understanding and winning the newer ending search for talent”. http://linezine.com/6.2/articles/phuwnes.htm

Haakon Kobbenes og Kristian Folkman, 2003
4 Learning: goals and tasks

“The plans are nothing, planning is everything”
General Dwight Eisenhower

The reason for undertaking structured learning activities within a company is usually to support the companies’ need for an adequately trained staff. However, learning is also an individual endeavor, a cognitive process in the minds of individuals. As such, learning is related to both individuals’ learning experiences while at the same time aims at serving the larger organizations’ learning needs (Lai 1997). According to Sørhaug (2002) the main focus should be on company as a system. As such e-learning must be integrated in prevalent practice that support work skill requirements, not as an ad on. Learning at work is built upon work tasks or work situations, and how to master or solve specific tasks (Sangster et al 2000). Another important dimension relates to the degree of planning and structuring of learning activities. Different learning contexts need different types of applications in order to support the goal for the activity. A learning application that is usable in order to support the need for quick help may not be usable in order to support learning in a continuous perspective. The content may be similar, but the context is different. This has important implications for usability, because the context partially determines how a given application will be used. Consequently, to improve usability, analysis of the learning context is vital.

5. Introduction to usability principles.

“Know your user” seems to be one point that most commentators on e-learning can agree on. The learners in a company setting are often adult learners, and they often have another sets of motivations than young learners. Andragogy is a set of assumptions about how adults learn, and principles that are important to keep in mind when we are

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9 http://www.strategyinternational.com/talk_loewen.html
11 Computerworld, 07.11.02
facilitating for adult learning. Knowles (1984)\textsuperscript{13} poses four principles about how adults learn, that are of importance for the design of learning: (1) Adults need to know why they need to learn something (2) Adults need to learn experientially, (3) Adults approach learning as problem-solving, and (4) Adults learn best when the topic is of immediate value.

Kevin Kruse (2000)\textsuperscript{14} sums the principles of adult learning and technology up with six questions that can be of help in order to make a usable learning program for adult learners:

1. Does the program immediately capture a learner's attention?
2. Does the program explain its own relevance? Does it answer the learner's question, "What's in it for me?"
3. Are learning objectives presented? Are they specific and measurable?
4. Is the presentation of content engaging through both design and media?
5. Does the learner have an opportunity for practice and recall (beyond stale multiple-choice questions)?
6. Does the program include a final posttest or other device to indicate mastery?


\textsuperscript{14} Haakon Kobbenes og Kristian Folkman, 2003
6. Usability heuristics and implications for design of e-learning

The single most neglected topic in the field of e-learning is the interaction between students and computers

Kevin Kruse 2002

According to Kruse, in instructional design, the design of the user interface is often left to chance. According to him: “Often when students complain about computer-based training or express a preference for classroom-based instruction, it’s not the training they object to, but rather it's confusing menus, unclear buttons, or illogical links that scare them off. The success of any training program is largely dependent on the student’s own motivation and attitude. If a poorly designed interface has them feeling lost, confused, or frustrated, it will become a barrier to effective learning and information retention.”

(Kruse 2002)

Since, user “frustration” is a common problem, what ideas and tools have been developed to increase the user friendliness in e-learning applications? Smulders concludes his paper “Web course usability”16 with: “Solid instructional design and facilitation rather than good usability principles, ensures that learners have a successful and enjoyable learning experience. However, addressing usability issues guarantees that the learning environment doesn’t become a barrier to learning. Consequently, learners are able to work thought a course, with minimal distraction or frustration. If developing a web course, testing its usability will help you focus on the user and improve your design.” The main focus when we are talking about design in e-learning is to keep it simple, easy and pleasant to use. There are different levels of usability focus in design, spanning from site navigation to the use of colors, text and graphics. The principles that are mentioned here is not necessarily learning specific, they are rather principles made for making web pages

15 e-Learning and the Negot of User Interface Design. Available at http://www.e-learningguru.com/articles/art4_1.htm (17.11.02)
16 Learning circuits: http://learningcircuits.com
easy and pleasant to use.\(^{17}\) These are frequently referred to as 'usability heuristics' and are key best practice principles, or measures, of usability, which contribute towards making a web site easy to use. Jacob Nielsen has developed ten usability heuristics that are frequently used, also in conjecture with e-learning design\(^{18}\).

**Box 1: Jacob Nielsen’s 10 Usability heuristics**

<table>
<thead>
<tr>
<th>Visibility of system status</th>
<th>The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match between system and the real world</td>
<td>The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.</td>
</tr>
<tr>
<td>User control and freedom</td>
<td>Users often choose system functions by mistake and will need a clearly marked &quot;emergency exit&quot; to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.</td>
</tr>
<tr>
<td>Consistency and standards</td>
<td>Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.</td>
</tr>
<tr>
<td>Error prevention</td>
<td>Even better than good error messages is a careful design, which prevents a problem from occurring in the first place.</td>
</tr>
<tr>
<td>Recognition rather than recall</td>
<td>Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.</td>
</tr>
<tr>
<td>Flexibility and efficiency of use</td>
<td>Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.</td>
</tr>
<tr>
<td>Aesthetic and minimalist design</td>
<td>Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.</td>
</tr>
<tr>
<td>Help users recognize, diagnose, and recover from errors</td>
<td>Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.</td>
</tr>
<tr>
<td>Help and documentation</td>
<td>Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.</td>
</tr>
</tbody>
</table>

\(^{17}\) A particularly useful website for usability guidelines is [http://usability.gov/guidelines/navigation.html](http://usability.gov/guidelines/navigation.html). The authors provide an overview of general principles, and assess the evidence underpinning the principle.

Haakon Kobbenes og Kristian Folkman, 2003

Below, we will focus on some central principles, and how this thinking has been furthered within the e-learning domain.

- **System architecture and navigation tools**: The important principle is to indicate site status. Give the users a visible indication of where they are within a web site, and how their current location relates to other features. Supply pathways that identify for learners the current page, viewed pages, and levels in the information architecture. Techniques to indicate web site status include:
  - title each page
  - Use menu bars, that represent the information architecture
  - Clearly name links
  - Identify whether links are for tools other than HTML pages, such as pop-up windows for PDFs
  - Include last-updated dates

- **Learner control**: Give learners control of navigation, try to make the design obvious, and let the learner easy find back to the interesting spot. And make it very easy to go back to and find frequently used pages. Stay away from excessive linear navigation, must learners click through half of each module before reaching an assessment. It is a good idea to include an index and search function for extensive course web sites.

- **Flexibility and accessibility**: Build flexible and efficient web pages, and avoid the newest technology that’s difficult to use or incompatible with most browsers. Some basics building an easy to use web site are:
  - Include course tools that improve access to content such as an index and the possibility to make a “time out”
  - Accommodate users who need to print documents by providing printer friendly, graphics-free pages. Remember it is also difficult to print sound.\(^{19}\)

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\(^{19}\) see [http://usability.gov/guidelines/graphics.html](http://usability.gov/guidelines/graphics.html)
- Keep web pages, graphics, and download files to a reasonable size. (Design for a connection speed of 56 kbs\textsuperscript{20}) And remember that not all people have big monitors.

- **Real world link and audience:** Understanding the target audience will help define the communication style of the web site. Use learner profiles to develop instructional design, style and tone. Remember that children and adults do prefer different approach to learning. To improve the readability of a site, use natural language, avoid slang, acronyms and the like (Allen & Eckols 1997)\textsuperscript{21}.

- **Be consistent and follow standards in layout and content organization:** consistency ensures a predictable environment for learners. Create a standard look and feel for the course. In terms of content organization, the organization of content and objects should be meaningful to the user. Building a consistent information infrastructure, to organize content is advised (Allen & Eckols 1997).

- **Prevent errors:** strive to be error-free, up to date and relevant. Check code for scripting errors and whether links are current. Make sure forms submit properly, interactive tools work, attachment downloads, and so forth. Provide links to plugins and alternatives for different hardware users. According to a study from Stanford, errors make pages feel less credible.\textsuperscript{22} Help the users recognize, diagnose, and recover from errors, despite all efforts, learners will likely encounter problems. Provide documentation, troubleshooting advice to potential problems, links that points to technical support, and contact information. A running FAQ in a discussion area lets learners share logistical and technical problems can be a good idea. Also, have contingency plans for interactive exercises.

\textsuperscript{20} see [http://usability.gov/guidelines/graphics.html](http://usability.gov/guidelines/graphics.html)

\textsuperscript{21} Allen & Eckols (1997): Handbook of usability principles. Center for Learning, Instruction, & Performance Technologies San Diego State University

- **Minimalist design**: Consider using a minimalist design, not only for aesthetic purposes, but also for learning. According to Allen & Eckols (1997): “Keep the interface simple because simplicity reduces the demand on users’ brain power and focuses users’ attention on the task. Strive for simplicity in layout, screen function, structural design and other program elements. Complex or extraneous interface elements unnecessarily burden users’ working memory”. According to usability.gov stay away from spinning logos and red text on a blue background (difficult to see), or effects for its own sake, that does not help the learner, it is fun the first time, and then it becomes annoying. According to Usability.gov, you should use color wisely, and do not rely on color alone to communicate a message.\(^\text{23}\)

6.1. **Usability principles for e-learning.**

The above heuristics are general. Clark (2002)\(^\text{24}\) provides insight into usability principles based on experiments carried out at the University of California at Santa Barbara on how to optimize learning in multimedia environments. Based on this research Clark describes six principles of effective and useable e-learning interface design with the use of multimedia, particularly how to best make use of visuals to promote learning. The principles are: the multimedia principle, the contiguity principle, the modality principle, the redundancy principle, the coherence principle, and the personalization principle. These principles are typical for a cognitive approach to learning, based upon human perception and memory research. The learning effect can in this tradition often be measured in what the learners are able to recall after the learning episode has taken place.

- The multimedia principle: The idea is that adding graphics to the words can improve learning. Using the right graphics for learning can improve the learning, but the use of graphics for entertainment can depress learning. According to

\(^{22}\) see [http://www.webcredibility.org/guidelines/](http://www.webcredibility.org/guidelines/)

\(^{23}\) see [http://usability.gov/guidelines/accessibility.html](http://usability.gov/guidelines/accessibility.html)

\(^{24}\) [www.elearningGuild.com](http://www.elearningGuild.com)
Clark, it is important that graphics is congruent with the instructional message, by for instance illustrating the principle at hand. Likewise, illustrations that for instance are included for esthetic purposes or entertainment can hinder learning by taking away the learners’ focus. Consequently the lesson is use graphics wisely.

- The contiguity principle: Contiguity refers to the position of the text and graphics on the screen. “Often in e-learning when a scrolling screen is used, the words is placed at the top, and the illustration is placed under the words, so that when you see the text, you don’t see the graphic and visa versa.” According to Clark you are better off putting them close together, so that they can be seen simultaneously. The reason for this, she claims, is the brain’s limitations for remembering new things, and that the brain can’t handle learning and remembering on the same time.

- The modality principle: explaining graphics with audio improves learning. If your system supports the use of audio, it can used to support learning, particularly for explaining complex animations, or if the topic is complex and unfamiliar to the learner. In order to remember things it can be helpful hear it, especially if there is an animation that shows the learner something.

- The redundancy principle: presenting information in several formats, for instance audio, text and graphics can hurt learning, by making it confusing for the learner. According to Clark, research has showed that combinations of auditory and visual modalities can be beneficial (se above); combining three modalities can be confusing and overloading. Consequently, do not use too many presentation techniques at the same time, it too much for the brain to handle.

- The coherence principle: More effects are not necessarily beneficial for learning, and using unwarranted visuals, text and sounds hurt learning. Learner attention is a scarce good, and instruments that lead the learners focus away, are negative.
According to Clark, The Las Vegas approach by adding “glitz and games to make the experience more engaging” is not helping; it is distracting and disturbs the learners’ organization of information. The lesson is too much ornament can confuse the learner. Less is more.

- The personalization principle: Research has showed that learners respond better to applications that enable some form of interaction or engagement, and that learners like to interact even if it is with the computer. Tools that can be used to enhance the personalization principle include the use of conversational tone, natural language and pedagogical agents, such as a voice, or a cartoon on the screen.

The six principles can help increase learning in a cognitive understanding of the word, and also be a guide in order to make the learning pleasant in more social and systems approach to learning that we emphasize. As such, e-learning design to be both usable and user friendly, must integrate both perspectives.


There are different methods designed to test and determine the usability of applications, and what can be done to improve usability. Here we will briefly describe three methods, although there are many of them, particularly within usability engineering. The three approaches are expert evaluations, focus and user group evaluation, and self-evaluation tools.

6.2.1 Expert evaluation - Heuristic usability testing

There are different ways to determine if the design is user friendly. Like the method that Nielsen calls heuristic usability testing. “Heuristic Evaluation (expert review) is a diagnostic method in which experts take the role of less experienced users and describe the potential problems they see arising in a system or interface for those users. The

review is based on compliance with a set of principles (heuristics)”. These heuristics or principles, as described above are derived from empirical research, and common practice in different IT industry guidelines. In this type of testing you are using experts that are trained to find violations of general guidelines, and they are focusing on elements like language, download speed, if there is a lot of uninteresting elements on the screen. It is regarded as better to use more than one evaluator, as more evaluators find more usability problems. According to Kantner & Rosenbaum (1997)\textsuperscript{25} heuristic evaluations are especially valuable when time and resources are short. The main problem or concern with expert evaluation is that they remain surrogate users; they are experts and are not typical users of a web site or an e-learning application.

6.2.2 Focus groups – involving lead users in development

Focus groups involve is a way to gaining valuable information about usability during the course of development and design, not post hoc testing of a product or service. This is done by systematically involving the perspectives of lead users in development.

According to Shackelford\textsuperscript{26} (2002) using a focus group does have some advantages, like:

- The focus group allows you to accomplish a great deal in a compressed timeframe. Bringing everyone together guarantees that ideas get shared, and that important points are brought up for discussion.
- Focus groups provide fixed time points for project milestones; you do not have to work on a “drop dead” deadline.
- The focus group can help to keep up the activity, in order to make sure that the program is not forgotten.
- Focus groups make customers and stakeholders active participants in the design process, the use of similar solutions as a start can be a good idea, but the work

\textsuperscript{25} “Usability Studies of WWW Sites: Heuristic Evaluation vs Laboratory testing”, Reprint from SIGDOC 97 Proceedings, Published by Association for Computing Machinery, INC., 1997.
\textsuperscript{26} see http://www.learningcircuits.org/2002/aug2002/shackelford.html
should be on the current working version of the new e-learning product. It is important to have acceptance with the users. People do not learn if they refuse.

The point with using a focus group is that it should work on and reviewing a real, working e-learning product, not a throwaway prototype. When the work is done, and the delivery is made, the communication channels must be held open, and the focus group can also function as an e-learning booster for the company.

6.2.3 Laboratory testing of user experience

In laboratory testing of user experience, representatives from the target population use the application in a controlled environment. The benefit is that it enables the developers to see how real users use an application, what problems they have, and what strategies they design to overcome them. Since the laboratory provides a controlled environment where users are given very specific tasks, this evaluation method can give answers to very specific questions, and give reliable data as input in the further design process (Kantner & Rosenbaum 1997). The main problem seen with this type of testing is that it takes time and resources. Moreover, concerns are expressed as to whether users actually use applications as intended and tested in laboratories. Some therefore highlights the need for usability testing in natural environments. A recent article in Newsweek\textsuperscript{27} describes the recent trend by hard- and software developers to use social scientists in evaluating how people in real life situations use computer equipment.

6.2.4 Usability testing – do it your self?

There are a number of checklists, evaluation schemes, etc available on the net today that can enable testing and developing the usability by designers and e-learning developers themselves, and for continuous improvement. These checklists are based on the usability heuristics described above below, and they vary in their degree of specificity. Although

\textsuperscript{27} Newsweek, October 21, 2002
they pinpoint what to be on the lookout for, they usually do not give much information on how to remedy problems, and particularly lack a holistic perspective on usability. We will here only give a couple of examples (out of many) that can be consulted in detail for interested parties, and our inclusion of them do not mean that we have evaluated them for relevance or quality. They are mainly focused on web site usability.

### Box 2: Online usability checklists

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<thead>
<tr>
<th>Name</th>
<th>Where?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research-based web-design and usability guidelines (national cancer institute)</td>
<td><a href="http://usability.gov/guidelines/index.html">http://usability.gov/guidelines/index.html</a></td>
</tr>
<tr>
<td>BCIT, Usability in online courses</td>
<td><a href="http://www.id.bcit.ca/usability%20design.pdf">http://www.id.bcit.ca/usability%20design.pdf</a></td>
</tr>
<tr>
<td>STC, Usability group</td>
<td><a href="http://www.stcsig.org/usability/resources/toolkit/toolkit.html">http://www.stcsig.org/usability/resources/toolkit/toolkit.html</a></td>
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</table>

Below, we provide a summary of our main points, by way of a series of questions, which can be used by organizations to analyze learning situations in terms of contexts, tasks, and participant characteristics, in addition to considerations for user friendliness. We emphasize that we consider tests of usability should be done in conjecture with specific analysis of tasks, user groups and contexts. These considerations again must feed into the interface design and testing process as outlined in model 1 in the report.

### 6.3 Questions for analysis of e-learning usability

- Goals and tasks
  - Is learning the primary motivation behind the application?
  - What learning goals are dominant?
  - Are the goals specific enough?
  - Are they communicated clearly?
  - What indicators can we use to evaluate goal achievements?

- **Contexts**
  - Is learning carried out externally or internally?
  - How informal vs formal is the learning situation?
  - What characterizes the learning context in which we want to introduce an e-learning application?
  - In what ways do the learners communicate, and what characterizes the social learning environment?
  - Are learning goals immediate, short or long term?
  - What are the physical frame-factors for learning?
  - Is certification necessary or wanted?
  - What time factors must we take account of?
  - How do these factors determine learning environments, and do we understand them well enough?

- **Participants**
  - How well do you know the target user group in terms of previous competencies and experiences, learning self-efficacy, motivation and inhibiting work/time/space requirements?
  - Is the application likely to motivate an adult learner?
  - Are goals and motivations relevant and evident?
  - Can learners’ experiences be accommodated?
  - Is the application flexible in terms of time outs?
  - Is the application close to practice, real-life problem solving or tasks?

- **User interface**
  - Do the user interface inhibit learning; are users frustrated?
  - Are key usability heuristics accommodated?
  - Is the information infrastructure visible and easy to navigate?
  - Does the learner have control?
  - Is the application accessible to all?

- Does the communication style match the audience?
- Is the design minimalist and consistent?
- Is there sufficient support?
- Is there a logical link between learning goal/task and design?
- Do we put strain on human memory and perception?

• Integration
- Is there a logical link between user interface, the content, the context, the user group characteristics and the learning goals?
- To what extent does the user interface enable different types of goals and measures of achievement?
- To what extent is the application usable in a specific physical and social learning context? Can we work with the dominant learning patterns?
- Are learners characteristic reflected in design and structure?
- How can we accommodate closer integration in development, design, and implementation of e-learning applications?