Watch Out for the Preview: The Effects of a Preview on the Usability of a Content Management System and on the Users' Confidence Level

Daniela Reddig
digital-ink mediadesign
d.reddig@digital-ink.de

Joyce Karreman
University of Twente
J.Karreman@utwente.nl

Thea van der Geest
University of Twente
T.M.vandergeest@utwente.nl

Abstract

As time moves on, a trend crystallizes that sets new requirements on Content Management Systems. The circle of users shifts from a small technically experienced group to a large network of inexperienced editors. Literature stresses that a higher need for usability is present if personnel with a low grade of human computer interaction expertise is using a system. But how can system designers accomplish a high level of usability? This study suggests a preview as an important factor for strengthening the usability (effectiveness, efficiency and satisfaction) of a Content Management System. The findings of this study support the hypothesis: the results showed that a preview enhances the users' satisfaction with the system. Moreover, the study shows that the users' confidence to be able to work with the system is an important factor; the results showed positive correlations between confidence and satisfaction and between confidence and effectiveness.

Key words: usability, Web site design, inexperienced users

Introduction

A content management system, or CMS, is an application designed to make it easy for non-technical users to add, edit and manage content to be distributed in different channels like a Web site or print documents. Therewith, it is made possible to publish information without specialised knowledge about the underlying technical implementations. Ovum and others already predicted several years ago that the market for content management tools would grow [1]. They have been proven correct.

Due to this development, a CMS is not used any more exclusively by large organizations. Many medium-size businesses have also established CMS support for their Web site [2], [3]. The circle of editors shifted from a small group who updated Web sites to a large network of editors managing the knowledge of their companies online. Nearly none of those people have advanced knowledge in human computer interaction.

Arora and Pannan stress that a higher need for *usability* is present if users with a low grade of expertise use a CMS [4]. Usability is defined in the standard ISO 9241, part 11 as "the extent to which a product can be used by specific users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use" [5]. Stone et al. define effectiveness as "the accuracy and completeness with which specific users can achieve specified goals in particular environments". Efficiency is defined as "the resources expended in relation to the accuracy and completeness of the goals achieved". Satisfaction describes "the comfort and acceptability of the work system to the user" [6].

Which characteristics does a CMS need to have when it is used by inexperienced users? This question was asked by a German software company that produced a CMS that had to be improved; it seemed to be too difficult for inexperienced users. In this paper, we describe the studies that we conducted to improve the usability of this system and to formulate general suggestions for the design of a CMS. We focused on the effects of integrating a preview in the CMS. Before our study, no preview was included in the CMS.

Literature about the effects of a preview

In direct manipulation interfaces, users can see what they produced immediately. Feedback is assumed to be very important here. "Feedback is information received by an individual about his or her past behaviour" [7]. Research indicates that feedback is important in diverse contexts.

978-1-4244-2086-5/08/$25.00 ©2008 IEEE

Farkas mentions feedback as an important component in the context of instruction writing to identify the system status [8]. The verification of screen states is also found to be an important factor for improving performance under some circumstances [9], [10]. This has, for example, been examined in the context of learning to perform software [11]. Users who learn using software with a visual manual need less time to verify screen states and make significantly less errors than subjects learning with a text-only manual ([11], pp. 234-235). Although this study focuses on learning with software instructions, we may assume that these findings are generalisable to other contexts. Feedback that allows users to verify the results of their actions (a preview) may help to interpret system reactions in the context of interface interaction.

Literature also suggests that *confidence* is an important factor for inexperienced users of complicated systems. Loorbach, Karreman and Steehouder showed that adding confidence enhancing elements to a manual has positive effects on the users' effectiveness [12]. The confidence enhancing elements in their study partly consisted of sentences that precisely described the outcomes of the users' actions. These elements allowed the users to check whether they had performed the correct actions. These textual elements had the same function as a preview of a Web site that is being designed with a CMS. Therefore, it might be that adding a preview has positive effects on the users' level of confidence. And that the level of confidence is correlated with the users' effectiveness or, in general, with the usability of the CMS.

Investigating the users' needs

Two studies about the users' needs were conducted to help optimising the system interface that was tested in the main study.

First, we interviewed six experts: two project leaders who supported the implementation of the system in their companies, two helpdesk employees, a lecturer of introductory workshops about the system and a division leader for the technical implementation of the system. The results of the interviews clearly showed a need for a more usable system. The experts considered the system as difficult to understand and confusing. Moreover, they expressed a need for more feedback on the actions that the users perform.

Second, a questionnaire was developed to ask the actual users of the system about the system's usability and about the tasks that they perform with the system. This questionnaire was based on two existing questionnaires: the subjective IBM usability measurement for systems and the evaluation questionnaire according to the international ergonomic norm ISO 9241 [13], [14]. Our questionnaire consisted mainly of statements that had to be answered on a 7 point scale from "I strongly agree" to "I strongly disagree".

The questionnaire was sent to approximately 500 people who worked in companies that were using the CMS. They were editors who were assumed to use the system for basic functions on a regularly basis. The response rate was very low. Only 22 editors completed the questionnaire. Some others let us know that their company did not seem to work with the system any more: "Unfortunately, I have to say that the system did not establish at any place in our company in the long run."

The mean scores of the 22 respondents on the questions about usability are around the middle of the scale or below. This implies that the users do not consider the system to be easy to use. Important questions that scored below the middle of the scale are: "Overall, I'm satisfied with the system" and "It is easy to find the information I need".

Generally, it can be concluded that this system needs to be improved. And, more specifically, it can be concluded that adding a preview might have positive effects. We firstly improved the CMS, based on the experts' suggestions in the interviews and the results of the questionnaires. After that, we designed two different conditions of the improved CMS, one with a preview and one without a preview. An experiment was conducted to test the effects of adding a preview to a CMS. The remainder of this paper is about the experiment.[1]

The expected effects of a preview

Three hypotheses about the effects of a preview that is integrated in a CMS were tested:

- A preview positively affects the three usability components: effectiveness, efficiency and satisfaction.
- A preview positively affects the users' level of confidence during task performance.
- Positive correlations exist between confidence on the one hand, and the three usability components on the other hand.

[1] More information about the design process of the CMS can be obtained by contacting the first author.

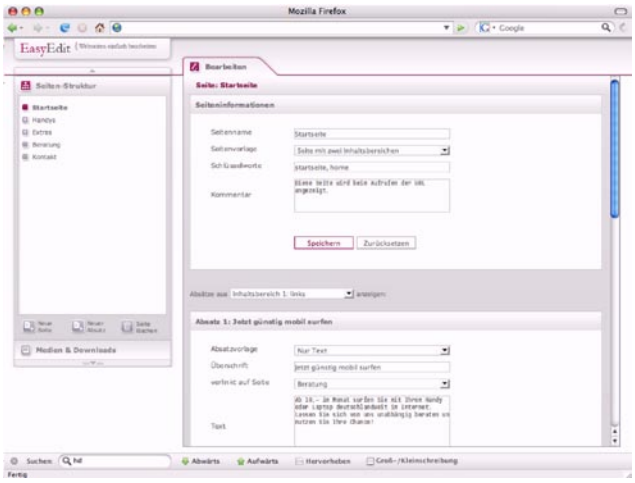

Figure 1 Editing mode of the interface

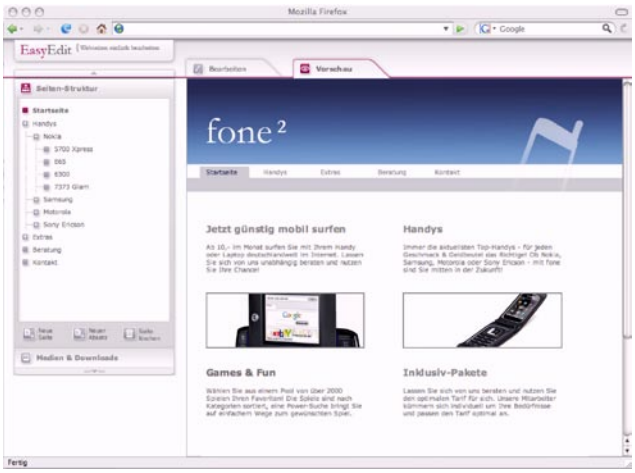

Figure 2 Preview of the Web site

Method

Participants

Students of the University of Twente in the Netherlands participated in this study for course credit. A total number of 40 native speakers of German (27 female, 13 male) were assigned to the two conditions with equal distribution. The participants' mean age was 20.7 years. They used a computer for on average 17 hours a week, but they had no expertise with Content Management Systems.

Content Management System

We developed a new, easy edit interface for the Content Management System, based on the results of the interviews with the experts and the survey among the users of this system. Two versions of this interface were created for this study: one interface that offered only an editing mode and no preview (see figure 1) and one interface that offered an editing mode and a preview at any moment that the user asked for one (see figure 2).

A fictitious Web site for a mobile phone company was created as context. The Content Management System can be operated for this Web site. We chose the topic of mobile phones for two main reasons. Firstly, we expected that the user group for the study was interested in this topic. So, this topic is expected to be motivating. Secondly, the probability that users have already some knowledge of the topic is expected to be high. Mobile phones play an important role in today's life of young people and nearly everyone owns one.

Some prior knowledge can be advantageous because it brings the participants closer to the actual user of Content Management Systems, who is expected to have some knowledge of the Web site content while having average to little experience in using Content Management Systems.

Procedure

The study was conducted individually. It took 30 minutes in total. First, the experimenter shortly explained the study to the participant. Then, the participant read an explanation on paper about the created situation for the experiment. After that, the participant watched an introductory video of approximately 3 minutes on the screen of the experimental computer. The video shortly introduced how the system worked and which actions could be undertaken.

After the introduction video, the participants started to perform tasks with the system. Each task was presented on a paper card that the participant had to read to the end before he started conducting the task. The participant could reread the description at any moment during task performance. After the participant said that he was finished or after he exceeded the time limit for that particular task, the experimenter gave him a new task description. All participants conducted three tasks in the same order. The tasks ascended from easy to more difficult.

Tasks

First task The participants were asked to change the alignments of the paragraphs and pictures on the Web sites of the mobile phones.

Second task The participants were asked to create a new, simple Web site for a new mobile phone.

Third task The participants were asked to create a completely new W eb site, according to a picture of that Web site.

We divided the three tasks in 21 subtasks.

Measures

The effects of the preview on four dependent variables were measured.

Effectiveness was measured by counting the number of subtasks that were completed successfully.

Efficiency was measured in two different ways. First, the time that the participants needed to finish each subtask was measured. Second, the number of mouse clicks that the participants needed to finish a task was measured.

Satisfaction was measured by a small survey that consisted of three questions, at the end of the study : 1) I am satisfied with this editing interface, 2) I would by this editing interface if I needed such a system, 3) I would advise this editing interface to my employer. Furthermore, satisfaction was measured while the part icipants performed the tasks. After the participants saved changes or fi nished a wizard, a pop up window appeared that asked: "How satisf ied are you at t he moment with the system?" The participants could answer on a 7 point scale from "not at all" to "very".

Confidence was measured during task performance, at the same moments that the part icipants were asked about their satisfaction with the system . The pop up window contained a second question: " How confident are you at the moment that you can finish this task correctly?" The participants answered this question using the same 7 point scale as they used answering the question about their satisfaction. After they had answered the question on the pop up window, they could continue with the task.

Results

The effects of the preview on the three usability components

It was hypothesized that a preview would positively affect the users' effectiveness, their efficiency and their satisfaction with the system. We executed *t tests* (using SPSS 14.0) to test the differences between the results of the participants in both groups. The results are summarized in table 1.

Effectiveness The participants who used the system with a preview completed on average somewhat more subtasks correctly than the participants who used the system without a preview. However, this difference was not statistically significant.

Efficiency The results show ed that particip ants who used the system with a preview we re less efficient than the participants who used the system without a preview. The difference is not statistically significant with regard to the time that the participants needed to complete the tasks, but the differe nce is statistically significant with regard to the number of mouse clicks ($t(38) = 2.68$, $p < 0.05$). These results, that are contradictory to our hypothesis, can be explained as follows. U sing the preview asks for two extra mouse clicks, one t o show the preview and one to go back to the editing mode. We repeated the *t test* after subtracting the mouse clicks that were needed to switch to the preview. This test did not show a difference between the numbers of mouse clicks that the two participant groups need ed. However, the hypothesis about a positive effect of the preview on efficiency has to be rejected.

Satisfaction The expectation about the positive effect of a preview on satisfaction about the system is confirmed. The participants who use d the system wi th a preview answered the three questions about their satisfaction at the end of the study more positively than the participants who used the system without a preview ($t(38) = 2.57$, $p < 0.05$).

Table 1. The effects of a preview on the usability of the Content Management System (means, standard deviations between brackets).

	Without preview (n=20)	With preview (n=20)
Effectiveness (maximum = 21)	14.18 (2.71)	15.37 (3.49)
Efficiency (number of clicks)	20.40 (16.51)	34.70 (17.23)**
Efficiency (time; minutes: seconds)	10:33 (3:37)	12:19 (2:59)
Satisfaction[a] (7 point scale)	4.32 (1.37)	5.33 (1.11)*

n Number of participants who used the version of the Content Management System
a Mean score on the three questions about satisfaction (Cronbach's alpha is 0.92). A higher score means a higher level of satisfaction.
* $p < 0.05$
** $p < 0.01$

Satisfaction and confidence during task performance

Satisfaction and confidence were measured during task performance. At several moments, a pop up window appeared on the screen with a question about the participants' satisfaction with the system and a question about the participants' confidence, at that moment. See table 2 for the participants' mean scores on these questions. As expected, the participants who used the system with a preview were on average more satisfied with this system than the participants who used the system without a preview ($t(38) = 2.82$, $p < 0.01$). The difference between the confidence levels of both groups is not statistically significant. The hypothesis regarding the positive effect of a preview on the participants' confidence level can not be confirmed.

Table 2. The effects of a preview on the satisfaction and confidence during task performance (means, standard deviations between brackets).

	Without preview (n=20)	With preview (n=20)
Satisfaction (7 point scale from "not at all" to "very")	4.42 (1.15)	5.40 (1.05)**
Confidence (7 point scale from "not at all" to "very")	4.64 (1.46)	5.11 (1.08)

n Number of participants who used the version of the Content Management System
** $p < 0.01$

Correlations between confidence and usability components

We expected that the usability of the Content Management System would positively correlate with the participants' level of confidence. The results partly confirmed this hypothesis. Tests to calculate the Pearson correlation coefficient showed:

- A statistically significant positive correlation between confidence and effectiveness ($r(38) = 0.47$, $p < 0.01$).
- No correlation between confidence and efficiency.
- A statistically significant positive correlation between confidence and satisfaction ($r(38) = 0.59$, $p < 0.001$).

This means that the higher the number of correctly completed subtasks and the higher the satisfaction with the system, the higher the participants' level of confidence was.

Conclusion and Discussion

We are aware of the limitations of this study. The participants were university students instead of the actual users of the system and the number of participants was rather low. Because of this, the results can not be generalised too far. However, together with the results of the two investigations of the actual users' needs, the results of the experiment provide a good argument for the statement that a preview integrated in an editing environment of content management has positive effects on the system's usability.

These results were expected, based on our literature study. However, the literature did not specify which effects a preview exactly would have on the different components of usability and on the confidence level of the users.

The results showed that a preview positively affects the users' satisfaction with the system and their effectiveness. The results also show that a preview does not positively affect the users' efficiency. It rather seems to be the other way around: users of a system without an integrated preview seemed to be more efficient than users of a system with an integrated preview, although those differences were not statistically significant. A possible explanation for this observation is that users are able to detect their errors when they watch the preview. When a user sees the result of his work and recognizes that he has done something wrong, then it is probable that he tries to correct this. It is undoubted that it takes some time to recover from faults.

We also expected that a preview would have positive effects on the users' level of confidence. Although the results do not show a statistically positive effect of the preview on the users' confidence level, the results do show that confidence is an important factor. Positive correlations between confidence and effectiveness and confidence and satisfaction were revealed. More research in this area is needed to investigate the effects of confidence more precisely.

In general, the results of this study show that a Content Management System with an integrated preview allows inexperienced users to publish information in an easy way. With the preview, users are able to discover errors that they made and they have the opportunity to correct them. This makes them less efficient but more effective and - most importantly - much more satisfied!

References

[1] Ovum. *Advising on the commercial impact of technology and market changes in telecoms, software and IT services.* [Online]. Retrieved from: www.ovum.com. 2000

[2] Noga, M., & F. Krüper. Optimizing Content Management System Pipelines, Separation and Merging of Concerns. Generative Programming and Component Engineering. *Proceedings of the ACM SIGPLAN/SIGSOFT Conference, GPCE 2002, Pittsburgh,PA, USA*. Berlin / Heidelberg: Springer, October 6-8, 252-267, 2002

[3] Goodwin, S., & R. Vidgen. Content, content, everywhere... time to stop and think? The process of Web content management. *Computing & Control Engineering Journal*. 13(2): 66-70, 2002

[4] Arora, N. & L. Pannan. Combining available standards and tools to build a compliance oriented website management system. *Proceedings of The Eleventh AustralianWorld Wide Web Conference*. Gold Coast, Queensland, Australia, 20-37, July 2005

[5] British Standards Institution. *Ergonomic Requirements for Office Work with Visual Display Terminals. BSI EN ISO 9241 - 11:1998. Part 11: Guidance on Usability.* London: BSI, 1998

[6] Stone, D., C. Jarrett, E.M. Woodro, & S. Minocha. *User Interface Design and Evaluation*. San Francisco: Morgan Kaufmann Verlag, 2005

[7] Annett, J. *The effects of knowledge of results, incentives, and reinforcement on training and performance. Feedback and human behaviour*. Baltimore, MD: Penguin Books, 1969

[8] Farkas, D. K. The logical and rhetorical construction of procedural discourse. *Technical Communication*, 46(1), 42-54, 1999

[9] Kluger, A.N., & A. DeNisi. The effects of feedback interventions on performance: A historical review, a meta analysis, and a preliminary feedback intervention theory. *Psychological Bulletin*, 119(4): 254-284, 1996

[10] Locke, E.A., & G.P. Latham. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice - Hall, 1990

[11] Gellevij, M., & H. van der Meij. Empirical proof for presenting screen captures in software documentation. *Technical Communication,* 51(2): 224-238, 2004

[12] Loorbach, N., J. Karreman, & M. Steehouder. Adding motivational elements to an instruction manual for seniors: Effects on usability and motivation. *Technical Communication, 54*(3), 343-358, 2007

[13] Lewis, J.R. (1993). IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use. *IBM Technical Report, 54.786*, 1993

[14] Prümper, & J., M. Anft. Die Evaluation von Software auf Grundlage des Entwurfs zur internationalen Ergonomie -Norm ISO 9241 Teil 10 als Beitrag zur partizipativen Systemgestaltung - ein Fallbeispiel. In: K.-H. Rödiger, *Software-Ergonomie '93*. Stuttgart: Teubner, 145-156, 1993

About the Authors

Daniela Reddig holds a Master degree in Communication Sciences. She graduated cum laude as an international student at the University of Twente, the Netherlands. Before, she has completed her Bachelor studies in the field of applied informatics and design at the University of Bielefeld, Germany. She is involved in the design process of content management interfaces at the e-Spirit AG, Germany. Her research interests focus on the usability of new media.

Joyce Karreman is an assistant professor in the Communication Studies / Technical and Professional Communication Department at the University of Twente, the Netherlands. She teaches courses in document design, user support and academic writing. Her research interests include the use and effects of different information types in instructive texts and the design and evaluation of texts on the Web.

Thea van der Geest is an associate professor in the Communication Studies / Technical and Professional Communication Department of the University of Twente, The Netherlands. She teaches courses in interface and interaction design, web design and research methodology. Her research focuses on the process of web design, methods for evaluating Web sites, usability and accessibility, and information and document design for new media.