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Testing 20 guidelines for usable web forms: How do they perform  
when used together?

Master's Thesis of:

**Peter Hänggli, B.Sc.**

e-mail: Peter.Haenggli@stud.unibas.ch

Faculty of Psychology

Department of Cognitive Psychology and Methodology

University of Basel

April 2012

First Reviewer: Silvia Heinz, M.Sc.

Department of Cognitive Psychology and Methodology, University of Basel

Second Reviewer: Prof. Dr. Klaus Opwis

Department of Cognitive Psychology and Methodology, University of Basel

**Abstract**

Web form usability often is critical for the functioning of a web site. E-commerce web sites gather the user's billing information via web form, and if the user is unable to interact with the form, the owners of the web site can not sell their products. The aim of this study was to test 20 guidelines for web form usability in a realistic setting. Three existing web forms were improved to adhere to the guidelines, then the original and the improved versions of those three forms were rated by 120 participants in an online survey. Objective and subjective measures both indicate a trend that the improved versions are more usable, although only few of the measures were significantly better. This suggests that the 20 guidelines could indeed be a valuable tool to enhance the overall usability of web forms, but more research needs to be conducted to test individual guidelines and to enhance their tangibility.

## **Testing 20 guidelines for usable web forms: How do they perform when used together?**

### **Introduction**

Websites fulfil many functions, for example e-commerce, entertainment, or information as can be seen on Alexa, a website that specialises on gathering statistics about websites (<http://www.alexa.com/topsites/category>). Many of those functions require the user to submit personal information, e.g. to submit billing information, or to create an account. Most websites use forms to gather information from their users. If the user is unable to submit his or her information, the website cannot fulfil its function. In case of an e-commerce website this would mean that the user cannot buy anything, since he or she cannot submit his billing information. The user's inability to submit the personal information can have two reasons: Either there's a technical problem with the form, or, if the form isn't usable, that the user doesn't understand how to interact with it. Wroblewski (2008) states that unusable forms lead to customers aborting a transaction prematurely, which results in a loss of profit. This is not surprising, considering websites are generally not visited with the goal to fill in a form. Forms are only a means to get what the user really wants, namely to take advantage of the website's service. If a suboptimal form is successfully redesigned, it may lead to an increased completion rate in the range of 10%-40% (Wroblewski, 2008). Considering the importance of e-commerce, which is illustrated by fact that already in 2006 sales from e-commerce were \$87.8 billion US dollars combined in the UK, Germany, and France, the three largest economies in Europe (Grau, 2006). These findings lead to an obvious question: What makes an online form usable? The next section aims to give an overview over the research that has been published in this area.

### Theoretical background

Bargas-Avila, Brenzikofer, Roth, Tuch, and Opwis (2010) propose to divide the usability of a web form into five different topics: (1) form content, (2) form layout, (3) input types, (4) error handling, and (5) form submission.

1. Form content: It is a basic concept of user-centered design to ease the understanding of a virtual environment by trying to match it to a natural environment which the user is already familiar with (Garrett, 2010). The familiarity with a concept in one environment makes it probable that the user also understands it in the other environment. Bargas-Avila et al. (2010) give the example of using the same layout for a paper form and for a web form. Users may get annoyed if they are asked to divulge a lot of non-critical information, which also makes the fill-in process longer than necessary (Beaumont, James, Stephens, & Ullman, 2002). It must be possible for users to distinguish between required and optional fields (Linderman & Fried, 2004; Willhelm & Rehmann, 2006). According to Pauwels, Hübscher, Leuthold, Bargas-Avila, and Opwis (2009), this is accomplished best by highlighting the required-fields with color coding, instead of the more widespread use of asterisks as markers for required-fields.

2. Form layout: If a web form is broken down into its components, those components consist mainly of different labels and input fields (e.g. free text entry, drop-down menus, checkboxes, etc.). This naturally poses the question of how to arrange the different components. Penzo (2006) recommends to place the label above the corresponding input field, since his eye-tracking experiment showed that this helped the participants to complete the test forms faster than when the label was placed to the left or right of the input field. Furthermore, Robinson (2003) states, that a form should consist of only one column, and that only one question should be asked per row. Wroblewski (2008) recommends matching the length of an input field to the length of the expected answer, which leads to less input errors (Couper, Traugott, & Lamias, 2001).

3. Input types: Miller and Jarret (2001) recommend to restrict the number of different input types to avoid confusing the user. Users prefer textboxes, so they should be used as often as possible (Beaumont et al., 2002). However, restricting the users freedom can have advantages, namely helping to avoid errors, prevent users from entering unavailable options, and simplify the decision process (Bargas-Avila et al., 2010). Linderman and Fried (2004) recommend using checkboxes, drop-down menu, or radio buttons. Radio buttons and drop-down menus are used to select a single option out of few and many options respective, while checkboxes are used to select multiple options. The options of a drop-down menu should be arranged in a meaningful order (e.g. weekdays), or, if no meaningful order is obvious, in an alphabetical order (Beaumont et al., 2002). Textboxes should accept any format of input, as long as this does not cause ambiguity (Linderman & Fried, 2004; Myers, 2006). This prevents the user from making avoidable errors.

4. Error handling: The goal for an ideal form would be, that the user does not make any mistakes, and therefore does not get to see any error messages. However, in reality one usually has to settle for preventing as much errors as possible. One source of errors are fields with format restrictions, such as passwords, user names, etc. To prevent errors in such occasions, format restrictions should be stated in advance by communicating the imposed rule (Bargas-Avila, Orsini, Piosczyk, Urwyler, & Opwis, 2011). If errors can not be avoided, users should be told in an easily understandable way what the problem is, and how they can solve it (Linderman & Fried, 2004; Nielsen, 2001). The error should be highly visible, using color and text to highlight the problem area. Seckler, Tuch, Opwis, and Bargas-Avila (2011) specify, that the error message should be shown to the right of the corresponding input field.

5. Form submission: Web forms should avoid reset buttons that clear all the data from the input fields. They do not provide any additional value, and can be clicked by

accident, which can be a source of frustration for the user (Linderman & Fried, 2004; Robinson, 2003; Wroblewski, 2008). Brenzikofer (2009) tried in her master's thesis to compile a set of 20 guidelines (see Appendix A, Table A1) with the aim to give an overview that gathers the work on particular components of a web form. The guidelines could then be used to design web forms that are usable in all their individual aspects. The article of Bargas-Avila et al. (2010) is based on Brenzikofer's master's thesis and published the guidelines.

Although these guidelines try to cover all the aspects of designing a usable web form, there are, to our knowledge, no studies that look into whether those individual improvements also withhold when combined and used to improve a form as a whole. Does the objective and subjective usability of a web form significantly improve when redesigned to abide by the guidelines? And, considering most of the previous studies have been conducted in a scientific setting, does this also apply when tested with a more realistic approach? Another question is: Are the guidelines themselves usable? Are they tangible enough that someone consulting them to design a web form will know what he or she has to do?

#### *Aim of the study*

The aim of this study is to evaluate, if the 20 guidelines promoted by Brenzikofer (2009) can be used to make web forms usable, as claimed by Brenzikofer (2009) and Bargas-Avila et al. (2010). The results of this study can help to determine if the guidelines already can be used as a checklist for web forms, or if there is a need for further research. The benefit of a checklist would be, that all the critical points for the usability of a web form are gathered in one place, and can be used to either improve existing forms, or to develop new forms that are usable from the beginning. The guidelines were used to identify existing web forms with bad usability. Three forms were then copied, and a

second version of each was created, which was adapted to adhere to the guidelines. This resulted in six different forms, three originals and three improved versions of those originals. Each form was then individually tested for usability by asking participants to fill them in, and then rate them. The subjective usability was measured with three usability questionnaires and one affective questionnaire. Additionally, the time it took the participants to complete a form, and how many times they had to click on the form's submit button before receiving no error messages, were measured, to obtain objective data about the forms usability. The hypotheses were, that the improved versions of the forms would firstly receive higher ratings from the four questionnaires, and secondly take less time and less submits to complete.

## Method

### *Research Design*

For this study an unrelated samples design was used. The independent factors were the factor form (Dell, Baublatt, Raiffeisen) and the factor guideline compatibility (original, improved). This resulted in a 3x2 design with six different experimental conditions, of which each participant saw one. Only showing one form per participant served to shorten the duration of the study, as this reduces dropouts in online surveys (Hoerger, 2010). The dependent variables were subjective user satisfaction, and efficiency (time spent to complete form) plus effectiveness (number of submits until no error messages were shown) as objective measures (Hornbaek & Law, 2007). Table 1 shows for each of the three forms how many and which guidelines it violates, which is how the participants encounter the form in the original condition. In the improved condition, the forms have been adapted to adhere to all the guidelines.

Table 1

*Which form violates which guidelines*

Form Name	No. of Guidelines Violated	Guideline Numbers
Baublatt	10	2,4,7,10,12,14,16,17,19,20
Dell	7	1b,5,10,14,15,16,17
Raiffeisen	10	1b,2,4,7,10,12,14,15,17,20

*Note:* For a full list of the guidelines see Appendix A, Table A1

### *Measurements*

The objective measures were attained using a tracker tool on the server which recorded page load and unload as well as every action the participants performed on the form (such as clicking on elements), with a timestamp that measured to the second. Efficiency was operationalized as the time it took the participant to complete the form

(Hornbaek & Law, 2007), by measuring the time from the page load until the click on the button on the confirmation page, which brought the participants back to the survey. Effectiveness was operationalized as the number of encountered errors (Hornbaek & Law, 2007), by counting the number of clicks on the submit-button. This was hypothesized to represent the number of times a participant encountered one or more error messages after clicking the submit-button. This method was chosen because counting each individual error message proved to form a substantial technical obstacle. User satisfaction was measured using four questionnaires. Three of them, namely the After-Scenario Questionnaire ASQ (Lewis, 1991), the System Usability Scale SUS (Brooke, 1996), and the Self Assessment Manikin SAM (Lang, 1980), have been validated while the fourth, the Form Usability Scale FUS (Aeberhard, 2011), is not yet published, and is currently subject to further validation. The ASQ measures the participant's satisfaction with a completed task, with three questions about the participant's satisfaction with the difficulty, the duration and the support information of the task. The participants rated these questions on a 7-point Likert scale (1 = completely disagree, 7 = completely agree). The questions were adapted to refer to filling in forms instead of completing tasks. The SUS was developed to provide a tool which could measure the usability of a given system, as economical and quick as possible. Participants rated nine questions on a 5-point Likert scale (1 = completely disagree, 5 = completely agree). Again, the questions were adapted to refer to a form and question number five of the original ten was eliminated because it referred to repeated use over an extended timespan, which is not suitable for a form that is normally only used once. The FUS is a questionnaire which has been developed specifically to rate the subjective usability of a web form, with questions about the efficiency and understandability of the form. Participants rated nine questions with a 6-point Likert scale (1 = I completely disagree, 6 = I completely agree) plus a "I cannot answer that" option. The SAM is a non-verbal pictorial rating scale with the three

dimensions pleasure, arousal, and dominance. The dominance dimension was not used in this experiment. Participants rated the two dimensions on a 5-point pictorial scale.

### *Materials*

The goal was for the study to be as close to reality as possible. To achieve this, it was decided to firstly concentrate on real, existing web forms and secondly to test the participants in the environment in which they would normally encounter those forms. Thus the websites of companies providing their services in Switzerland were searched for "bad" web forms. A web form was deemed bad if it did not adhere to the guidelines (see Appendix A, Table A1) promoted by Brenzikofer (2009). A list was then compiled, showing which form violated which guideline and in what way, and the five forms that violated the most guidelines were chosen to be included in the study. Two of those forms were improved by the respective owners during the preparations for the study. They were excluded to retain the option of a collaboration with the form owners. Next, with the help of the programmer working at the faculty, copies of the remaining three forms were created and hosted on the faculty's server. The three forms were, the business customer contact form of Dell (Dell, 1999), the newsletter form of Baublatt (Baublatt, 2010), and the newsletter form of Raiffeisen (Raiffeisen, 2006). Based on those three copies, another version of each form was created, with changes where the form did not adhere to the guidelines. The forms were tested to work with all major browsers (Firefox, Internet Explorer, Safari, and Chrome).

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**Registrieren**

Füllen Sie bitte folgende Angaben aus. Mit einem Stern markierte Felder sind obligatorisch.

- \* Der Login-Name muss 3 - 60 Zeichen lang sein!
- \* Bitte geben Sie eine gültige E-Mail-Adresse ein.
- \* Bitte geben Sie Ihren Nachnamen ein.
- \* Bitte akzeptieren Sie unsere [Datenschutzerklärung und Haftungsausschluss](#)

Login-Name \*   
 Anrede   
 Name \*   
 Vorname   
 Strasse   
 PLZ, Ort   
 E-Mail Adresse \*   
 Version   
 Ich bin Kunde der Raiffeisenbank...   
 Sprache

Ich nehme zur Kenntnis  [Datenschutzerklärung und Haftungsausschluss](#)

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**Tipps**

**Registrieren**

Ihr Passwort muss mindestens sechs Zeichen lang sein. Verwenden Sie bitte nicht das Raiffeisen E-Banking Passwort.

Mit aktuellen Mail-Programmen wie Outlook Express und den meisten Web-Mail-Programmen können Sie die normale Version (HTML) bestellen.

Figure 1. Screenshot of the original version of the Raiffeisen form

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## Registrieren

Bitte füllen Sie das Formular aus. Die gelb gefärbten Felder müssen zwingend ausgefüllt werden, damit wir Sie optimal bedienen können.

**Bitte entschuldigen Sie, etwas verhindert das Absenden des Formulars. Bitte beachten Sie die Meldungen rechts neben den Formularfeldern um das Problem zu beheben.**

**Tipps**

**Registrieren**

Mit aktuellen Mail-Programmen wie Outlook Express und den meisten Web-Mail-Programmen können Sie die normale Version (HTML) bestellen.

**Login-Name**  
(mindestens 3, maximal 60 Zeichen)  
 Bitte wählen Sie einen Login-Namen mit 3 - 60 Zeichen Länge.

**E-Mail Adresse**  
 Bitte geben Sie eine gültige E-Mail-Adresse ein.

**Anrede**

Frau  
 Herr

**Vorname**

**Name**  
 Bitte geben Sie Ihren Nachnamen ein.

**Strasse**

**PLZ, Ort**

In welcher Form möchten Sie den Newsletter erhalten?

Normale Version (HTML)  
 reine Textversion

In welcher Sprache möchten Sie den Newsletter erhalten?

Deutsch  
 Französisch  
 Italienisch

Sind Sie bereits Kunde der Raiffeisenbank?

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Bitte akzeptieren Sie unsere Datenschutzerklärung und Haftungsausschluss.

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Figure 2. Screenshot of the improved version of the Raiffeisen form

Figures 1 and 2 show the original and the improved version of the Raiffeisen form. Some of the adaptations, which were done so the improved version adheres to the guidelines, can be clearly seen by comparing the two screenshots, for example the use of radio buttons for few options (guideline 4) instead of dropdown menus, the placement of the labels above the input-fields (guideline 12) instead of to the left, the marking of required-field with a color (guideline 14) instead of asterisks, and the placement of the error messages to the right of the input-fields and in red (guideline 20) instead of at the top. For a complete list of the guidelines, see Appendix A, Table A1. Guidelines no. 1a, 2, 13, and 14 were not included in this study, because it is necessary to understand the exact purpose of a form, otherwise it is not possible to judge if the form adheres to these specific guidelines. Especially guidelines no. 9, 11, and 16 are rather ambiguous, which made it necessary to interpret them in a more tangible fashion. For a detailed overview of how the individual guidelines were implemented see Appendix B, for screenshots of all the versions see Appendix C.

### *Procedure*

The participants received an invitation per e-mail with a link. The study was created using the survey-software Unipark ([www.unipark.de](http://www.unipark.de)). After clicking on the link, participants were sent to the first part of the survey. They received a short explanation of the background of the study, plus that they will be asked to fill out a form and then rate it, while none of their personal information will be saved. On the next page of the survey, they were presented with a short story plus a link which led to one of the six forms on the faculty's server. The stories were used to create a context for the following form and provided data that the participants could enter into the form, if they did not want to convey personal information. For example, the story for Dell, who sells computers, was about being part of the IT-staff who wants to procure new hard- and software for 50

co-workers. The stories plus the corresponding link were randomized by the survey software so that each of the six couples were presented with the same frequency. The links then opened the form on our server, where the participants filled it in. Each form had a marked link on its confirmation page, which led the participant to the second survey with the rating options. After rating the form and submitting some basic demographic information, the participants could choose to also submit their e-mail for a chance to win the vouchers.

### *Participants*

120 participants took part in the study. They were recruited in part using the participant pool of the Institute of Psychology, University of Basel, in part by contacting acquaintances of the author due to the small response rate from the participant pool. As an incentive the participants had the possibility to enter a raffle for six vouchers from [www.digitec.ch](http://www.digitec.ch) worth 50 CHF. 73 (61%) of the participants were female, 47 (39%) male. The age of the participants ranged from 19 to 82 ( $M = 36.17$ ,  $SD = 14.19$ ) and 7 persons withheld that information in the survey.

All of the participants use the internet at least once per week, 104 (87%) participants use it daily. 85 (71%) participants have rather much or more experience with computers. 86 (72%) have rather much or more experience with surfing the internet. 44 (37%) participants have rather much or more experience with online shopping. Table 4 shows a more detailed overview.

Table 2

*Number of participants per condition and their knowledge using computers*

	Dell		Baublatt		Raiffeisen		All forms M(SD)
	Original	Improved	Original	Improved	Original	Improved	
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)	
N	19(15.8%)	12(10.0%)	19(15.8%)	22(18.3%)	19(15.8%)	29(24.2%)	120(100%)
Age	35.95(13.53)	37.64(13.60)	33.56(12.07)	35.45(14.24)	36.39(16.18)	37.85(15.68)	36.17(14.19)
Internet frequency	3.89(.32)	3.92(.29)	3.84(.38)	3.95(.21)	3.84(.38)	3.76(.51)	3.86(.37)
Computer knowledge	5.21(1.13)	5.58(1.31)	5.32(1.11)	5.27(.88)	5.11(1.10)	5.00(1.28)	5.21(1.13)
Surfing knowledge	5.32(1.25)	5.58(1.00)	5.11(1.24)	5.36(1.14)	5.00(1.20)	5.07(1.33)	5.21(1.21)
Online- shopping knowledge	4.00(1.63)	4.92(1.24)	4.05(1.87)	4.14(1.49)	3.84(1.30)	4.10(1.61)	4.13(1.55)

*Note:* Knowledge was rated on a 7-point Likert scale (1 = no experience, 7 = expert), internet frequency on a 4-point Likert scale (1 = several times a month, 4 = daily).

## Results

Before data analysis, a score was derived from each of the four questionnaires. This was done by combining the ratings of the individual items of a questionnaire into one number per participant. That is, each participant had an ASQ score, a SAM score, a SUS score, and a FUS score for the form he or she completed. When checking the data for outliers, 10 cases were excluded from the tests with form duration measure, which deviated more than 2.5 standard deviations ( $>324$  seconds) from the mean, and therefore were deemed extreme outliers. A further 6 cases had to be excluded from both the form duration and the number of submits measures, because of missing data (see Table 3 for the number of participants per condition and measure). When checking for normality across conditions, the Shapiro-Wilk test bore significant results for a majority of the measures (objective and subjective). Since normality could not be achieved with a simple transformation, it was decided to use the non-parametric Mann-Whitney U-test instead of a parametric test. Two-tailed tests were used in case that the use of the combined guidelines actually worsens the usability of the forms. A comparison of measures for each form in its original and improved version using Mann-Whitney U tests with an alpha level of .05, is illustrated in Table 3.

*Objective measures.* The hypotheses for the objective measures, number of form submits and form duration, state that the mean ranks for the improved versions of the forms are expected to be lower than those of the original versions. For the Baublatt forms and the Raiffeisen forms this was the case. For the number of submits measure, the tests showed a significant difference,  $U(18,20) = 69.5$ ,  $p = .001$ (two-tailed test) for the Baublatt forms and  $U(18,27) = 167.5$ ,  $p = .02$ (two-tailed test) for the Raiffeisen forms. For the form duration measure, the differences pointed in the predicted direction, but not significantly so. The improved version of the Dell form scored higher with both measures,

but not significantly so. This can be explained by the complete absence of error messages in the original version.

*Subjective measures.* The hypotheses for the questionnaires, ASQ, SUS, FUS, and SAM, state that the mean ranks for the improved versions of the forms are expected to be, in contrary to the hypotheses for the objective measures, higher than those of the original versions. As can be seen in Table 3, the difference in mean ranks of the ASQ, the SUS, and the FUS score all but one pointed in the predicted direction. For the Baublatt forms, the difference was significant with  $U(19,22) = 126.5$ ,  $p = .03$ (two-tailed test). The only deviation from this trend was the SUS score for the Raiffeisen forms, where the difference points in the opposite direction.

*Affective measure.* For the SAM, none of the mean ranks differed significantly between the original and the improved versions of the form. As can be seen in Table 3, the differences for the Dell and the Raiffeisen forms pointed in the predicted direction, but for the Baublatt forms it pointed in the opposite direction.

Table 3  
*Mann-Whitney U test values for each measure, divided by form*

Measure	Dell			Baublatt			Raiffeisen		
	Original N(MR)	Improved N(MR)	Both U(DMR)	Original N(MR)	Improved N(MR)	Both U(DMR)	Original N(MR)	Improved N(MR)	Both U(DMR)
Submits	19(14.87)	12(17.79)	92.5(2.92 <sup>a</sup> )	18(25.64)	20(13.98)	69.5**(-)	18(27.19)	27(20.20)	167.5*(-)
						11.66)			6.99)
Duration	18(14.28)	12(17.33)	86.0(3.05 <sup>a</sup> )	17(21.88)	19(15.47)	104.00(-)	15(21.50)	23(18.20)	142.5(-)
						6.41)			3.30)
ASQ	19(15.63)	12(16.58)	107.0(.95)	19(16.66)	22(24.75)	126.5*(8.09)	19(24.26)	29(24.66)	271.0(.4)
SUS	19(13.58)	12(19.83)	68.0(6.25)	19(17.63)	22(23.91)	145.0(6.28)	19(28.26)	29(22.03)	204.0(-)
									6.23 <sup>a</sup> )
FUS	19(14.47)	12(18.42)	85.0(3.95)	19(18.76)	22(22.93)	166.5(4.17)	19(23.21)	29(25.34)	251.0(2.13)
SAM	19(14.55)	12(18.29)	86.5(3.74)	19(21.79)	22(20.32)	194.0(-)	19(23.58)	29(25.10)	258.0(1.52)
						1.47 <sup>a</sup> )			

*Note:* MR = Mean Rank, U = Mann-Whitney's U, DMR = Difference between Mean Ranks, \* = significant <.05, \*\* = significant <.001, <sup>a</sup> = Difference in the opposite direction than predicted

## Discussion

The aim of this study was to evaluate if the 20 guidelines proposed by Brenzikofer (2009) can be considered a usable tool, which helps making usable web forms. Therefore, the guidelines were employed in a manner a potential user, e.g. a web programmer, would presumably use them. Already existing web forms that violated some of the guidelines were copied and adapted to adhere to all the guidelines, then the original and the improved version were rated by participants. In general, it can be said that the results showed a trend in the direction the hypotheses predicted. That is, with two exceptions, namely the Raiffeisen forms with the SUS score and the Baublatt forms with the SAM score, all the improved versions of the forms had higher scores on the four questionnaires. The ASQ score for the improved Baublatt version was in fact significantly higher than the one for the original version. It should be noted that the scores for the FUS, the only questionnaire that was developed specifically to test the usability of web forms, were consistently higher for the improved versions of all three forms, although not significantly so. Therefore, it seems that the participants indeed perceived the improved forms as more usable, since the ASQ, the SUS, and the FUS claim to measure usability (Aeberhard, 2011; Brooke, 1996; Lewis, 1991) and positive affect (SAM) towards a form also indicates good usability (Billis et al., 2011). For the objective measures, the number of form submits was significantly lower for both the Baublatt and the Raiffeisen forms, which is what the hypotheses predicted. The lower number of submits suggests that participants made less mistakes, and therefore did see less error messages and did not have to resubmit the form as often, when filling in an improved forms compared to filling in original form. The form duration as well was lower for both the Baublatt and the Raiffeisen forms, which is the predicted direction, although not significantly so. According to Hornbaek and Law, these results of the efficiency and effectiveness measures also suggest that the improved forms are indeed more usable. The objective measures for the Dell forms both showed

higher values for the improved version than for the original version. This can be explained by the fact, that the original Dell form does not have any error messages whatsoever. This was changed for the improved version prevent users from entering unavailable options and simplify the decision process (Bargas-Avila et al., 2010), and to remove the inconsistency of the original form having required-fields but not checking if they are filled in. As a result, a click on the submit button on the original version always led to the confirmation page, which of course resulted in consistent number of exactly one form submit and eliminated the possible delay of reading error messages and correcting errors. The results therefore seem to support the use of the 20 guidelines (Bargas-Avila et al., 2010; Brenzikofer, 2009) to ensure the usability of web forms

#### *Limitations and further research*

It has to be acknowledged, that the study suffers from several limitations. First of all, the number of participants and their distribution across conditions are not ideal. Due to technical issues the study suffered from a low response rate. With a related samples design, compared to the applied unrelated samples design, less participants would have been needed to obtain a suitable number for the statistical evaluation. But participants filling in several completely unrelated web forms in succession would have been inconsistent with the aim to stay as close to reality as possible and the online survey was chosen because it's closer to reality to come across such forms while surfing the web in private. With a related samples design participants would have a reference, to which they could compare the second form they complete. Presumably, this would bear more significant differences.

Unfortunately It was not possible to determine exactly how much more errors were encountered with the original forms, due to the restrictions of the data tracking. This problem could, in follow-up studies, be avoided by conducting the study in a usability lab

with an eye tracker. A lab experiment would also prevent participants from getting distracted while filling in the form, which would presumably raise the validity of the form duration data. It could also be speculated that results would differ with longer forms. Longer forms may have a greater potential to profit from improvements, simply because there are more possible error sources. Furthermore, it took some participants up to two hours to complete a form while the majority of participants took less than two minutes. This leads to the assumption, that some of the participants were distracted during the experiment, which in turn questions the causality of the correlation between form completion time and form usability in this study. It also has to be acknowledged that several of the decisions about how to implement the ambiguous guidelines (i.e. guidelines no. 9, 11, 16, see Appendix B for a detailed description of how the guidelines were implemented) could be subject to discussion. Furthermore, guidelines no. 1a, 2, 13, and 14 require the designer to understand the exact purpose of the form, otherwise it is not possible to, for example, decide which fields are necessary and which are not. These guidelines will have to be tested either in collaboration with the owner of a form, or with artificial forms. Possibly, studying the effects of the guidelines as a whole and trying to keep the study as close to reality at the same time was too much. To heighten the value of the guidelines as a tool that facilitates the design of web forms for web designers, further research should aim to render them more tangible. When all of the guidelines are tangible, a next step could be to design an artificial web form, which includes every element that is mentioned in a guideline. This form could then be used to simulate different degrees of guideline adherence, from all or nothing to stages in between. This could also be used to rank the guidelines, since presumably not every violated guideline has the same impact on the usability of the form as a whole. Presumably, further studies with real web forms should only be conducted after the aforementioned further research. This should facilitate convincing an owner of a web form to cooperate for a field study. In exchange for

non-personal information before and after the form redesign (e.g. number of completed forms per month, user feedback about the form, etc.), the owner would receive a free web form redesign.

### *Conclusion*

The guidelines could presumably be a valuable tool with a big impact on the everyday business of web designing, since the usability of a web form can make the difference between a buying customer or a new user, and an annoyed user who resorts to a competitor. But to allow the guidelines to fulfill that role, they themselves need to be more usable.

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## Appendix A

### The 20 guidelines

Table A1

*The 20 guidelines as promoted by Brenzikofer (2009).*

No.	Guideline
1	Let people give answers like they are used to from common situations.
1a	Whenever possible use textboxes for information, which the user knows by himself (e.g. address, date, state).
1b	Keep an intuitive sequence of the questions (e.g. 1. name, 2. address, 3. telephone number).
2	Use checkboxes, radio buttons or drop down menus to restrict the number of options and for entries, which can easily be written wrong. Also use them if it isnt clear to the user in advance what kind of answer is expected from him.
3	Use checkboxes instead of list boxes.
4	For few options use radio buttons, when more options are required use a drop-down menu to save screen real estate.
5	Order options in an intuitive sequence (e.g. week days). If no meaningful sequence is possible order them alphabetically.
6	Disable the submit button as soon as it has been clicked to avoid multiple submissions.
7	After the form has been sent display a confirmation site which thanks for the submission and tells what will happen next.
8	Do not provide reset buttons as they can be clicked by accident.
9	If the answer is unambiguous allow answers in any format.

---

No.	Guideline
10	If answers are required in a specific format state this in advance.
11	If date entries are split into different text fields use symbols (MM, YYYY) and position these either left, right or above the corresponding input field.
12	To enable people to fill in a form as fast as possible place the labels above the corresponding input field.
13	Keep the form as short and simple as possible and do not ask for unnecessary input.
14	If possible separate required from optional fields. In other cases use color to mark required fields.
15	Do not separate a form into more than one column and only ask for one input per column.
16	Match the size of the input fields to the expected length of the answer.
17	Error messages should be polite and explain in to the user familiar language that a mistake has happened. Eventually the error message should apologize for the mistake and it should clearly describe what the mistake is and how it can be corrected.
18	After an error happened never clear the already filled in fields.
19	Always show error messages only after the form has been sent. Show them altogether or one by one embedded in the form or one by one in a pop-up window.
20	Show embedded error messages in red under the corresponding input field surrounded by a red border.

---

*Note:* Table adapted from (Brenzikofer, 2009)

## Appendix B

### How the guidelines were implemented

As mentioned before, not all the guidelines give clear, precise instructions as to how they should be applied. To explain how the guidelines were implemented in this study, each will be curtly commented:

Guideline No.1: As a reference for a common situation the completion of a paper form as suggested by Brenzikofer (2009) was taken. 1a: Since the owners of the tested forms were not consulted, nothing was changed here. It was assumed that, if options were given, their correct spelling was crucial for the completion of the form. 1b: See No.1.

Guideline No.2: Same reasoning as in 1a. (Linderman & Fried, 2004) say that a user shouldn't be able to enter unavailable options, but again it was not possible to judge which options are available. It was assumed that the options given are those available.

Guideline No.3: No list boxes were encountered.

Guideline No.4: Miller and Jarret (2001) recommends radio buttons for one to four options, five or more get a drop-down menu.

Guideline No.5: Lists without a meaningful sequence were rearranged to be in alphabetical order.

Guideline No.6: This was not specifically implemented, since our test forms reacted too fast to test this.

Guideline No.7: Add a thank you message and clarify the next steps. Example: Original message: "In the next minutes you will receive an e-mail to the address (*address which the user entered*) to activate the newsletter subscription."; Improved message: "Thank you very much for your registration! You will shortly receive a confirmation e-mail. To protect your privacy your newsletter subscription will not be activated until you confirm it by clicking on the corresponding link. If you don't confirm the link within a

week your data will be deleted.”

Guideline No.8: All reset buttons were removed.

Guideline No.9: A good example for this would be the input field for the telephone number. For instance the fictitious Swiss number 012 345 67 89 could be written as: 012-345-67-89; 0123456789, 0041123456789, +41 (0)123456789 and so on. Thus this field accepts numbers, parentheses, hyphen, blank spaces and plus signs. Every other character would trigger an error message.

Guideline No.10: A good example for this would be the input field for a user name which checks if the user entered between three and sixty characters but doesn't state this unless the user gets it wrong. To avoid this I added an advice. Original field label: "Login-Name"; Improved field label: "Login-Name (at least 3, maximal 60 characters)". For those fields that have self-evident format requirements, like the aforementioned input field for the telephone number, did not have the restrictions added in written form but as an internal validation check where prohibited characters trigger an error message.

Guideline No.11: None of the tested forms had date fields therefore this guideline didn't have to be implemented.

Guideline No.12: All the labels were placed above the corresponding input fields. This also made it easier to implement guideline no.10 since there is more horizontal space available than if the label is positioned to the right or left of the input field.

Guideline No.13: Since the used forms already existed it was not possible to assess the necessity of any particular input fields, consultation with the owner of the form would have been necessary. Therefore, none of the forms were shortened.

Guideline No.14: With the same reasoning as with guideline no 13, no.14 wasn't implemented either.

Guideline No.15: Forms with more than one column were rearranged so that there is only one column. Horizontally arranged binary choice radio buttons were rearranged

vertically.

Guideline No.16: Input fields were matched to the length of the input if said length could be determined. For example, in Switzerland, postal codes consist of four numbers plus an optional country code as prefix. Thus, postal code input fields were constructed to only accept four numbers, and to also visually be only long enough for 4 characters. This can insofar be problematic as there are characters with different width (compare 1 and 2 or l and m). Therefore the visual trimming can only be an approximation.

Guideline No.17: To avoid cluttering the error messages with non vital information, an apologizing message was displayed at the top of the page as soon as one or more errors occurred: "We apologize, errors prevent the form from being sent. Please follow the instructions stated below to resolve them."

Guideline No.18: All fields had the retaining of already filled in information implemented.

Guideline No.19: The forms validate the user input when the user clicks on the submit button. If an error occurs, the form is shown again, this time with the apology from guideline no.17 and the respective error messages are added. Seckler et al. (2011) specify that that error messages are best displayed embedded into the form, which makes them more salient.

Guideline No.20: This guideline contradicts in part the newer findings of Seckler et al. (2011), who states that to the right of the corresponding input field ist the user-friendliest location for error messages, which is the location that was therefore chosen for this study. The color of the error messages plus the border color of the corresponding input field were changed to red in case of an error.

## Appendix C

## Screenshots of the six form versions

Produkte Support

Lösungen \_ Service \_ Systeme \_ Elektronik und Zubehör \_ TechCenter Alle anzeigen \_

Offentliche Auftraggeber Windows®. Leben ohne Grenzen. Dell empfiehlt Windows 7. [Français](#)

### Beginnen Sie Ihre Partnerschaft mit Dell

Danke für Ihr Interesse an Dell. Bitte füllen Sie das folgende Formular aus, damit wir Ihre Angaben direkt an den zuständigen Dell Berater weiterleiten können. Er wird Sie in Kürze kontaktieren, um Ihre Fragen zu beantworten.

**Persönliche Informationen**

• Vorname  • Nachname

• Firma  Adresse

Funktion

• Telefon  Ort

• E-Mail  Postleitzahl

**Ihr Unternehmen**

Wie viele Mitarbeitende beschäftigt Ihr Unternehmen?  Welche der folgenden Bezeichnungen trifft am ehesten auf Ihren Industriesektor zu?

Damit wir Ihre Bedürfnisse besser erfüllen können, bitten wir Sie, uns Ihr Interesse zu spezifizieren:

Server  Storage

Networking  Notebooks/Desktops/Workstations

Software  Drucker und Zubehör

Internetanschluss  Premier - ImageWatch

Ungefährs Implementierungsdatum neuer Technologien:

Kommentar

**Datenschutz**

Erlauben Sie Dell, Ihre Daten weiter zu verwenden? Die Informationen, die Sie uns zur Verfügung gestellt haben, werden vertraulich behandelt und nur dazu verwendet, um Ihnen bei Bestellungen, bei Serviceleistungen, bei technischen Problemen zu helfen oder Sie auf Wunsch zu kontaktieren. Weitere Informationen zu Datenschutz bei Dell.

Ja

[Abschicken](#)

Figure C3. Screenshot of the original version of the Dell form

Produkte Support

Lösungen \_ Service \_ Systeme \_ Elektronik und Zubehör \_ TechCenter Alle anzeigen \_

Öffentliche Auftraggeber Windows®. Leben ohne Grenzen. Dell empfiehlt Windows 7. [Français](#)

### Beginnen Sie Ihre Partnerschaft mit Dell

Danke für Ihr Interesse an Dell. Bitte füllen Sie das folgende Formular aus, damit wir Ihre Angaben direkt an den zuständigen Dell Berater weiterleiten können. Er wird Sie in Kürze kontaktieren, um Ihre Fragen zu beantworten.

Bitte füllen Sie das Formular aus. Die gelb gefärbten Felder müssen zwingend ausgefüllt werden, damit wir Sie optimal bedienen können.

**Bitte entschuldigen Sie, etwas verhindert das Absenden des Formulars. Bitte beachten Sie die Meldungen rechts neben den Formularfeldern um das Problem zu beheben.**

**Persönliche Informationen**

Vorname  **Bitte geben Sie einen Vornamen ein.**

Nachname  **Bitte geben Sie einen Nachnamen ein.**

Adresse

Postleitzahl

Ort

Firma  **Bitte geben Sie einen Firmennamen ein.**

Funktion

Telefon  **Bitte geben Sie eine Telefonnummer ein.**

E-Mail  **Bitte geben Sie eine E-Mail-Adresse ein.**

**Ihr Unternehmen**

Wie viele Mitarbeitende beschäftigt Ihr Unternehmen?

Welche der folgenden Bezeichnungen trifft am ehesten auf Ihren Industriezweig zu?

Damit wir Ihre Bedürfnisse besser erfüllen können, bitten wir Sie, uns Ihr Interesse zu spezifizieren:

Server

Storage

Networking

Notebooks/Desktops/Workstations

Software

Drucker und Zubehör

Internetanschluss

Premier - ImageWatch

Ungefähres Implementierungsdatum neuer Technologien:

Kommentar

Figure C4. Screenshot of the improved version of the Dell form



aktuelle Informationen für die Schweizer Baubranche



[News](#) [Fachbeiträge](#) [Agenda](#) [Service](#) [KOF-Indikator](#) [Baustelle des Monats](#) [Gipfelstürmer](#)

- Abonnement-Nr field is required.
- Anrede field is required.
- Vorname field is required.
- Nachname field is required.
- Strasse field is required.
- PLZ field is required.
- Ort field is required.
- Telefon field is required.
- E-Mail field is required.
- Bitte 'Kanton' auswählen.
- Bitte 'Branche' auswählen.

### Abo-Registrierung Baublatt

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#### Baublatt - die Fachzeitschrift

Abonnement-Nr\*

Firma

Firma Zusatz

Branche\*  ▼

Anrede\*  Frau  Herr

Vorname\*

Nachname\*

Strasse\*

PLZ\*

Ort\*

Kanton\*  ▼

Telefon\*

Fax

E-Mail\*

Nach erfolgreicher Anmeldung wird Ihnen ein generiertes Passwort zugestellt, das Sie jederzeit ändern können. Mit Ihrer E-Mail und dem dem Passwort können Sie sich online einloggen und haben vollen Zugriff auf alle Online-Artikel.

Newsletter abonnieren

Figure C5. Screenshot of the original version of the Baublatt form



**RAIFFEISEN** fr · it [E-Banking Login](#) Kontakt Disclaimer  [Erweiterte Suche](#) [Sitemap](#)

Home > Newsletter > Registrieren

**Registrieren**

Füllen Sie bitte folgende Angaben aus. Mit einem Stern markierte Felder sind obligatorisch.

- \* Der Login-Name muss 3 - 60 Zeichen lang sein!
- \* Bitte geben Sie eine gültige E-Mail-Adresse ein.
- \* Bitte geben Sie Ihren Nachnamen ein.
- \* Bitte akzeptieren Sie unsere [Datenschutzerklärung und Haftungsausschluss](#)

Login-Name \*   
 Anrede   
 Name \*   
 Vorname   
 Strasse   
 PLZ, Ort   
 E-Mail Adresse \*   
 Version   
 Ich bin Kunde der Raiffeisenbank...   
 Sprache

Ich nehme zur Kenntnis  [Datenschutzerklärung und Haftungsausschluss](#)

[Weiter >](#)

**Tipps**

**Registrieren**

Ihr Passwort muss mindestens sechs Zeichen lang sein. Verwenden Sie bitte nicht das Raiffeisen E-Banking Passwort.

Mit aktuellen Mail-Programmen wie Outlook Express und den meisten Web-Mail-Programmen können Sie die normale Version (HTML) bestellen.

Figure C7. Screenshot of the original version of the Raiffeisen form

**RAIFFEISEN** fr · it [E-Banking Login](#) [Kontakt](#) [Disclaimer](#)  [Erweiterte Suche](#) [Sitemap](#)

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[Börse](#)

**Raiffeisen Gruppe Newsletter**

[Registrieren](#)

[Passwort vergessen](#)

[Newsletter Archiv](#)

## Registrieren

Bitte füllen Sie das Formular aus. Die gelb gefärbten Felder müssen zwingend ausgefüllt werden, damit wir Sie optimal bedienen können.

**Bitte entschuldigen Sie, etwas verhindert das Absenden des Formulars. Bitte beachten Sie die Meldungen rechts neben den Formularfeldern um das Problem zu beheben.**

Login-Name (mindestens 3, maximal 60 Zeichen)  
 Bitte wählen Sie einen Login-Namen mit 3 - 60 Zeichen Länge.

E-Mail Adresse  
 Bitte geben Sie eine gültige E-Mail-Adresse ein.

Anrede  
 Frau  
 Herr

Vorname

Name  
 Bitte geben Sie Ihren Nachnamen ein.

Strasse

PLZ, Ort

In welcher Form möchten Sie den Newsletter erhalten?  
 Normale Version (HTML)  
 reine Textversion

In welcher Sprache möchten Sie den Newsletter erhalten?  
 Deutsch  
 Französisch  
 Italienisch

Sind Sie bereits Kunde der Raiffeisenbank?

Ich akzeptiere die [Datenschutzerklärung und Haftungsausschluss](#)  
 Bitte akzeptieren Sie unsere Datenschutzerklärung und Haftungsausschluss.

[Weiter](#) >

**Tipps**

### Registrieren

Mit aktuellen Mail-Programmen wie Outlook Express und den meisten Web-Mail-Programmen können Sie die normale Version (HTML) bestellen.

Figure C8. Screenshot of the improved version of the Raiffeisen form

**Author Note**

I would like to thank everyone who helped me during the course of my master's project and the writing of my master's thesis. First and foremost I would like to thank my supervisor Silvia Heinz for her constant support, invaluable advice, and motivational impulses. Without her, this paper would not exist. Many thanks go to Lars Frasseck for the technical realisation of the test forms, to Elisa Mekler for the review of the thesis and tips for the layout, to Gina Hänggli for an open ear whenever I needed it, to Alex Tuch for his impromptu motivational speech, and to Klaus Opwis as second reviewer for the thesis. Last but not least I would like to thank Lucas Schneider for his help on keeping me focused, and for sharing the woe of writing an academic thesis.

**Non-plagiarism statement**

I hereby declare that this thesis is my own work and that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Peter Hänggli

Basel, April 16, 2012