Evaluation of Different Design Options for Presenting Edit Messages in Web Forms

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What is an edit message?

- An automated message presented to a user.
- The message may point out something wrong with an entry or ask the user to check an entry.
- It could be automatic or under the control of the user.

Why bother with this study?

Previous usability testing showed that users did not see (missed) edit messages



And even when they saw them, some users did not, or were not able to, follow instructions



High-Level Research Questions

- How big a problem is this?
- What factors are important?



If a problem ... what can we do about it?

Characteristics of a Good Edit Message

- 1. User sees and understands the message.
- 2. The message points out:
 - Where the problem is (which item)
 - What the problem is
 - How to fix it

Some Context - Examples

- Web page with more "traditional" <u>error</u> indicator
- Scrolling <u>Web page</u> with standard error message

What are important design factors?

- Hard or soft
- User control (for initiating and closing message)
- Visual characteristics (e.g., font size/type, color, layout, use of graphics)
- In same or different window (pop-up)
- Complexity of message/readability
- Position on screen/page & timing
- "One at a time" vs. "All at once"
- Tone of message
- Scrolling page (context)

What was varied in this study?

- 1. Timing of message (Under system control)
 - When user clicks *Continue*
 - When user moves to next item in sequence
- 2. Location of message
 - At top of page/screen (under standard header)
 - Under item that triggered message

Why study these design features?

- Includes approach already used
- Second approach (under item) relatively easy to do
- Third approach, more difficult, would need experimental support

What was kept constant in this experiment?

- Same visual design (and "wording") of edit message.
- Message in same window & on same page.
- Same items/questions.

Three Instruments

Instrument 1.

 Edit messages at top of page/screen, after all items on page completed, & user clicked *Continue*

Instrument 2.

 Edit messages displayed on page, under the item that triggered the edit, after all items on page completed, & user clicked *Continue*.

Instruments (continued)

Instrument 3.

 Edit messages displayed on page, under the item that triggered the edit, as soon as user moves to next item (by clicking mouse or pressing tab key)



1. Instrument 1

2. Instrument $\underline{2}$

3. Instrument $\underline{3}$

Test Instrument

- Survey of Occupational Injuries & Illnesses ... mirrors paper closely –Uses scrolling pages
- Three separate edits
 - -Total hours worked
 - -Date of injury
 - -Age of worker

Edit	Location	Soft/Hard	Appear.	Instruc.
Total hours worked	Item 2	Soft	1st on page, only 1 in scenario	Verify entry
Date of Injury	Item 18	Hard	1st on page, 2 in scenario	Match date format
Age of Worker	Item 23 (out of 31)	Hard	2nd on page, 2 in scenario	Enter new value

Experimental Procedure

- Each user completed 3 scenarios
- In a single scenario either one soft or two hard edits appeared:
 - 1. "Total hours worked" soft edit, or
 - 2. "Date of injury" and " Age of worker" hard edits. But, not both 1 & 2.
- Order of instruments and edits was counterbalanced

Procedure (continued)

- Since same edit could appear twice in one session, used different item values in scenarios
- Basic user task: transfer data from paper form to Web form
- "Talk aloud" procedure
- 42 paid participants, recruited by asking:
 - Experienced with Internet?
 - Comfortable using keyboard & mouse?

Procedural "Glitches"

• "Total hours worked" edit always triggered

But ...

- "Date of injury" edit could be avoided
- "Age of worker" edit could be avoided on second appearance in same session

Key Variables

 Did the user notice the edit message on its first appearance?

If noticed ...

• Was the proper corrective action taken on the first attempt? Also,

-User preference

-How did the designs vary in terms of completion time?

"Total Hrs Worked" Did user see the edit?

Instrument	Missed	Noticed	# of Times Edit Appeared
1	0.43	0.57	21
2	0.33	0.67	21
3	0.45	0.55	20
Overall	0.40	0.60	

"Total Hrs Worked" Was correct action taken? (based on # of times user saw edit message)

Instrument	Yes	Νο	# of Times Edit Appeared
1	0.83	0.17	12
2	0.93	0.07	14
3	0.89	0.11	9
Overall	0.89	0.11	

"Total Hrs Worked" Was correct action taken? (based on total # of times edit appeared)

Instrument	Yes	Νο	# of Times Edit Appeared
1	0.48	0.52	21
2	0.62	0.38	21
3	0.44	0.56	18
Overall	0.52	0.48	

"Total Hrs Worked" Time to advance to next page (when user saw message & took correct action)

Instrument	Mean (sec)	SD	Ν
1	79.3	39.7	21
2	100.2	59.5	21
3	71.2	30.2	18
Overall	84.2		

"Total Hrs Worked" Time to advance to next page (when user missed message)

Instrument	Mean (sec)	SD	N
1	94.3	45.7	9
2	113.3	68.6	7
3	59.3	24.7	9
Overall	87.1		

Time to Move from Edit 1 to Next Page



"Date of Injury" Did user see the edit?

Instrument	Missed	Noticed	# of Times Edit Appeared
1	0.27	0.73	15
2	0.23	0.77	13
3	0.10	0.90	10
Overall	0.21	0.79	

"Date of Injury" Was correct action taken? (based on # of times user saw edit message)

Instrument	Yes	Νο	# of Times Edit Appeared
1	0.73	0.27	11
2	0.67	0.33	9
3	0.78	0.22	9
Overall	0.72	0.28	

"Date of Injury" Was correct action taken? (based on total # of times edit appeared)

Instrument	Yes	Νο	# of Times Edit Appeared
1	0.53	0.47	15
2	0.50	0.50	12
3	0.70	0.30	10
Overall	0.57	0.43	

"Age of Worker" Did user see the edit?

Instrument	Missed	Noticed	# of Times Edit Appeared
1	0.05	0.95	20
2	0.00	1.00	19
3	0.18	0.82	17
Overall	0.07	0.93	

"Age of Worker" Was correct action taken? (based on # of times user saw edit message)

Instrument	Yes	Νο	# of Times Edit Appeared
1	0.79	0.21	19
2	0.78	0.22	18
3	0.71	0.29	14
Overall	0.76	0.24	

"Age of Worker" Was correct action taken? (based on total # of times edit appeared)

Instrument	Yes	Νο	# of Times Edit Appeared
1	0.75	0.25	20
2	0.78	0.22	18
3	0.59	0.41	17
Overall	0.71	0.29	

Did the User See the Edit?



"Success Rate" of Edit Message



Time to advance to next page (when both hard edits handled correctly)

Instrument	Mean (sec)	SD	Ν
1	241	95.3	12
2	157	75.2	7
3	258	134.7	11
Overall	228	111.8	

Which Version Did Users Prefer? (Asked to rank best to worst, where 1 is best)

Instrument	Mean Rating	SD	Ν
2	1.67	0.621	39
3	1.85	0.812	39
1	2.46	0.822	39

User Ratings (where 10 is most "positive")

Que	stion	Av.	SD	Ν
Q1.	How easy was it to enter the survey data?	9.0	1.61	42
Q2.	How easy was it to understand the edit message?	8.6	1.81	42
Q3.	How helpful were the edit messages?	9.1	1.52	42
Q4.	How closely did the Web form match the paper form?	8.5	1.87	41

Significant Correlations

- Between "ease of entering data" and "time to complete page for "total hours" edit
 - ✤ Correlation = -0.313 (p < 0.05, 2-tailed)</p>
- Between "ease of entering data" and "ease of understanding the edit messages"
 - ✤ Correlation = +0.452 (p < 0.01, 2-tailed)</p>

Significant Correlations

- Between "ease of entering data" and "how closely the Web form matched the paper form"
 - ✤ Correlation = +0.391 (p < 0.05, 2-tailed)</p>
- Between "ease of understanding the edit messages" and "helpfulness of edit messages"
 - ✤ Correlation = +0.375 (p < 0.01, 2-tailed)</p>

Non-Significant Correlations

	Ease of entry	Ease of understanding	Helpfulness	Closely match paper
*Correlation	-0.095	+0.210	-0.027	-0.014

* Correlation between rating scale items and number of times users saw the "total hrs worked" edit

Some Conclusions

- "Change Blindness" appears to be occurring
- Rating scales rough measures of usability

 Biased toward being overly positive
 Not a complete picture
- Observational data point out important problems
- Mirroring the paper form leads to a perceived easier entry task

What is "Change Blindnesss?"

- The failure to detect what should be a very obvious visual change
- Or, very large changes can be made to a picture without observers noticing them
- Good experimental literature on this and how it occurs in a variety of situations
- <u>http://www.cs.bris.ac.uk/~cater/PhD/Chan</u>
 <u>geBlindInfo/Examples.html</u>

Theoretical Explanation

- Our eyes receive and send over 10 million signals to our brains each second
- The most liberal estimate is that people can process 40 pieces of information per second
- The rich visual environment we perceive is an illusion
- There is a major processing "bottleneck"

Theoretical background (continued)

- "Change Blindness" first noticed when change occurred during eye movement saccade, but effect not specifically related to eye movements alone
- Necessary condition for "Change Blindness"
 - Change occurs simultaneously with disruption in visual continuity
 - "Flicker effect"

What happens in edit messages?

- "Flicker" effect occurs
 - Screen is displayed
 - Screen reorients/redisplays when edit message is displayed
 - Screen reappears, but users fail to notice what seems to be an obvious change

What Can Be Done About It?

- Use a hard edit
- Place edit message on a separate screen
- Some other suggestions. Use:
 - Contrasting color
 - Small, blinking change markers (to draw user's attention)
- Results of this study suggest that:
 - User experience is important
 - Scrolling page may contribute to effect (test page-by-page format?)
 - Put explanatory message on home page?

If I could repeat the study

- Get a better measure of user expertise with the Web and general computer use
- Measure user literacy



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From: http://www.cs.bris.ac.uk/~cater/PhD/ChangeBlindInfo/Examples.html

Here are some examples which demonstrate change blindness by the use of mudsplashes, masking rectangles or the flicker paradigm. What these then simulate in the human visual system are blinking, eye saccades or actual mudsplashes on the windscreen of a car.



Original Picture



Modified Picture with mudsplashes



Modified Picture



Marginal Interest Change







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 Use your completed Calendar Year 2004 Summary of Work-Related Injuries and Illnesses (OSHA Form 300A), and copy the information into the spaces below.
Use the worksheets for Items (1) and (2) if annual average employment and total hours worked is not available from your OSHA 300A.
1. Enter the A nnual Average Employment for 2004.
20 <u>Click Here for a Worksheet to Estimate Employment</u>
2. Enter the Total Hours Worked for 2004 excluding vacation, sick leave, holidays, and other non-work time.
17,500 <u>Click Here for a Worksheet to Estimate Total Hours</u>
3. Check any conditions that might have affected your Annual Average Number of Employees or Total Hours Worked during 2004:
Shutdown or layoff C shutdown or layoff L anger work schedules or more pay periods than usual
Seasonal Work
L Natural disaster or adverse weather conditions M Nothing unusual happened to affect our employment or hours figures.
Did you have ANY Occupational Injuries or Illnesses during 2004?
© No (NOTE:Occupational Injuries or Illnesses were previously entered.)
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	Enter the A nnual Average Employment for 2004. 20 <u>Click Here for a Worksheet to Estimate Employment</u> [*]	
:	Enter the Total Hours Worked for 2004 excluding vacation, sick leave, holidays, and other non-work time. I5300 Click Here for a Worksheet to Estimate Total Hours	
	Please double check the number of Total Hours entered in Question 2. If correct, please re-enter the same value, then move to the next question.	
:	Check any conditions that might have affected your Annual Average Number of Employees or Total Hours Worked during 2004:	
	Strike or lockout Shorter work schedules or fewer pay periods than usual	-
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Some Links

- <u>http://www.syntagm.co.uk/design/articles/cb.htm</u>
- <u>http://www.cs.bris.ac.uk/~cater/PhD/ChangeBlin</u> <u>dInfo/Examples.html</u>