

The Impact of Paging vs.

By J. Ryan Baker

In a previous issue of [Usability News](#), we examined the use of paging vs. scrolling for the presentation of search results. In that study we found that a moderate amount of scrolling (fifty links per page) was preferred to search result presentations that required either a large or small amount of scrolling (one-hundred links per page and ten links per page, respectively). Participants were also fastest at searching in the fifty-link condition.

In this study, we examined the use of paging vs. scrolling in reading passages, including participants' reading comprehension in paging and scrolling conditions. Dyson and Kipping (1998) found that participants read through paged documents faster than scrolled documents, but showed no differences in reading comprehension.

METHOD

A Pentium II based personal computer, with a 60 Hz, 96dpi 17" monitor with a resolution setting of 1024 x 768 pixels was used. Content for the passages came from Barron's "Passkey to the ACT" (2001) study guide. The articles had a mean of 713.7 words (S.D. = 36.83). The passages were presented in 10 point Verdana. Participants' performance was tracked using Ergobrowser™ software.

Participants

Fifteen participants (3 males, 12 females) volunteered for this study. They ranged in age from 18 to 40, with a mean age of 23.3 (S.D. = 6.11 years). The median Web use for the participants was 7-14 hours per week (100% used the Web a few times per week or more).

Procedure

Participants were asked to read one passage from each of three distinct layouts: one passage presented over four web pages, ("Paging", see Figure 1), one passage presented over two separate web pages with no scrolling necessary, ("Full", see Figure 2), and an entire passage presented on one web page, ("Scrolling", see Figure 3).

After reading each passage, participants were given five multiple-choice comprehension questions related to the given passage (e.g., "*In making decisions about parent-child relationships, judges are often guided by the principle that: [A: the family unit is the basic unit of society]*"), and following those, five search task items (e.g., "*What did the economic needs of families and communities necessitate until the end of the 19th century?*"). Participants were not permitted to refer to the passages when answering the comprehension questions. Information in the search tasks had to be found within 5 minutes in order to be considered correct. Participants moved through the pages using the "forward" and "back" button presented on the page in the paging and full conditions, or by clicking on the scrollbar in the scrolling condition. The Paging condition required the users to click a page-forward button 3 times, the Full condition required the users to click on a page-forward button 1 time, and the Scrolling condition required user to click a maximum of 7 times on the window scroll button. The layouts were counterbalanced using a Latin square design. The layouts were stored on a local server, virtually eliminating download time in each condition.

The classic liberal thinkers provided the principles for alleviating the repressed social conditions of the slave, the serf, the woman, for in effect, assertion of individualism and equality of opportunity. But children were not to be included within these principles. For Henry Maine was sure that "they do not possess the faculty of forming a judgment on their own interests; in other words...they are wanting in the first essential of an engagement by Contract." And John Locke was clear that the limited capacity of children necessarily excluded minors from participation in the social contract. "Children...are not born in the state of equality, though they are born to it." Although Adam was "created" as a mature person, "capable from the first instant of his being to provide for his own support and preservation...and govern his actions according to the dictates of law and reason," children lacked a "capacity of knowing that law." Parents were therefore under an obligation of nature to nourish and educate their children to help them attain a mature and rational capacity, "to [their] understanding be fit to take the government of [their] will." And thus we see how natural freedom and subjection to parents may consist together and are both founded on the same principle.

Figure 1. "Paging" condition

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There is of course no unalterable legal boundary between childhood and adulthood. In different societies and at different times, young people have been accepted into adult society at different ages and children have been variously viewed, and law has differently regulated familial relations at different times. One writer has noted the changing from the early colonial days of this country to the present of the legal regulation of the assumption by the child of an adult economic role. Thus, from the early days till near the end of the 19th century, the economic needs of communities and families in America necessitated early entry of children into the work force. At first, these children were closely restrained by law and custom, whether they lived at home or in an apprentice system in a master's home, and they worked not for their own account but for the account of the family or master. Gradually, the law imposed upon parents some regard and consideration for the child's welfare, especially the obligation to prepare him for assumption of full adult responsibilities.

Figure 2. "Full" condition

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but in the post-Civil War industrialization and the social dislocation accompanying it, social custom and supporting law shifted to a greater

Figure 3. "Scrolling" condition

After finishing all questions for each condition, participants answered a satisfaction questionnaire. The questionnaire consisted of a 6-point Likert scale, with 1 = "Disagree"

and 6 = "Agree" as anchors. The questionnaire items were: "The layout made it easy to find information," "This site was visually pleasing", "The arrangement of this site promotes comprehension," "I am satisfied with this site," and "The layout looks professional." After participants completed the questionnaire for all conditions they ranked the three layouts for general preference.

RESULTS

A within-subject ANOVA design was used to investigate participant performance (mean reading time, comprehension, and search completion time) and perceived ease of use of the three conditions. A Friedman χ^2 was used to analyze preference for all three conditions.

Reading Task Completion Time

Evaluation of the average time (in seconds) taken to read each passage revealed a significant difference between the three groups [$F(2,28) = 3.42, p < .05$] (S.D. Paging = 72.4, S.D. Full = 53.5, S.D. Scrolling = 57.89; See Figure 4). Post hoc analysis found reading time in the Paging condition to be significantly slower than the Full or Scrolling conditions.

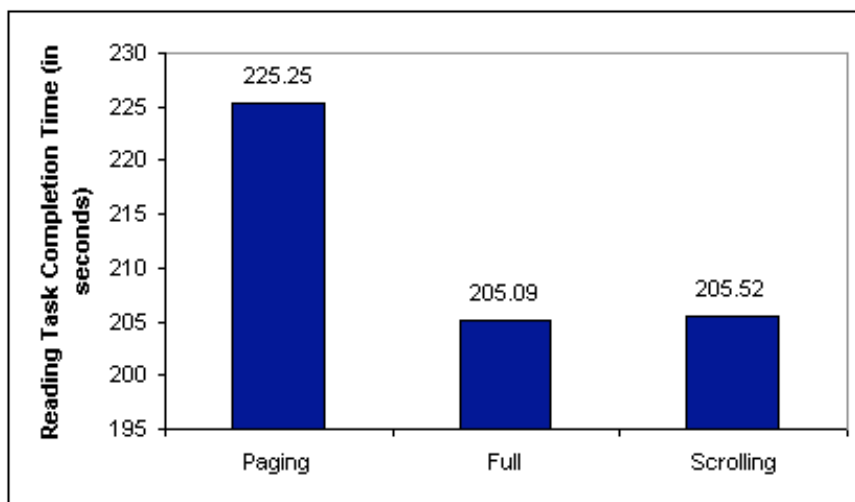


Figure 4. Mean Reading Task Completion Time (in seconds)

Comprehension Questions Correctly Answered

Evaluation of the number of comprehension questions correctly answered revealed no significant differences between the three conditions [$F(2,28) = 1.213, p = .31$] (S.D. Paging = 1.32, S.D. Full = 1.16, S.D. Scrolling = 1.40; See Figure 5).

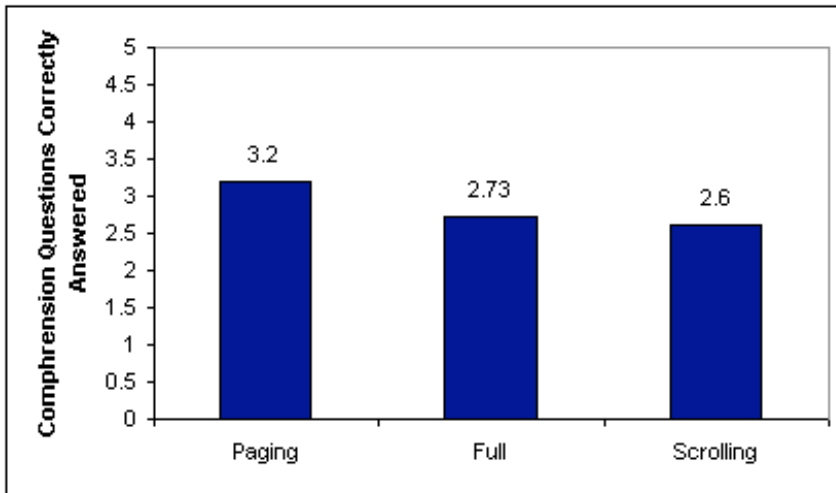


Figure 5. Comprehension Questions Correctly Answered

Search Task Completion Time

Evaluation of the time (in seconds) taken to complete the search tasks revealed no significant differences between the three groups though there was a trend for the search time in the Paging condition to be longer than that in the Full or Scrolling conditions [$F(2,28) = 1.795, p = .185$] (S.D. Paging = 92.83, S.D. Full = 139.43, S.D. Scrolling = 83.48; See Figure 6).

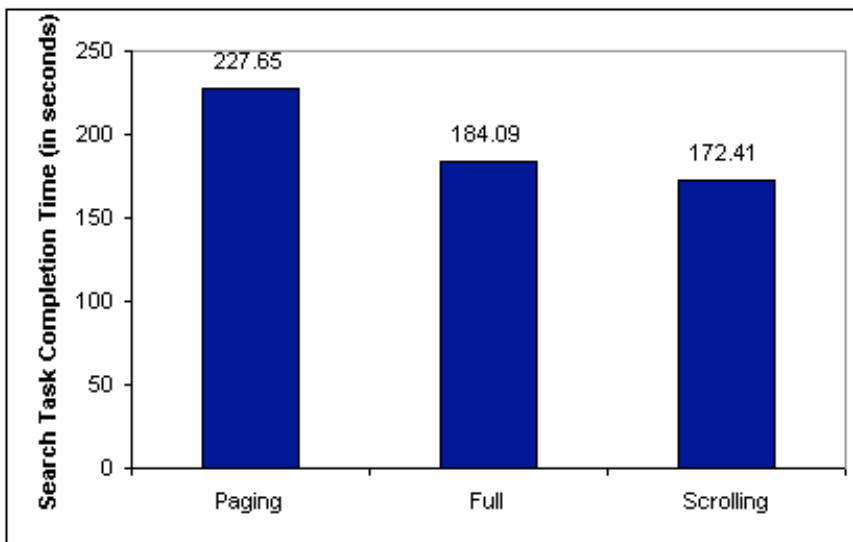


Figure 6. Mean Search Task Completion Time (in seconds)

Perceptions of Site Efficiency

Well-suited for Reading

No significant differences were found in the perception that a particular condition was more well-suited for reading [$F(2,28) = .079, p = .924$]. (S.D. Paging = 1.33; S.D. Full = 1.40; S.D. Scrolling = 1.53). (See Figure 7).

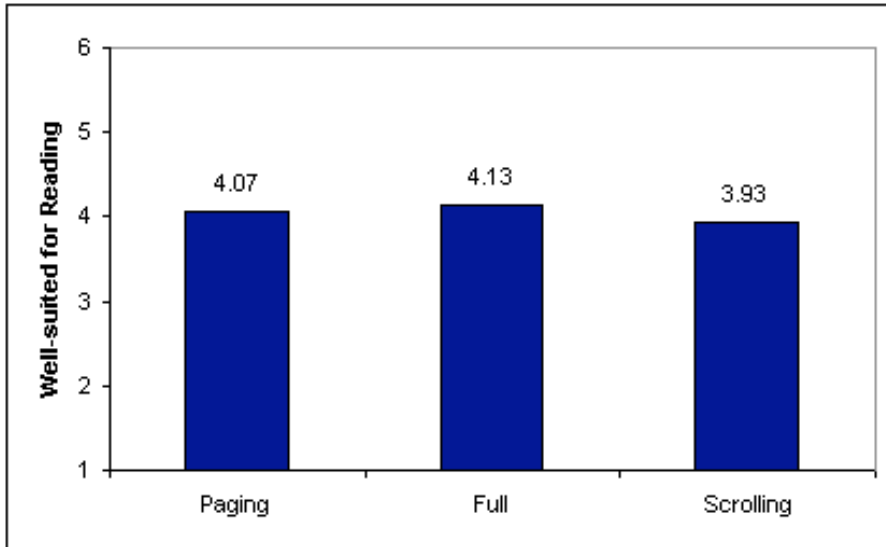


Figure 7. Well-suited for Reading (1 = Disagree and 6 = Agree)

Easy to Find Information

No significant differences were found for participant satisfaction between the conditions in terms of user perceptions' that information was easy to find [$F(2,28) = .547, p = .585$]. (S.D. Paging = 1.43; S.D. Full = 1.47; S.D. Scrolling = 1.33). (See Figure 8).

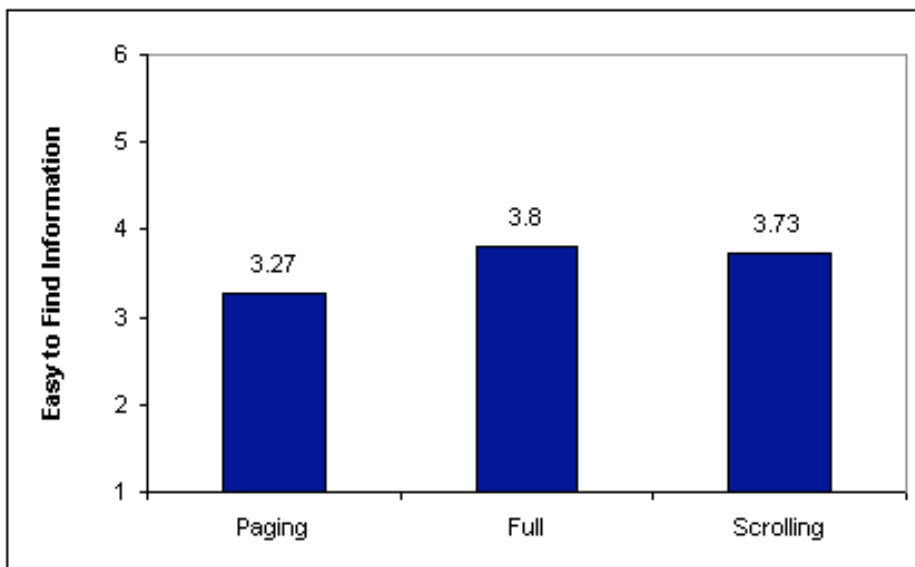


Figure 8. Easy to Find Information (1 = Disagree and 6 = Agree)

Arrangement Promotes Comprehension

No significant differences were found for the perception that a particular layout promoted comprehension [$F(2,28) = .483, p = .622$]. (S.D. Paging = 1.37; S.D. Full = 1.42; S.D. Scrolling = 1.37). (See Figure 9.)

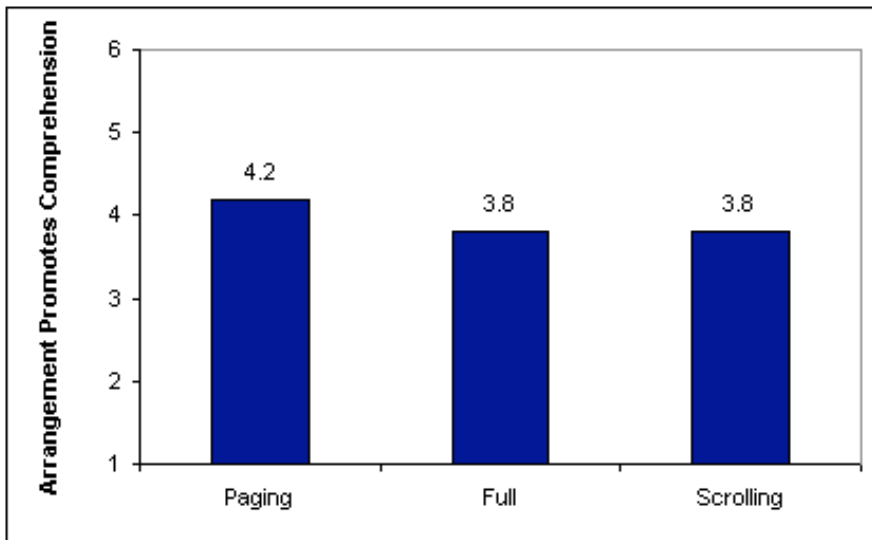


Figure 9. Arrangement Promotes Comprehension (1 = Disagree and 6 = Agree)

Layout Preference

Analysis of layout preference using a Friedman χ^2 showed no significant preference for any of the conditions [Friedman $\chi^2(2, N=15) = .133, p = .936$.] (See Figure 10.)

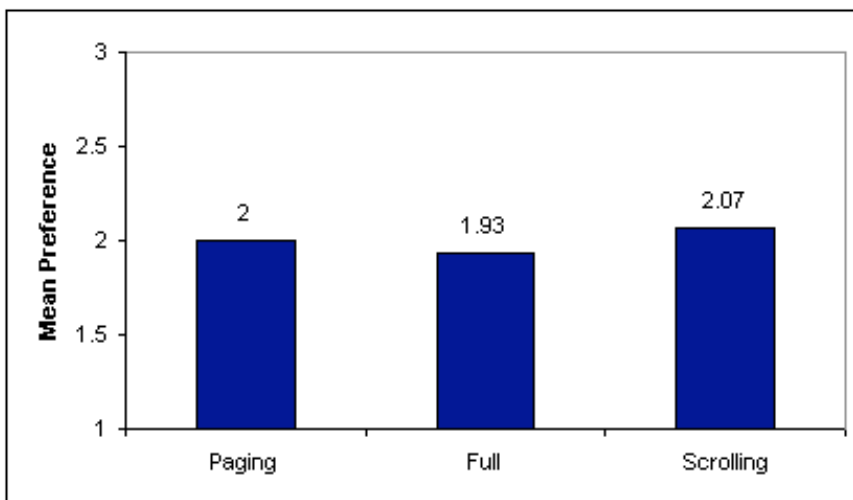


Figure 10. Mean Site Preference (the lower the bar, the higher the preference)

CONCLUSION

The findings from this study show that participants using the paging condition took significantly longer to read the passages than either the full or scrolling conditions. Participants also showed no significant differences in their ability to answer comprehension questions correctly, nor in their perceptions or satisfaction of the reading conditions. This is somewhat surprising given that previous research has shown paging to be typically faster than scrolling (Dyson & Kipping, 1998). One might have expected that the Scrolling condition may be more time consuming given the users had to click the scroll bar more times to view the entire passage than they did in the Paging (3 clicks) or Full (1 click) condition. However, several users commented that they were more accustomed to scrolling when reading documents on the web. It may be that since participants had more exposure to scrolling they were able to read through the documents more quickly using that mode of navigation. Participants stated that they found the Paging condition to be "too broken up," and that they had to "go back and forth" quite a bit to search for information. It is possible then, that for searching as well, viewing more of the document on a single screen facilitated easier scanning.

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