



ORIGINAL ARTICLE

Evaluating college students' performance of Arabic typeface style, font size, page layout and foreground/background color combinations of e-book materials

Mohamed Zaki Ramadan *

Industrial Engineering Department, College of Engineering, King Saud University, P.O. Box 800, Riyadh 11421, Saudi Arabia

Received 3 April 2010; accepted 26 June 2010

Available online 3 April 2011

KEYWORDS

Arabic text;
Text format;
Arabic typography;
Arabic font

Abstract The present study was conducted to explore students' preference of Arabic typeface style, font size, page layout, and foreground/background color combinations of written materials. Legibility and readability guidelines described in the literature are written for Western readers; make it difficult for e-book providers to know exactly what recommendations to follow in Arabic. First, the participants completed the font style selection process from among all the Arabic font styles available in Windows. They were then asked to select the typeface style (Simplified, Traditional, Kofi, and Nassekh) and font size (10-, 12-, and 14-point) they preferred when reading e-passages. Finally, they read another group of e-passages in the typeface style and font size they had selected in one- and two-column formats with four foreground/background color combinations. To assess their reading speed and comprehension as well as their preferences, we asked questions about the information they had read. In Experiment 1, 49 participants preferred 170 font styles from a pool of 877 presented in 12-point font size. In Experiment 2, 31 participants selected 14-pt Arabic simplified as a good readable font style for next experiment. In Experiment 3, 31 participants preferred to read Arabic materials in one column with black/white for foreground/background color combination. Participants were able to read the e-materials significantly faster and with better comprehension

* Tel.: +966 1 4676713; fax: +966 1 478657.
E-mail address: mramadan1@ksu.edu.sa



when they were presented in 14-pt Arabic simplified font style in one column with black/white for foreground/background color.

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1. Introduction

The use of an electronic equivalent to a conventional printed book is called an electronic-book (e-book). The advantages of reading from e-books are: reading in low light or even total darkness, requiring far less storage space with low distributed cost; and no need to visit a bookstore (Muter, 1996).

Reading information on a visual display terminal (VDT) or a liquid crystal display (LCD) by paging is similar to reading a book, but reading speed on the screen was 28.5% slower (Muter et al., 1988) and proofreading time on the screen was 20–30% slower than on a printed paper (Gould and Grischkowsky, 1984). The reason why people read more slowly from VDTs than reading from a hard copy appears to be related to image quality. The higher the resolution of the screen is, the less the difference between reading from a VDT and reading from a hard copy will be (Näsänen et al., 2001). Harpstedt et al. (1989) and Kuo et al. (2007) reported that low quality (resolution) typeface styles stimulate different spatial frequency responses in the brain than do high-quality typeface styles. This difference results in poorer accommodation to low-quality typeface styles of VDTs and maybe the cause of the poorer performance associated with reading from older VDTs. With newer, higher-resolution VDTs' monitors and LCDs, however, reading from VDTs' monitors may be as easy as reading from a hardcopy.

Researches have demonstrated that typography plays a critical role in ensuring legibility and readability that should be put into consideration when producing written electronic educational materials (Ley, 1988; Gould et al., 1987; Brooks and DeJoy, 1998; Schenkman and Schmid, 2003; Al-Harkan and Ramadan, 2005; Lee et al., 2008; Sheedy et al., 2008; Yau et al., 2008).

Legibility affects how rapidly, easily, and accurately one character can be recognized and distinguished from another (Huang and Ma, 2007). In other words, the greater, the ease, speed, and accuracy of sensation and perception of the character is, the more legible is the typeface (Goldstein, 1984). Typeface size is designated in points and is set to specific width and depth. The point size of a font is a measure of the overall space that the typeface styles occupy not the actual size of any individual character. Because point size does not tell you everything about how big a particular typeface will actually look, selecting type size is a visually based criterion. Bernard et al. (2003) found words to be most distinguishable when character size was about 1.14 mm wide with 0.75 mm spacing.

Typeface styles on VDT screen can be dark in a light background or light in a dark background. The research evidence is mixed in the issue of which one should be considered in the text displayed design. Some studies report no effect of polarity "the contrast of the type color and the background color" (Pawlak, 1986; Huang, 2008; Kutas et al., 2008) while others find improved performance (time and accuracy) with dark typeface styles on a light background (Ling and Schaik,

2002; Bodrogi, 2003; Hunag and Chiu, 2007; Wang and Tseng, 2007; Ramadan and Mohamed, 2010).

Text materials may provide more legibility with changing foreground and background colors. Murch (1985) and Marcus (1997) argued that opponent colors were the best combinations to use; although Murch felt that blue should be avoided as a text. On the contrary, Ling and Schaik (2002) argued that it was best to go with the combination of a blue text on a white background.

Al-Harkan and Ramadan (2005) argued that larger improvements in visual identification performance can be achieved by changing task features. Consequently, page layout seems to be an important factor in reading performance and subjective preference of e-book users. To date, research investigating the optimal use of line length, multiple columns, and text justification is inconclusive. Longer line lengths typically result in faster reading times (Dyson and Kipping, 1997, 1998), but research suggests medium to short line lengths typically may result in better comprehension (Chaparro et al., 2004). In terms of text column, the research supports both long single column of text (Dyson and Kipping, 1997) and multiple short columns (Lam et al., 2000) while preference seems to be toward multiple short columns (Dyson and Kipping, 1997; Bouma, 1980; Andrevey and Martynov, 2000).

Legibility and readability guidelines, which include typography guidelines, described in the literature are written for English readers. Most of the investigating of variables concerned with information presentation on VDTs has been done within the context of Western language alphabets and convention of printing and reading. It is vague for Arabic language, making it difficult for Arabic e-books' providers in general to know exactly what recommendations to follow when producing e-books.

Because of the many differences between Arabic and English text styles, character recognition methods differ in the way they handle texts in the two languages. For example, the Arabic text is read and written from right to left while English is read and written from left to right. Arabic text is cursive, i.e., characters are connected within each word without spaces and in this way they are treated as a block forming one word. Words are separated by spaces (Al-Mutawa, 1999).

English characters take two different forms (upper and lower case). However, Arabic characters take different forms for different reasons. When a character comes at the beginning of a word it has a special shape. When it comes in the middle of the word it has another shape and so on. Each character in Arabic language has up to seven forms depending on the font used such as "أ", "إ", "آ", "ؤ", "ل", "ل", "ل", "ل" for "Aleph", and location of the character within a word, i.e., "ص", "ص", "ص", "ص" for "Sad". In addition, some characters may have more or fewer forms than others such as "ي", and "ي" for "Ya". No middle form character should be placed at the end or at the beginning of the word; no end form character should be placed anywhere other than the end of the

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