Proposed Features of Online Examination Interface Design

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Abstract: User interface design plays a highly significant role in computer applications whether the application is in the online or offline environment. Accordingly, online examination is an equally important system within e-Learning. Consequently, online examination design features need to be a central concern because they are a significant factor in enhancing efficiency as well as convenience of examinees when taking online tests. Accordingly, this paper focused largely on a comprehensive literature review, the results of which answered the two main questions raised with regards to the design features of online examinations. The results of this study show that online tests have nine main design features, namely font (i.e., type, size, colour and style), background colour, sound alert, questions group, counters and number of questions per page. Each of these features has potential values which can be explored for optimal interface design that addresses both the efficiency and convenience of online examination takers.

Key words: Online exam, design features, design attributes, interface design, counters

INTRODUCTION

The growth in online education over the last few years has been marked by a competitive academic environment (Trenholm, 2007). Moreover, a new concept that has emerged from the world wide web is e-Learning (Alotaibi and Argles, 2011; Alavi and Leidner, 2001). The phenomenal growth of e-Learning can be attributed to the fact that it is a financially viable venture for institutions. In fact, according to a new report by the global industry analyst (Xiao and Ji, 2011), the e-Learning market is projected to reach $107.3 billion by 2015.

Computer technology has proven itself to be generally useful in the field of education, in particular, as teaching and learning tools. In terms of the evaluative phase of the teaching-learning process, online examination is an increasingly important component of online courses. Generally, an examination or a test is a tool that evaluates knowledge or skills learned in a particular subject. Accordingly, along with the growth of e-Learning, online tests evolved rapidly as well (Sarrayrih and Ilyas, 2013). Largely, however, online course examinations are used to evaluate the student's knowledge using computer technology without causing undue effects on the traditional university course examination that is, tests taken with pens, papers and invigilators while the traditional examination system using pen and paper requires more effort on the part of students and invigilators, a growing concern of educational institutions is improving the standards of online tests. Considering the increasing use of online examinations, the development of network technology policies has opened avenues on the conduct of online tests. Doubtless, university students can benefit from these services. Of late, experts have noted the need for a more efficient and convenient system of conducting online examinations by directing attention to all the elements of online examination, including the online test environment. Largely, efforts to streamline online examinations focused either on ensuring the credibility of test results by improving security and user authentication techniques, or by trying to improve the online test display and design features for a more efficient, convenient and usable interface. However, a majority of prior literature on e-Learning examinations focuses largely on security concerns and has proposed the best user authentication systems to prevent online examination threats such as cheating and impersonation (Karim and Shukur, 2015). On the other hand, according to our knowledge, hardly any research focuses on the online examination design features. Hence, this study proposed to identify the specific design features of online examinations which will facilitate the efficient and convenient process of taking online tests. Accordingly, a literature review was conducted to determine the potential elements or design features that make up online examination interface design and the possible values that could be used with these features.

Online examination design features: Recent developments in information and computer technology and the use of the Internet worldwide underscores the importance of user interfaces (Calvary et al., 2003). New technologies are emerging for the comfort and

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Table 1: Online examination potential interface design features

Design features	Description	References
Font size	Font size has a significant effect on objective and subjective readability and comprehensibility	(Rello *et al.*, 2012, 2013; Bernard *et al.*, 2001, 2002)
Font face	Reading efficiency and reading time are important aspects related to the font type and size; many font sizes are suggested in previous literature	(Bernard *et al.*, 2001, 2002)
Font style	Four main values can be recommended: Regular, Italic, Bold and Bold Italic	(Hill and Scharff, 1999)
Text colour	Literature shows that text and background colour affect text readability and colours with greater contrast ratio generally lead to greater readability	
Background colour		
Time counter	Some online examination systems display the time counter on the screen until the examination time is ended.(Sarrayrih and Ilyas, 2013)	(Hui *et al.*, 2012; Islam *et al.*, 2013)
Alert	An alert can be used to give attention for online examination takers about remaining examination time	(Hui *et al.*, 2012)
No. of questions per page	The number of questions per page in the online examination has its own advantages and disadvantages.	
Group questions	This feature allows users to group questions by topic, difficulty, or type (objective vs.essays) which are ways to organise an examination into meaningful parts.	

convenience of the user. Thus, user interfaces are becoming the key discriminator for the products (Park and Lim, 1999). McDaniel defines user interface as follows:

> "Hardware, software (including menus, screen design, keyboard commands and command language), or both that allow a user to interact with and perform operations on a system, program, or device (p. 724)."

The user interface is an essential part of any software application, one that often determines how well end- users accept, learn and efficiently work with entire systems. Whatever the underlying technology is, users can contact the system through the user interface (Chalmers, 2003; Agah and Tanie, 2000). For instance, a student taking an online exam deals with the interface that is made up of many elements that are used in the question display and should help the student to perform the examination comfortably and efficiently.

MATERIALS AND METHODS

This study posed the following research questions:

- Question 1: What are the possible design features that may affect online examination interface design?
- Question 2: What are the appropriate values for each feature of online examination design?

This review was performed on several scientific digital libraries and databases in English and it focused on articles identified with online exam design features. All other insignificant articles were excluded. Several scientific digital libraries and databases were searched such as Scopus, Springer link, IEEEXplore, Science Direct, ACM and Google Scholar. String displays the search keywords used in the above-mentioned digital libraries.

Search keywords
String:

- {Online exam/e-exam/e-assessment/web page} design features
- {Online exam/e-exam, e-assessment/web page} interface design
- {Online exam/e-exam, e-assessment/web page} design attributes
- {impact/effect} {web page/online exam/e-exam/e-assessment} {text/background/colour /font}

RESULTS AND DISUSSION

Data extraction and analysis: This study shows several samples of the data extraction. To answer Question 1: What are possible design features that may affect the online exam interface design, Table 1 summarises some of the collected literature within three sections: design features, description and references. It shows nine design features that may be important in online examination interface design:

To answer Question 2: What are the appropriate values for each feature of online examination design? Fig. 1 shows the summary of potential values that can be used for online examination interface design. A brief summary for each feature is described below.

Font size: The suggested levels are 10, 12, 14, 18, 22 and 26 points. Meanwhile, 10 pt. is suggested as minimum font size in standard usability guidelines. However, other font sizes are suggested because they were recommended in previous studies, namely 12 pt. in (Islam *et al.*, 2013), 14 pt. in (Hui *et al.*, 2012) and 18, 22, 26 points in (Rello *et al.*, 2013).

Font face (type): The core font types in the Web are Andale Mono, Arial, Arial Black, Comic Sans Ms, Courier New, Georgia, Impact, Times New Roman, Trebuchet Ms, Verdana and Tahoma (Bernard *et al.*, 2001, 2002).
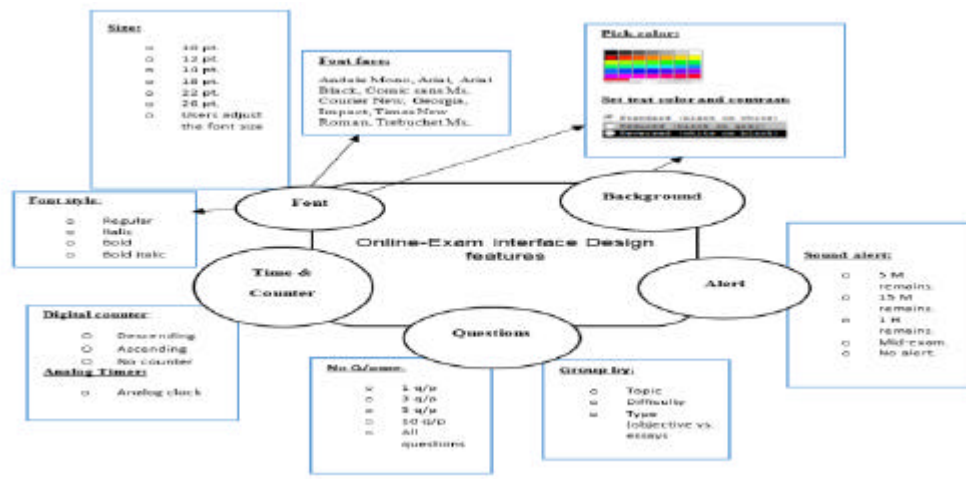
Fig. 1: Features of online examination interface design and its potential values

Text colour/background colour: This study suggests the use of some popular combinations used in the online examination of Harvard Law School in addition to suggested combinations from other literature to allow the user to pick his own colours (Hill and Schraff, 1999).

Time counter: It comes in three options: countdown timer, ascending counter and traditional clock. Harvard Law School and Examsoft software use countdown timer in their online examination (Hui *et al.*, 2012; Islam *et al.*, 2013).

Sound alert: Harvard Law School uses sound alert in its online examination system. In the Softest software (Microsoft), the user can set a reminder alarm to appear at a specific time during the exam. The suggested values of this feature are: 5 M remain, 15 M remain, 1 H remains, Mid-exam, No alert.

Number of questions/page: A non-profit organisation Etudes (Sinou, 2014) who works on the learning management systems field discusses the advantages and disadvantages of the number of questions/page. Etudes noted that on short exams and quizzes, the one-question-per page layout is best. However, it may be cumbersome for long and timed assessments. For very long tests, it is best to break them up in parts and place no more than a dozen questions in each part. Hence, based on Etudes, the following are the choices for the number of questions per page: (1 q/p, 3 q/p, 5 q/p, 10 q/p and all questions in one page).

Questions groups: Etudes proposed to add a new feature for assessments. This feature allows a user to group questions by topic, difficulty, or type (e.g., objective or essey) which is a way to break up and organise an examination in meaningful parts.

CONCLUSION

Students taking online examinations deal with the interface which is made up of many elements largely applied in the questions display which help the students to take the test comfortably and efficiently. There are nine possible design features in an online examination interface design, namely font (i.e., type, size, colour and style), background colour, sound alert, questions group, counters and number of questions per page. Each one of these features has a number of potential values that can be applied to get an effective online examination interface design.

LIMITATION

The limitation of this research was in the lack of literature that exclusively focuses on online examination design features. Nonetheless, for future research, an experimental study to identify the most common, suitable and accepted values that can be used to design online examination interface is recommended.

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