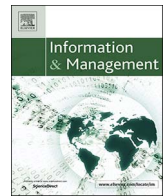




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## Managing online wait: Designing effective waiting screens across cultures

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### ABSTRACT

We investigate how to effectively manage online wait using a waiting screen with progress cues in different cultures. A research model is developed based on uncertainty reduction model, resource allocation model, color psychology, and Hofstede's cultural model. Two controlled lab experiments (n = 269 subjects each) were conducted in U.S. and Taiwan. We found that high hedonic valence and high time affordance were more effective to induce greater enjoyment and less uncertainty respectively, resulting in shorter perceived waiting time. We also found the significant background color effect and interaction effects between culture and progress cue design.

### 1. Introduction

As the Internet becomes the *de facto* means for people around the globe to search and download contents, purchase goods, and conduct business, many wait situations occur and waiting online can pose a challenge for both web content providers and users because of its negative impact, including stress and dissatisfaction with online stores, resulting in site abandonment and loss of revenue [28]. A recent study of Walmart Labs investigates its websites' slow page loading issue and finds that every 100 ms improvement on page loading time of its website leads to a 1% increase in incremental revenue and every 1 second improvement leads to a 2% boost in conversion rates. This study also found that online travel bookings tallied \$129 billion dollars in 2013 but 43% of online travel and lodging shoppers abandoned a site after three seconds of wait.<sup>1</sup> Nah [42] found that the maximum tolerable waiting time online (for information retrieval) is only two seconds. Considering the crucial financial impacts of online wait, e-vendors have made considerable investments to technically reduce online waiting time yet the outcomes are still ineffective.

One of the most pervasively adopted alternative solutions is displaying a waiting screen, a webpage shown to users while they wait for responses, such as search results or files to be downloaded [34]. These waiting screens can contain a variety of interface cues, including progress cues, background color, text, images, and multimedia. For

example, a progress cue can provide a graphical provision of waiting duration information (e.g., a filling bar) or indicate the processing in progress only (e.g., moving dots). These various interface cues are expected to manage online users' waiting perception (e.g., uncertainty, enjoyment, and waiting time), and ultimately affect their behaviors favorably towards corresponding websites. However, to date practitioners still tend to design waiting screens based on their own instincts, gut feelings, or educated guesses [34], with limited scientific research on online wait management using waiting screens just starting to emerge (e.g., [6,28]). Therefore, there is an imperative need for rigorous research to provide valid and reliable guidance for waiting screen design.

In addition, as online users become more globalized and increasing numbers of organizations operate more than one version of their website across the globe, researchers have emphasized the cultural consideration in web design such as website localization, cultural congruity, and culturability [3,11,12,56]. Barber and Badre [3] recommend incorporating appropriate 'cultural markers' in websites, which are "interface design elements and features that are prevalent, and possibly preferred, within a particular cultural group." Given this background, the primary goal of this research is to propose and test a model of online wait management that explains how different interface cues (i.e., progress cues, background color) on a waiting screen influence online users' waiting perception (i.e., perceived uncertainty,

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<sup>1</sup> The study of Walmart Labs was presented at the SF Web Performance Meetup, February 16, 2012 by Cliff Crocker, Aaron Kulick, and Balaji Ram of Walmart Labs (<http://www.meetup.com/SF-Web-Performance-Group/events/50485972/>).

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perceived enjoyment, perceived waiting time) and behavior (i.e., satisfaction, use intention) with consideration of cultural differences (i.e., across two countries with distinct cultures).<sup>2</sup>

We develop our research model based on two models related to time perception: uncertainty reduction model [21,46] and resource allocation model [66], conjecturing that progress cues and background color affect users' perception and behavior during a wait. We conducted two controlled experiments by manipulating types of progress cues (low vs. high time affordance; low vs. high hedonic valence) and background colors (blue vs. red) with a total of 538 subjects from two countries (U.S. and Taiwan) representing different cultures. Such a scientific study on waiting screen design across cultures can help advance our understanding of the relationships between web interface cues and culture for both researchers and practitioners.

## 2. Literature review and theoretical background

Based on four theoretical references including uncertainty reduction model, resource allocation model, color psychology, and Hofstede's cultural model, we build our study around the time affordance and hedonic valence of progress cues, background color of a waiting screen, and culture and website design. We describe each in detail in the following subsections.

### 2.1. Progress cue design

#### 2.1.1. Time affordance and perceived uncertainty

Positing the significant effect of cues on people's tracking and perception of time passage, researchers [21,66] have identified cues with distinct levels of time affordance. According to Conn [10], 'time affordance' is defined as "a presentation of the properties of a delay in a task or anticipated event that may be used by an actor (e.g., user) to determine the need for an interrupting or facilitating action (p. 188)." Computer and web design in the human-computer interaction (HCI) literature utilize certain interface cues that provide information or feedback to users during a wait can be referred to as 'time affordance' (e.g., [44]). That is, cues with high time affordance are those that provide information about the duration of the wait, including the percentage or portion of time remaining, the exact time remaining, and an individual's position in a waiting queue [41].

Perceived uncertainty (PU) represents ambiguity or lack of confidence in the likelihood that an event will occur [60]. The positive influence of cues with high time affordance to reduce perceived waiting time (PWT) has been reported based on the uncertainty reduction model [21,39,41], predicting that the PWT will seem shorter and negative feeling toward the wait will be reduced when individuals receive temporal information about the wait. That is, when perceived uncertainty about the wait is reduced, people tend to worry less about the wait and waiting time, resulting in shorter PWT. Therefore, time affordance is designed to reduce the uncertainty of the wait [45], and can include the different components showing progress, working, exception, remainder, and completion [10,55]. In HCI field, one common time affordance design, a progress cue, provides the indication of progressing of a computer-based task as waiting situation occurs. The design can take a higher level (e.g., a progress cue with the graphical provision of wait duration information such as a filling bar) or a lower

level (e.g., a progress cue showing the processing in progress such as repeated moving dots or a moving bar).

#### 2.1.2. Hedonic valence and perceived enjoyment

Web interfaces contain both functional and aesthetic components [31]. Thus, the aim of web designers should be to come up with a website that is not only useful and usable but also conveys positive emotions and feelings through its aesthetic features [4,65]. Venkatesh [63] suggested that perceived enjoyment (PE) represents the experience of using a system being perceived to be enjoyable regardless of resulting performance from such use. However, previous HCI and IS studies have mostly focused on functional aspects of interface design [34], placing too much emphasis on performance issues and not enough on emotional aspects, such as pleasure, fun, and excitement [31]. This can be attributed to the fact that traditionally the IS discipline is more accustomed to tackling 'hard' problems than 'soft' issues such as aesthetics, and IS developers are unfamiliar with established visual design practice [44]. Web visitors appear to appreciate hedonic attraction from emotional involvement and affective evaluation of web interfaces. Thus, a traditional functional-oriented design with low hedonic valence can probably induce only partially positive website perception. That is, effective web interfaces should contain aesthetic value and, therefore, incorporate design with high hedonic valence to induce enjoyable experience for online users. As a result, IS researchers have started to investigate the affective dimension of systems and web elements used for influencing users' perceived enjoyable experience and response [12,34,67].

The resource allocation model [66] suggests that the use of cues, in particular, visually attractive ones, can distract people from thinking about the wait (i.e., focus their attention to visually appealing cues during wait) as a way to increase enjoyment and reduce PWT. The rationale supporting this perspective is that if more attention is directed toward those cues during a wait, there are fewer resources available for time estimation, resulting in a shorter PWT [38]. In particular, if a cue with high hedonic valence that provides aesthetics and pleasure impression is presented, it effectively attracts online users' attention and distract them from waiting situation while invoking positive emotions during wait. Along this line, waiting time literature suggests that affective stimuli can improve customer mood and waiting time perception and, therefore, calls for attention on hedonic component design [8]. For example, Cai and Xu [7] suggest that hedonic components could attract users' attention and provide them with an enjoyable interactive experience. We intend to further examine whether interface cues with higher hedonic valence on a waiting screen can influence users' perceived enjoyment of a waiting experience and subsequent positive response.

### 2.2. Color

In our daily life, color is believed to be perceived on almost every object that people view; it is even present in our dreams [51]. Studies (e.g., [23,64]) show that colors can carry different emotional and psychological properties to people and at the same time influence both human behavior and human physiology [37]. In the color psychology fields, many aspects of human's psychological functioning related to color have been studied such as physiological reactions to color, color effects on emotions, and color effects on behavior. For example, Lee et al. [33] pointed out that color is a powerful tool for attracting an individual's attention, bringing out the desire to consume, and making communication more efficient. Further, Bonnardel et al. [4] suggested that people are more attracted when they see their favorite colors and look at their favorite color longer. Companies have utilized color to manipulate brand images in customers' minds [53]. Considering that the Lanham Act in the United States was passed to protect product colors as trademarks, there is a clear indication of the significance of color for conveying meaning [37].

<sup>2</sup> Lee et al. [33] suggested that two categories of factors might influence a user's attention – (1) conspicuous external stimuli (i.e., luminance, color contrast, spatial layout), and (2) the user's internal processes (i.e., knowledge, experience, curiosity, or other complicated reasoning). In this research, our focus is to investigate the former. That is, we investigate the effects of factors "during the wait" (situational factors such as interface cues that can be controlled by a web designer) but not factors "before the wait" (individual factors such as personality traits) as mentioned by Durrande-Moreau [16]. In addition, while there are many aspects of color psychology and various dimensions of cultural differences, we acknowledge that in this research only selected aspects and dimensions are referred for the focus related to online wait management.

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