# AN EXPLORATORY STUDY ON WEB USABILITY AND THE INTERNATIONALIZATION OF US E-BUSINESSES

Shirley Ann Becker
Computer Information Systems
College of Business Administration
Northern Arizona University
annie.becker@nau.edu

**ABSTRACT**

The Internet provides opportunities in accessing international marketplaces that in the past were virtually unreachable by many organizations. As a result, US businesses are pursuing a global Web presence at an increasing rate in recognition of the huge global market external to it. Along with the opportunities in the international marketplace, there are complexities associated with the diversity of religion, culture, and language. There are also complexities associated with local differences in computing technologies used to access the Internet.

An exploratory case study was conducted using seventeen e-businesses in the US to assess the state of Web usability from a localization perspective. The findings are summarized in terms of potential barriers uncovered during the use of a Web usability assessment model as a framework for evaluating localized sites. Several Web usability factors from the model, design layout, information content, and performance, were used to uncover design and technological issues that might impede the widespread use of localized Web sites.

## 1. Introduction

The Internet has provided opportunities in accessing international marketplaces that in the past were virtually unreachable by many organizations. As a result, US businesses are pursuing a global presence via the Web in recognition of three quarters of the global market being external to its borders (Gareiss, 2000). It is predicted that global net commerce will reach $6.8 trillion in 2004, as more international users get online. This will compose approximately 8.6% of international sales of goods and services (Forrester Research, 2000).

Along with the opportunities in the global digital economy, there are complexities associated with the diversity of culture, religion, and language. There are also complexities associated with local differences in computing technologies used to access the Internet. US organizations that do not meet the challenges of developing multilingual, multicultural Web sites will lose out to the growing number of e-businesses in Asia and other parts of the world (Macaluso, 2001).

Organizations risk repeating the same mistakes made by the failed dot coms unless they develop a strategy for internationalizing their Web sites. Jakob Nielsen (1999, January) had correctly predicted a Web usability meltdown for many local e-businesses because of the rush to deploy Web sites that didn't meet the needs of the targeted user. This will happen on a global scale if organizations choose to ignore religion, culture, and language as well as, technological constraints in the development of localized Web sites.

Statistical data regarding the opportunities in the global, digital marketplace reflect the need for sensitivity to local user needs. Today, 85% of existing Web sites are accessible only if the user speaks English (Tweney, 2001). Yet, local users stay twice as long and are four times more likely to make a purchase if the information content on the Web site is in a native language (Enos, 2001). Seventy percent of the world's purchasing power and 92% of the world's population live in countries where English is not the native language (Dunlap, 2000). By 2007, Chinese will outrank English as the most used language on the Web (Gereiss, 2000).

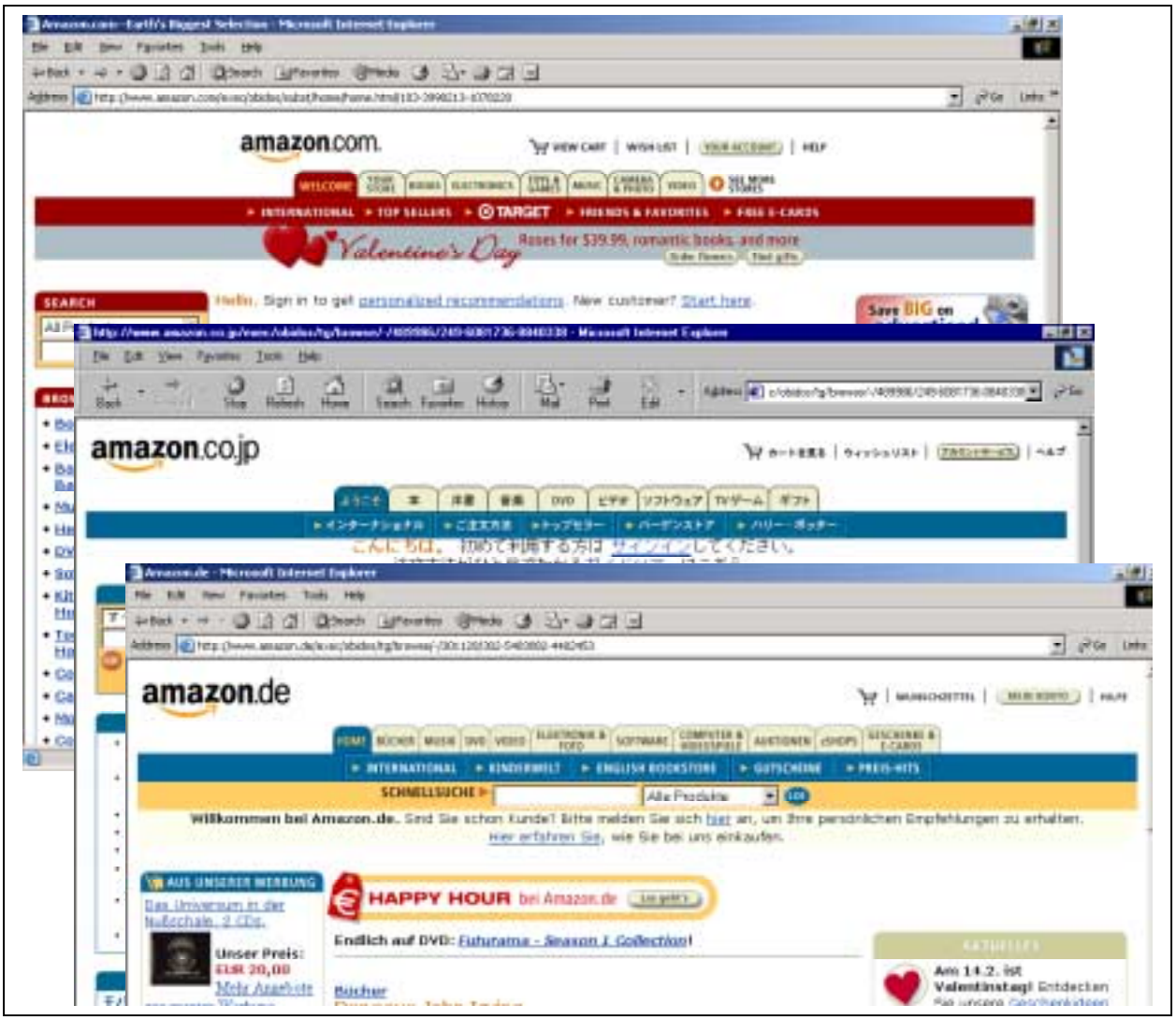
Cultural influences on Web use cannot be studied in isolation of computing environment issues, thus adding complexity to the study of Web usability. Network access speed in many countries lags behind the US thus impacting download time and overall performance of a Web site. Computer hardware and software also lag in global regions in terms of operating systems, internal memory (RAM), processing capabilities, and monitor screen size.

The pursuit of a globalization strategy requires the internationalization and then the localization of the e-business' Web site. The internationalization process results in a culturally neutral Web infrastructure, which is capable of supporting multiple languages and data content formats (Schwartz, 2000). The e-business may develop a

standard design template in order to promote international recognition regarding the "look and feel" of each localized Web site through the use of corporate logos, images, and colors.

An e-business may attempt to localize its Web site by displaying a country flag or the country name without any translation into a native language. The localization process goes beyond this minimal effort by 1) adjusting Web page objects via translation, data and text formats, punctuation, and bi-directional design layout and 2) adjusting the aesthetic design by the use of color, images, text flow, functionality, and communication patterns (Sun, 2001, p. 95). Web page design and content are customized to appeal to a local customer and to promote brand loyalty as it relates to the overall Web experience. In addition, culturally sensitive images, icons, symbols, and colors are taken into account as well as, linguistic considerations regarding word choice and the use of clichés and slang.

Figure 1: Amazon.com's Localized Web Sites




Amazon.com, for example, has internationalized its e-business by providing local Web sites for the United Kingdom, Japan, Germany, France, and Austria. Each country Web site makes use of the same design template with navigation bars, buttons, icons, folders, and other Web objects having the same look and feel as the US Web site (Figure 1). This standardization takes advantage of Amazon's lessons learned from the implementation of previous versions of its Web site. It also promotes universal branding, as customers around the world share the same Amazon.com online shopping experience. Amazon makes use of the Euro currency on its European Web sites as a means of standardizing monetary exchange in the international marketplace.

Each of Amazon.com's Web sites displays products that are popular in the local market, but which may be unknown or inappropriate in the other local markets. Some of the localized Web sites promoted Valentine's Day, while others made no reference to it. Each localized Web site is translated into a native language and uses local currency in addition to the Euro.

This paper examines the current state of US-based e-businesses in localizing their Web sites. The findings are based on Web site assessments from e-businesses in the automobile, travel, portal, computer products and services, financial, and retailing industries (refer to Table 1). Seven hundred and eighty localized Web sites were used during the assessment process to explore sensitivities to cultural and religious differences in the international marketplace. Section 2 presents an overview of Web usability studies in e-commerce and from a cultural perspective. Section 3 describes a Web usability assessment model that has been used to provide feedback on localized Web sites for international e-businesses. It was used in this research as a framework to study design layout, information content, and performance usability factors while taking into account the user profile, computing environment and strategic goals of the e-business. The paper concludes with a summary of the findings and future research.

Table 1: E-businesses and Localized Web Sites

| **Industry** | **Non-US localized Web sites** |
|---|---|
| Portals: | |
| MSN | 30 |
| Lycos/Terra | 43 |
| AltaVista | 21 |
| Yahoo | 21 |
| Netscape | 17 |
| Strategic goals - information dissemination, entertainment, and sales of goods and services. | |
| Computer Products & Services: | |
| Dell | 77 |
| IBM | 63 |
| Microsoft | 72 |
| Apple | 43 |
| Hewlett-Packard | 65 |
| Strategic goal - sales of goods & services | |
| Automobile Manufacturers: | |
| Ford | 120 |
| General Motors (Chevrolet) | 42 |
| Strategic goal - sales of goods & services | |
| Financial Institutions: | |
| Visa | 99 |
| American Express | 35 |
| MasterCard | 20 |
| Strategic goals - financial & information dissemination. | |
| Retail and Travel: | |
| Amazon.com | 6 |
| Expedia.com | 6 |
| Strategic goal - sales of goods & services | |

## 2. Web Usability

Many of the Web site usability guidelines published during the last decade were based on developer expertise, project experiences, and subjective studies. Existing user interface design recommendations were extended to include designing user interfaces for the Web (Lynch & Horton, 1999; Nielsen, 1999; Schneiderman, 1998). Those experienced in designing user interfaces provided heuristics or guidelines for designing Web pages often by identifying design layout, navigation, and performance issues associated with particular Web sites (Flanders & Willis, 1998; Hurst 1999; Spool, Scanlon, Schroeder, Snyder, & DeAngelo, 1999). Many of these guidelines were incomplete or too general to apply to the development of all Web sites, though much insight was gained from these efforts.

The experiential and heuristic approaches to Web usability studies reflect the technological explosion associated with Web use in such a short time period. Numerous online articles[1] were published based on developer experiences, customer feedback, and economic and marketing data regarding Web use. Most of these articles focused on Web usability guidelines from a US perspective in terms of technological, economic, and cultural considerations. When internationalization was addressed, it typically was in terms of language translation, date, time, currency, and number formats, units of measure, and phone number and address formats.

Empirical research efforts have focused on Web usability primarily in a local e-commerce business environment (refer to Zhang and von Dorn, 2002, for a compilation of recent Web usability studies in this area). Bellman, Lohse, and Johnson (1999) studied user characteristics in predicting online buying behavior and discovered that both demographics and lifestyle characteristics influence online shopping. Ho and Wu (1999) found that logical support, technical characteristics, information characteristics, homepage support, and product characteristics, all impact customer satisfaction when shopping online. Zhang and von Dran (2002, p. 29) conducted studies on user perceptions of Web sites in terms of quality expectations. Their findings suggest that Web site designers should focus on users' basic needs and performance quality expectations. Web design quality, from a functional perspective, was found to have a major affect on consumer's use of electronic stores (Liang & Liu, 2000).

Though these research efforts contribute to the area of Web usability, none focused specifically on the customer in an international online marketplace. Individual profile data was gathered in terms of education, age, and gender. However, none of the studies gathered user characteristics based on linguistics, religion, or culture. In addition, none of these studies took into account constraints imposed by the user's computing environment, which in localized markets may a significant impact on Web site usability in terms of performance and reliability.

Designing effective user interfaces for an international market is not a new concept. Russo and Boor (1993) and Nielsen and Del Galdo (1996) described the need for cultural sensitivity in designing user interfaces for computer products long before the rush for Web site deployment began. They focused primarily on providing guidelines for functionality, ease-of-use and understandability of software products to support international users.

Most would agree that research regarding global Web usability is in its early stages and much more needs to be done in studying religious, linguistic, and cultural issues in the international marketplace. Schneiderman (1997) discussed the concept of *universal access* in terms of taking into account user diversity and computing technology in developing an effective Web user interface. Nielsen and Gould (1996) described the user interface issues associated with an international marketplace and the complexity of overcoming them. Marcus (2002) points out that until recent world events occurred, user-interface designers faced an uphill battle in obtaining funding for culture-oriented research. Now there is an increased awareness of religions, culture, and ways of thinking, which he predicts will work its way into user interface design research and development.

Research has been initiated in terms of cultural sensitivity and user diversity in the international, online marketplace. Thatcher (1999) has focused on the cultural aspects of Latino users in terms of communication patterns and their impact on Web usability. Marcus and Gould (2000) have initiated the study of user interface and Web design based on Hofstade's (1990) work on cultural dimensions. These cultural dimensions influence the local user's perception of Web usability in terms of appropriate and meaningful information content, images, icons, and symbols. Huang and Tilley (2001) have discussed the issues of content and structure associated with multilingual Web sites. Barber and Badre (1998) compiled cultural markers, Web design elements (color, icons, symbols) that are associated with a particular culture, from existing Web sites. Sun (2001) expanded upon their work in a study on four cultural markers on two multilingual Web sites.

These initial research efforts provide a glimpse at both the complexity and opportunities associated with Web usability in a global economy. They offer important insights regarding specific cultural aspects of Web site usability, but more needs to be done in terms of linguistic, religion, and cultural influences on localized Web site usability.

**3. A Web Usability Assessment Model**

As part of a commercially funded research project, a Web usability assessment model, shown in Figure 2, was developed when it was found that none of the existing heuristics or guidelines would satisfy the usability requirements for assessing localized Web sites. The heuristics that were available were too general, as the strategic goals, the target market, and computing technology were not fully taken into account when assessing a Web site's perceived usability. The usability assessment factors were defined as such as a means of comparing the Web site

[1] There are many online resources that provide access to such articles including www.webreview.com, www.internet.com, www.forrester.com, and www.ecommercetimes.com.

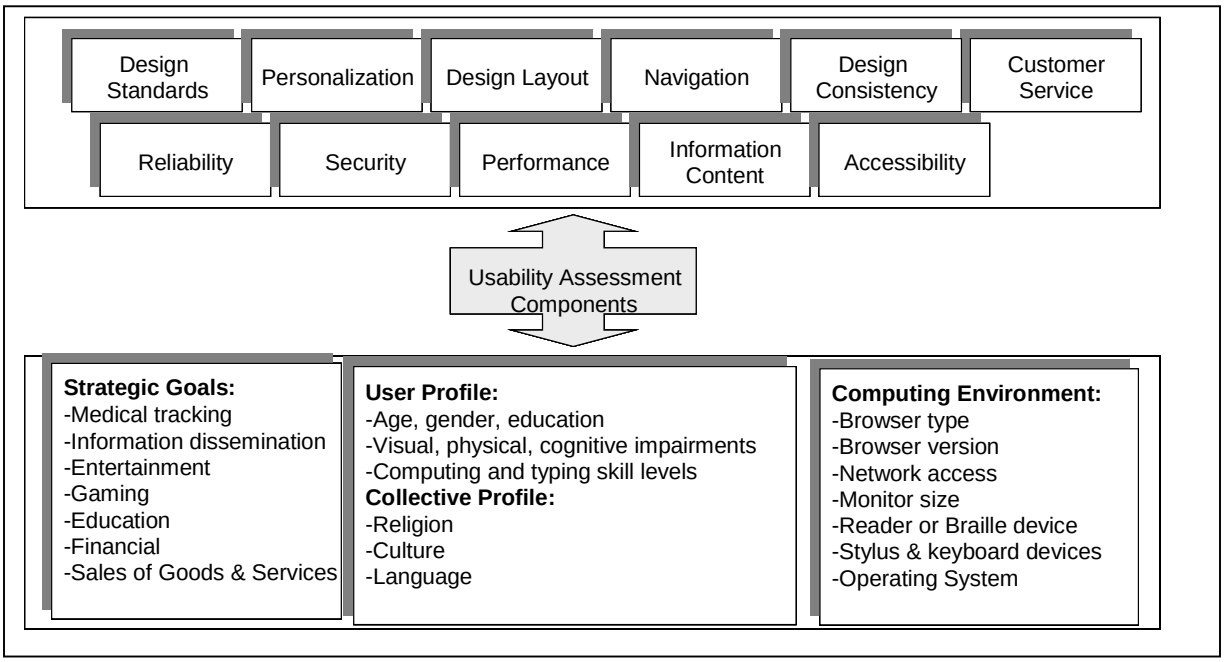



Figure 2: Web Usability Assessment Model

functionality of one localized version with another. Though the results of this initial work remain confidential, it was clear that Web site usability varied greatly from one localized version to another.

The Web usability assessment model is made up of several key components: strategic goals of the organization in using the Web, localized target markets described collectively as a user profile, the computing environment typical for the localized market, and generic usability factors. The eleven usability factors in the model, *navigation*, *design standards*, *personalization*, *design layout*, *performance*, *customer satisfaction*, *design consistency*, *reliability*, *security*, *information content*, and *accessibility* were extracted from a compilation of usability guidelines written by practitioners in the field, the National Institute of Standards and Technology (2001), and the IEEE Standard 2001-1999 (1999). Each of the usability factors is briefly described below from an internationalization perspective.

*Design Standard* is the basis for internationalizing a Web site in terms of standardizing its "look and feel" from any user's perspective. HTML style sheets, for example, provide a means of ensuring that a standard font size, style, and color are used throughout a Web site. Localized design standards are used to ensure the correct and complete bi-directional layout of information content and Web objects to support international Hebrew and Arabic translated Web sites.

*Personalization* is used to customize a Web site to meet the needs of a particular user in terms of customized images (refer to www.landsend.com for an illustration of image personalization for visualizing products), personal data (name, address, phone, and credit card data), and buying preferences. From a localization perspective, it is important to take into account cultural considerations when personalizing a Web site. For example, the "first name, middle initial, and last name" format is a US standard, but is not necessarily the correct data format for other regions and countries. In Southern India, the father's last name is used as a first initial in the child's name as follows: Raghunath Vemuri (US format) would be V. Raghunath (India format).

*Design Layout* is the visual presentation of Web page content in terms of the positioning of Web objects as well as, colors, icons, symbols, font sizes and styles. From a localization perspective, a Web site design is sensitive to the local culture. The design must take into account text flow and Web object layout when native language is bi-directional (e.g. Hebrew or Arabic) and text length increases when converting buttons, labels, and messages from one language to another.

*Navigation* is the navigational schema in terms of breadth and depth of search paths and traversal mechanisms. Navigational considerations, from a localized aspect, include ready access to a country site from a home page or via a navigational schema on each page. If the navigational component of a Web site doesn't provide native language support, then global maps, national symbols (e.g., flags), or other visual markers need to be used. Amazon.com, for example, presents a country flag symbol next to the English text associated with each international Web site.

*Design Consistency* is the consistent location of Web objects within and across pages. It supports a standardization of all local Web sites by providing a common look and feel to them. Microsoft.com, for example, uses a consistent Web design for many of its local sites in terms of the position of the navigation bar, links, textual information, help, and search mechanisms even when the Web page is inverted to support bi-directional languages.

*Customer Service* provides additional mechanisms to enhance the online experience. Online customer service typically offers online chat or email capabilities in order to get timely feedback from the e-business. Customer service capabilities in an international marketplace offer unique challenges not experienced in a US marketplace. Barriers need to be overcome in terms of differences in language, text and data formats, currency, and culture.

*Reliability* is defined in terms of site crashes, downtime, error messages, and consistent response times. In terms of localized Web sites, reliability can be enhanced or diminished when local servers are used to host a Web site. The local computing technology and network access capabilities play a critical role in maintaining an acceptable level of reliability. In the US, the reliability of power sources and phone and cable lines is taken for granted. In India, overused utilities result in sporadic power outages thus impacting the reliability of Internet access for many users.

*Security* is concerned with privacy and limited access to personal information. The same security issues facing US users regarding the misuse and unauthorized distribution of credit card numbers, addresses, phone number, income, and other personal data extend to all users in the international, online marketplace.

*Performance* is measured in terms of consumer wait time and system response time. There is significant global disparity in terms of network access speed thus impacting the performance of localized Web sites. The judicious use of animation technology is critical in minimizing user wait time.

*Information Content* is the correct and complete translation of text into a native language. Most of the translated Web sites that we reviewed for this study included some English text (e.g., 44% of Microsoft.com localized Web sites displayed English words though most of the text was translated). Complete translation of a Web site includes all messages, prompts, buttons, links, help support, and search results. It also includes semantic correctness by ensuring text is not culturally offensive, archaic, or nonsensical when translated from one language to another (Becker & Mottay, 2001).

*Accessibility* is typically discussed in terms of effective Web use regardless of visual, physical, and cognitive impairments. From an internationalization perspective, Web accessibility is impacted by reading and language comprehension skills of the targeted user. A Web site is virtually inaccessible when its comprehension requirements are misaligned with those of the targeted user.

In terms of internationalization, it is proposed that the usability of a local Web site cannot be described as "good" or "bad" without an understanding of the strategic goals of the organization, a profile of the local user, and the local user's computing environment. The strategic goals of e-business include medical tracking, information dissemination, entertainment, gaming, education, financial, and sales of goods and services. Each of these strategic goals is targeting a particular user group, which can be profiled in terms of individual and collective characteristics. In addition, the strategic goals drive the computer technology requirements in terms of network access speed, screen size, browser type and version, and operating system. The network access speed required for a highly animated gaming Web site, for example, is significantly different than that required for a non-animated search engine Web site.

The computing environment for a local user needs to be understood in terms of potential barriers to Web use. The computing environment includes screen size limitations, not only in terms of older, smaller monitors, but also in terms of newer, tiny screen sizes associated with mobile devices. Those Web sites that are highly animated may be virtually unusable for global regions where computer technology is not state of the art.

It is important to note that many US e-businesses are assuming broadband network access, as 31% of US online users have this capability at home, work, or school (Pastore, 2001). Most of the broadband users are located in only a small part of the global market including Asia-Pacific countries (Korea, Japan, Singapore, Taiwan, and Hong Kong), parts of Europe (Germany, Scandinavian countries) and North America (Macklin, 2001, September). For expanded use of broadband in the global marketplace, local barriers must be overcome such as a lack of two-way cable, DSL, and alternative broadband access technologies, a lack of competition in cable and DSL sectors, low ownership of personal computers, and poor economic conditions (Macklin, 2001, March).

The collective user profile takes into account language, religion, and culture in addition to individual characteristics such as age, gender, education level, and typing and computing skills. It may also take into account accessibility issues associated with visual, physical, and cognitive impairments, though these profile elements are beyond the scope of this study. Khaslavsky (1998, p. 365) defines culture as a system of shared meanings that form a framework for problem solving and behavior in everyday life. Meaning is assigned during communication based on beliefs, values, and attitudes of the collective group. We refer to user characteristics related to a particular

culture, religion, and language as "collective" because of their widespread impact on Web usability in the local marketplace.

Many e-businesses implicitly target a collective user who speaks English, has a moderate to high English reading level, has basic typing and computing skills, is within a specified age range and income level, and has little or no visual or physical impairments. This implied user profile excludes a significant portion of the global market, and as such has a major impact on global Web usability. Many India and other Asia-Pacific[2] Web sites, for example, are in English though for much of this population English is a second language or unknown. This language barrier to Internet access is an issue for the 496 million Hindi speakers and the hundreds of millions who speak Bengali, Urdu and other Indian languages (BBC News, 2001).

**4. Web Usability of Localized Web Sites**

The Web usability assessment model was used in this study as a framework for evaluating localized Web site usability of the e-businesses in terms of religious and cultural aspects of the user profile. The linguistic aspect of the collective user profile was considered beyond the scope of this study because of the complexity associated with assessing multiple languages and dialects. The study evaluated localized versions of US Web sites with what we perceived as the strategic goals of information dissemination, entertainment, financial, and sales of goods and services, as shown previously in Table 1. The study focused on the usability factors of performance, design layout, and information content from the collective user perspective because of local barriers to Web use observed during industry usability assessments. The study hypothesizes that localized Web sites for the selected e-businesses are sensitive to religion and culture in terms of information content, design layout issues, and performance.

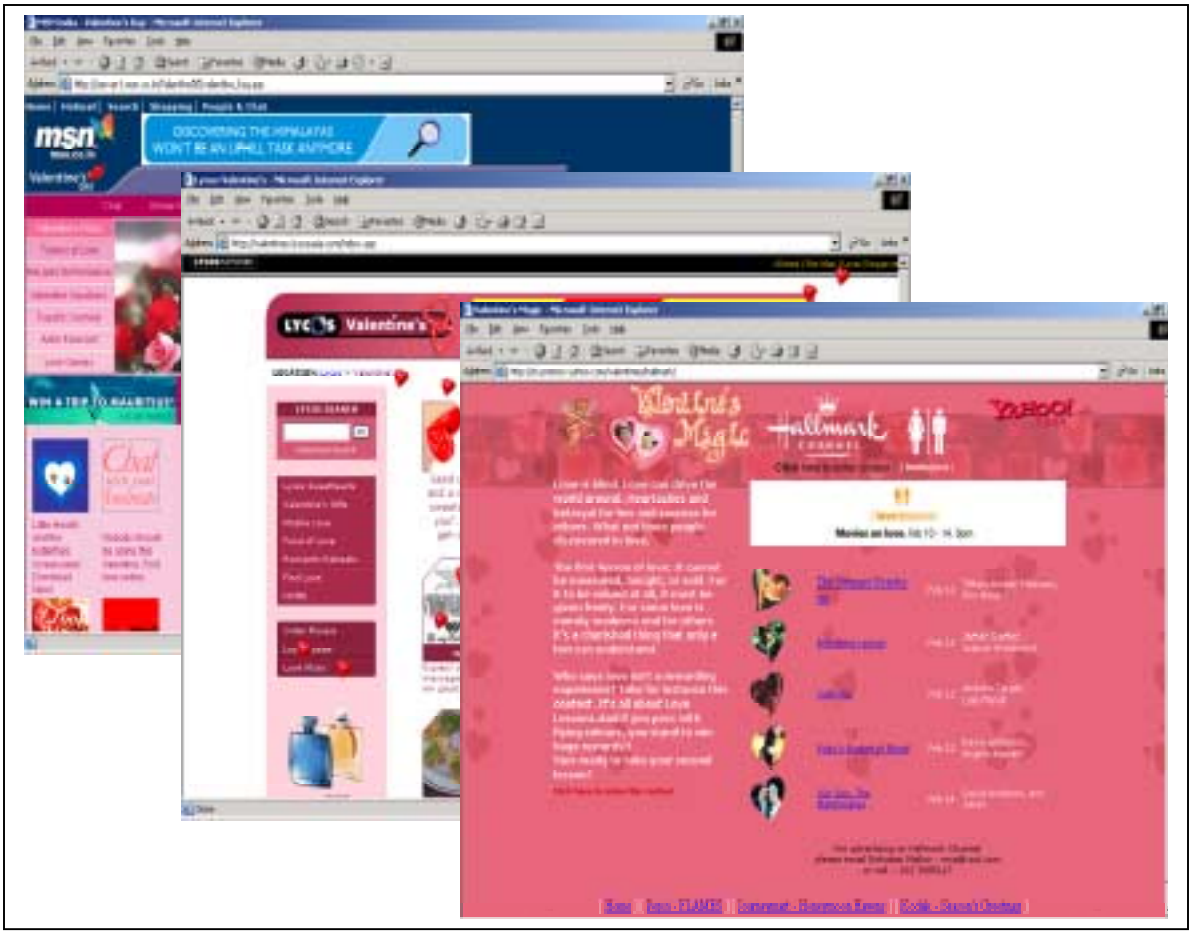



Figure 3: Valentine's Day Promotion on Localized Web Sites

[2] Malaysia, Indonesia, China, Hong Kong, Taiwan, Vietnam, Philippines, Japan, Korea, Australia, and New Zealand are considered part of the Asia-Pacific region.

**1) Hypothesis: The information content of localized Web sites is sensitive to religious belief systems of the collective user.** In certain global markets, it would not be appropriate to promote US holidays with religious overtones. US celebrated holidays including Valentine's Day, St. Patrick's Day Christmas, and Halloween, require local sensitivity in terms of acceptable images and text. Though many North American and European users may view pictures of evergreen trees and snow, for example, as representative of the winter season, others may view them as affiliated with a particular religion. Using black and orange for background and font colors during the month of October (Halloween colors), is another example of local offensiveness because of religious overtones.

Thirty percent of the e-businesses in this study had images or text that referenced the Valentine's Day holiday on localized Web sites. Valentine's Day has its roots in Christianity and as such it would be insensitive to reference it on localized Web sites for regions where other religions are practiced by a large part of the targeted population. The celebration of Valentine's Day is prohibited and punishable by law in much of the Middle East (Associated Press, 2002). Hindu nationalists in India boycotted the holiday as they viewed its celebration as obscene (Goyal, 2002).

The travel Web site, Expedia.com, advertised Valentine's Day getaways on approximately 70% of its regional Web sites. This may be deemed acceptable, from a localization perspective, because Expedia.com targets North America and European markets, which have relatively widespread acceptance of this particular holiday. However, localized Web sites, including those for Yahoo.com (India), MSN.com (India), and Lycos.com (Asia), promoted Valentine's Day in the Asia-Pacific area, as shown in Figure 3. This may be viewed as insensitive when taking religion into account in meeting the needs of the collective user profile. In this study, no reference to Valentine's Day was found on localized Web sites for the Middle East though it is important to note that there were very few sites to assess.

**2) Hypothesis: The information content and design layout of localized Web sites are sensitive to bi-directional language support for the collective user.** Language translation offers many challenges in meeting the needs of local users both from a contextual and technological perspective. For bi-directional languages, such as Hebrew and Arabic, the design layout is such that translated text and all Web objects must appear in right to left order. Of the few e-businesses that supported bi-directional languages in this study, 100% had Hebrew-translated Web sites, and 30% had Arabic-translated Web sites. There were small barriers to understandability and ease of use

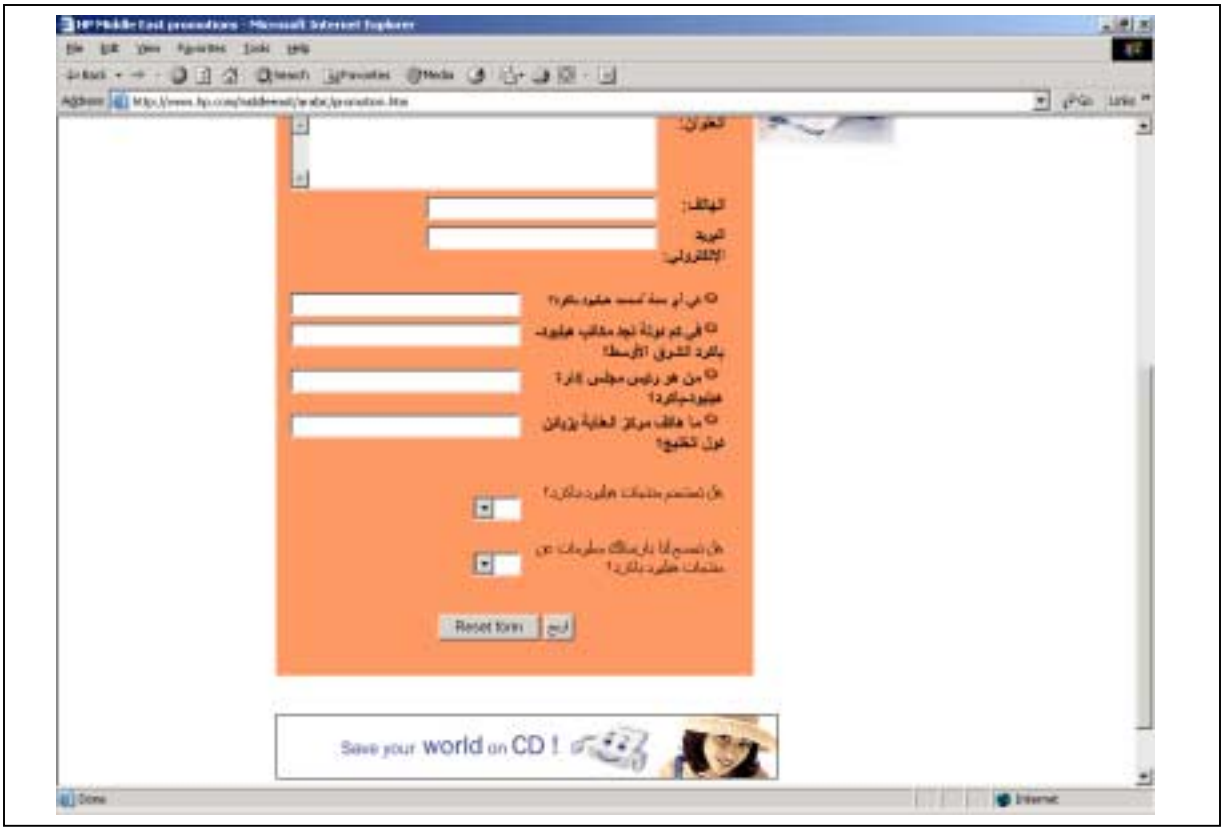



Figure 4: Arabic Web Site With Bi-Directional Translation Issues

for the localized, Arabic and Israel Web sites that were assessed. Hewlett Packard and Microsoft Web sites had pages that were not completely translated into Arabic. Dell.com supported some Hebrew translations though there was a significant amount of English text on the Web site. Ford.com had three brand Web sites and only one (Volvo) supported the Hebrew language. The other two sites were in English with an Israel identifier at the top of the Web page.Though most of these Web designs were presented right to left, each had one or more Web objects that had not been bi-directionally converted. The HP.com example, in Figure 4, displays several buttons that are correctly positioned, but one of which has not been translated into the native language. The page displays two promotional images (one shown at the bottom of Figure IV) both displaying English text. The vertical scroll bar is incorrectly positioned on the left side of the Web page.

**3) Hypothesis: Images and colors on localized Web sites are culturally sensitive to the collective user.** Cultural sensitivity associated with female and male images must be taken into account when developing a localized Web site. Regions vary greatly in what is considered acceptable in terms of exposure of the human body on a Web page. Some collective users would expect human images to have much of the body covered; whereas, other collective users deem acceptable images with much of the body exposed. Overall, the images on all of the localized Web sites included in this study appeared to be culturally sensitive given the strategic goals of the e-businesses. It is noted that this assessment is subjectively based on the researchers perception of cultural tolerance for such images in regional areas of the world.

Of the e-businesses assessed, the portal Web sites with strategic goals of entertainment, sales of goods and services, and information dissemination, had the most controversial images in terms of body exposure. Lycos.com's France Web site, for example, displayed a nude image that would be deemed inappropriate for most of the North American and Asia-Pacific markets and unlawful in the Middle East. However, it may be viewed as culturally acceptable for the local market given the entertainment and sales goals of portal Web sites and the cultural tolerance for such images in France. The image did not appear on any of the other 42 localized Web sites.

Approximately 70% of the MSN.com localized Web sites had images of men or women that exposed parts of the human body that would be deemed insensitive for many collective users. However, MSN.com appears to have localized these images, as reflected in 9% of the its Asia-Pacific Web sites displayed partially exposed human images compared to 43% of its European Web sites.

In our study, we found that of the localized Web sites with male and female images they appeared to be some cultural basis for their use. For Microsoft.com, approximately 32% of European Web sites had male images only, 13% had female images only, and 32% had both males and females in the images. In terms of the mixed images, 19% of these had more males than females in the images. There were no major differences in the Asia-Pacific region in terms of the number of male versus female images displayed. South America Web sites utilized primarily the same design template for the region, which showed a male image. The English Web site for the Middle East prominently displayed a father and son image with a much smaller image of a mother and daughter towards the bottom of the Web page. The Israel Web site contained a team image composed of 7 men and 11 women.

The male and female composition of these images may be a reflection of what Hofstede identified as the masculine and feminine cultural dimension associated with collective users. Marcus and Web Gould (2000, p. 38) point out that more masculine cultures would favor more traditional gender and family distinctions on a Web page, as shown by Middle Eastern site. The mix of male and female images on the European Web sites shows little or no distinction between the genders, which is more typical of feminine cultures.

We found that many localized Web sites use national colors (e.g., yellow appears on many Germany Web sites) for navigation bars, images, and other Web objects to promote customer loyalty and national pride, as well as for "branding" the customer experience. The e-business, Terra.com (Lycos.com in the US), uses bright orange on many of its South American Web sites, as a means of aligning itself with the local user. A Brazilian user interpreted the orange color as representing "clay", which is also the meaning of "Terra" in the Portuguese language. The concept of clay, from this local perspective, brings to mind clay pottery, homes, roads, and other positive, local images. A Brazilian saying, "good homemade food is always cooked in a clay pot," supports the use of this color from a cultural perspective.

Unfortunately, color was also found to be used with little regard to its impact on readability and ease-of-use from the end user perspective. Many localized China, Hong Kong, and Taiwan Web sites, for example, have red backgrounds, images, and fonts because Web design guidelines have specified that red is a joyous and happy color. Figure 5 shows the localized (Hong Kong) MSN.com Web page with a dark red background and a red popup window used to celebrate the Chinese New Year. The dark red color along with a holiday background image has a significant impact on readability, as the black font is not readily visible. This is also the case for the red font on the black background.


Figure 5: Use of Color on a Localized Web Site

**4) Hypothesis: The information content of non-translated localized Web sites is aligned with the English reading comprehension skills of the collective user.** The fact that many localized Web sites are in English makes it important to assess the reading comprehension requirements of localized Web sites. Approximately 6% of the world's population uses English as a native language and most of these users are in the US or the UK (Crystal, 1995). It is estimated that English is a second language to approximately one-third of the world's population (The English-Speaking Union, 2002) though the level of language comprehension is unknown.

Though we could find no statistics regarding the reading grade level of the world's English speaking population, we subjectively relied on reading comprehension guidelines established in the US by health organizations. The Joint Commission on Accreditation of Healthcare Organizations recommends material for patient use should be written at fifth to eighth grade reading levels (UVA Health System, 2002). Arter, et al. (1997) point out that an average adult typically reads one to two grade levels below their last grade completed, and as such recommends a sixth-grade reading level. The National Work Group on Literacy and Health (1997) recommends a fifth reading grade level. We used these guidelines as they include multicultural users in the US for which English is a second language.

Nineteen localized Web sites from the portal e-businesses were randomly selected to study the reading grade level associated with the English language articles posted on these sites. The portal Web sites were used in this part of our study because of the amount of information that is disseminated to the collective user. Articles were randomly selected from each of the nineteen Web sites and reading grade level was calculated using the popular Flesch-Kincaid reading index (Flesch, 1974). The reading index calculates readability based on the average number of syllables per word and the average number of words per sentence. The score indicates a reading level ranging from first grade and upwards. It was found that the average reading grade level for all articles was approximately eleventh grade, and there were no articles written below an eighth grade reading level. Over 47% of the articles required a reading grade level of twelfth grade or higher.

**5) Hypothesis: The performance of localized Web sites is sensitive to regional differences in computing environments for the collective user.** Data on the number of animated objects on the main Web page for four e-businesses; MSN.com, AltaVista.com, Lycos.com, and Yahoo.com, are presented in Table 2. These e-businesses are similar in their strategic goals and targeted market, yet the use of animation on localized Web sites is significantly

different. Yahoo.com internationalized its Web design with a minimal number of animated objects on each local Web site thus being the most sensitive to regional differences in network access speed.

Table 2: Animation on Localized Web Sites

| Region: | MSN | AltaVista | Lycos | Yahoo |
|---|---|---|---|---|
| Australia/NZ | 1-2 | 0-1 | 2 | 0 |
| India | 6 | 0 | 4 | NA |
| Asia | 2-6 | Korea – 0 | 1-7 | 1-2 |
| North America | 1 | 0-1 | 1-2 | 0 |
| Central America | 2-11 | NA | 2-4 | 1 |
| South America | 3 | Brazil – 0 | 1-5 | 2 |
| South Africa | 2 | NA | NA | NA |
| Middle East | 2-3 | NA | NA | NA |
| Caribbean | NA | NA | 2 | NA |
| Russia | NA | NA | 1 | 0 |
| Europe | 2-10 | 0-4 | 1-2 | 1 |
| Pop-up windows were counted as animated objects. | | | | |

In general, Asia-Pacific Web sites had more animated objects than other regions, even in the case of Yahoo.com. Of these portal systems, MSN.com had the highest animation rate for Central America, Asia, and Europe. The Mexico Web site of MSN.com had the highest number of animated objects on a localized site, though the typical network access speed in Mexico is significantly lower than what is found in the US. (In 2001, 46% of the world's broadband subscribers were in the US, as compared to only 1% in Latin America (Macklin, 2001, September)). It is interesting to note that many of the US e-businesses used little or no animation on US Web sites, though online users in the US have the highest percentage of high-speed access.

Microsoft FrontPage software was used to illustrate the disparity of download times for US Web sites and their localized versions in a simulated environment. FrontPage can be used to calculate download times for 14.4, 28.8, and 56.6 modem speeds and ISDN, T1, and T3 network access speeds. Given simulated 28.8 and 56.6 modem speeds, the results in Table 3 show that US Web sites typically took less time to download than their localized Asia-Pacific sites. An exception is the US-based Amazon.com site, which takes longer to download than any of the other Amazon.com localized Web sites. This may be a reflection of Amazon's effectiveness at strategically marketing its goods and services in the international marketplace.

Table 3: Performance Measurements Based on Modem Speed

| E-business | US Version of Web Site | | Localized Version of Web Site | | |
|---|---|---|---|---|---|
| | 28.8 modem | 56.6 modem | Country | 28.8 modem | 56.6 modem |
| Microsoft.com | 28 | 14 | Hong Kong | 78 | 40 |
| Lycos.com | 40 | 20 | China | 48 | 25 |
| Ford.com | 51 | 26 | China | 52 | 26 |
| Visa.com | 16 | 8 | Japan | 33 | 17 |
| Amazon.com | 51 | 26 | Japan | 44 | 23 |
| Mastercard.com | NA | NA | Korea | 52 | 27 |

**5. Conclusion**

The Web usability assessment model, used as a framework in this study, kept us focused on the strategic goals, collective user, and computing environment when assessing a localized Web site. The preliminary results of this study provide a foundation upon which future research on culture and religion may be conducted. It is exploratory in nature because of the restricted sampling of US-based e-businesses and the evaluation of localized Web sites at a particular point in time. These initial findings draw attention to religion and culture issues associated with Web usability in the global marketplace that go beyond the use of icons, symbols, and colors. They point out the need for additional guidance regarding the use of cultural markers, as reflected in the indiscriminate use of the color red on localized Web sites.

Religious sensitivity on localized Web sites is a very complex issue given religious diversity within a local region and the strategic goals of an e-business to market goods and services based on a particular holiday. Our usability assessments highlight the need for sensitivity regarding the religious aspect of referencing US holidays on

localized Web sites though more research is needed to draw any definitive conclusions. Valentine's Day was used in the evaluation of localized Web sites and the results draw attention to its extensive reference on localized sites. Future research is needed to address religious sensitivity and Web usability when there is significant religious diversity within a regional area. It is important to point out that only 18% of the e-businesses in this study had localized Arabic Web sites, and as such, there was little to assess in terms of sensitivity to religion. As more localized Web sites are developed targeting this region, this sensitivity issue needs to be addressed.

The use of animation appeared to be used indiscriminately with no value added to the Web site from a collective user perspective. Clearly these animated Web objects are related to sales of goods and services, but there is no distinction between countries with less reliable and slower network access and those that have reliable services and cable modems, ISDN, and T1/T3 lines.

Though the technology is available for supporting bi-directional Web pages, there were only a few Web sites that were fully translated. The mix of English and the native language severely impacts the usability of a Web site when English is not comprehended or is a second language for the collective user. Given that the literacy recommendations made by US health organizations for English speaking adults is between fifth and eighth grade, it is surmised that the reading grade level for non-native English speaking users should be consistent with this recommendation. With this assumption and using the data collected, there appears to be a misalignment between the reading comprehension requirements of localized, portal Web sites and the targeted collective user.

The use of male and female images on localized Web sites appeared to be relatively sensitive to culture for the European and South American Web sites. However, more research is needed to assess the use of images and cultural sensitivity particularly in the Asia-Pacific region.

The Middle East, Africa, and India in particular have large target markets that will become available as more individuals get access to the Web. Table 4 provides the percentage of online users (not active users but those who have Internet access) in relation to the total population for selected countries. Some of these countries are being serviced by one Internet Service Provider (ISP), which makes Internet use prohibitively expensive at the present time.

Table 4: Percentage of Global Online Users for Selected Countries (CyberAtlas, 2002)

| Country | Percentage of Online Users | Number of ISP Provides |
|---|---|---|
| Bahrain | 6.20 | 1 |
| Egypt | .65 | 50 |
| Israel | 20.00 | 21 |
| Jordan | .57 | 5 |
| Kuwait | 3.15 | 3 |
| Lebanon | 11.67 | 22 |
| Libya | .14 | 1 |
| Oman | 1.92 | 1 |
| Saudi Arabia | 1.32 | 42 |
| Syria | .12 | 1 |
| Yemen | .07 | 1 |
| UAE | 38.33 | 1 |
| South Africa | 3.44 | 44 |
| Sudan | .03 | 1 |
| Tunisia | 1.24 | 1 |
| India | .50 | 43 |

Many researchers and practitioners alike predict an explosion of online users in these and other regions within the next few years. It is predicted that India alone will see a 23% increase in Internet users by 2003 (Gupta, 2002). The opportunities for US e-businesses in the global marketplace makes it imperative that research regarding religion, culture, and language continue in order to develop localized Web sites that meet the needs of the collective user.

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