Globalization of User-Interface Design for the Web

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Abstract

User interfaces, including information visualization, for successful Web-based products and services enable users around the world to access complex data and functions. Solutions to global user-interface design consist of partially universal and partially local solutions to the design of metaphors, mental models, navigation, appearance, and interaction. By managing the user's experience of familiar structures and processes, the user-interface designer can achieve compelling forms that enable the user interface to be more usable and acceptable to a wider range of users. The user will be more productive and satisfied with the product in many different locations globally.

Keywords

globalization, graphic design, information design, information visualization, internationalization, knowledge design, knowledge visualization, localization, semiotics, user-interface design, visual semiotics, web design

Introduction

The Web implies the availability of and easy access to knowledge-based products among all peoples in all countries worldwide. Successful Web-based products developed for markets in different countries and among different cultures consist of partially universal, or general, solutions and partially unique, or local, solutions to the design of user interfaces. By managing the user's experience with familiar structures and processes, the user's surprise at novel approaches, as well as the user's preferences and expectations, the user-interface and information-visualization (UI+IV) designer can achieve compelling forms that enable the user interface to be more usable and acceptable. Globalization of product and service distribution, as with other manufacturing sectors, requires a strategy and tactics for the design process that enables efficient development, marketing, distribution, and maintenance. Globalization of UI+IV design for the Web, whose content and form is so much dependent upon visible languages and effective communication, improves the likelihood that users will be more productive and satisfied with computer-based products in many different locations globally.

Demographics, experience, education, and roles in organizations of work or leisure can define users. Individual needs as well as their group roles can define their tasks. A user-centered, task-oriented design method accounts for these aspects in effective UI+IV design. Information visualization includes specific solutions for tables, charts, maps, and diagrams of structure and processs. User-interface components, including those for information visualizations, conceptually consist of metaphors, mental models, navigation, appearance, and interaction. The user-

interface components may be defined in this way [Marcus, 1995; Marcus, 1998]:

Metaphors: Essential concepts conveyed through words and images, or through acoustic or tactile means. Metaphors concern both over-arching concepts as well as individual items, like drag-dropping files and folders into the "trashcan" standing for their "deletion" within the "desktop" metaphor.

Mental models: Organization of data, functions, tasks, roles, jobs, and people in groups at work or play. The term, similar to, but distinct from cognitive models, task models, user models, etc., is intended to convey the organization observed in the user interface itself, which is presumably learned and understood by users and which reflects the content to be conveyed as well as users' tasks.

Navigation: Movement through mental models afforded by windows, menus, dialogue areas, control panels, etc. The term implies process, as opposed to structure, i.e., sequences of content potentially accessed by users, as opposed to the static structure of that content.

Interaction: The means by which users input changes to the system and the feedback supplied by the system. The term implies all aspects of command-control devices, e.g., keyboards, mice, joysticks, microphones, as well as sensory feedback, e.g., changes of state of virtual graphical buttons, auditory displays, and tactile surfaces.

Appearance: Verbal, visual (graphic), acoustic, and tactile perceptual characteristics of the displays. The term implies all aspects of visible, acoustic, and haptic languages, e.g., typography or color; musical timbre or cultural accent within a spoken language; and surface texture or resistance to force.

For example, an application, its data, the graphical user interface (GUI) environment, including specific information visualizations, and the hardware, all contribute to the functional and visual form attributes of the user interface. An advanced English text editor working within the Microsoft Windows 95™ GUI environment on a mouse- and keyboard-driven Intel Pentium™ processor-based PC presents one set of characteristics. The LCD displays and buttons on the front panel of a French paper copier, or the colorful displays and

fighter-pilot-like joysticks for a children's video game on a Japanese Sega game machine present alternative characteristics.

This paper discusses the development of Web-based UI+IVs that are intended for users in many different countries with different cultures, languages, and groups in the context of the emerging global information society. The text surveys important issues, as well as recommended steps in the development of user interfaces for an international and intercultural user population. With the rise of the World-Wide Web and application-oriented Web sites, the challenge of designing good userinterfaces that are accessible immediately by users around the globe becomes an immediate, practical matter, not only a theoretical issue. This topic is discussed from a user-perspective, not a technology- and code-perspective. The paper will introduce fundamental definitions of globalization in user-interface design and demonstrate in recommendations why globalization is vital to the success of computer-based communication products.

Definition of Globalization

Globalization refers to the worldwide production and consumption of products. Globalization includes issues at international, intercultural, and local scales. In an information-oriented society, globalization affects most computer-mediated communication, which in turn affects user-interface design. The globalization discussion that follows refers specifically to Web-based UI+IV design.

Internationalization issues refer to the geographic (location), political, and linguistic/typographic issues of nations or groups of nations. An example of efforts to establish international standards for some parts of user interfaces is the International Standards Organization (ISO) draft human factors standards in Europe for color legibility standards of cathode-ray tube (CRT) devices [ISO 1989] or the international sign standards that have been established for other communication media, which might b adapted to UI+IV circumstances [ISO 1990, 1993]. Another example is the legal requirement for bilingual English and French displays in Canada, or the quasi-legal denominations for currency, time, and physical measurements, which differ from country to country.

Intercultural issues refer to the religious, historical, linguistic, aesthetic, and other more humanistic issues of particular groups or peoples, sometimes crossing national boundaries. Examples include calendars that acknowledge various religious time cycles, color/type/signs/terminology that reflect various popular cultures, and organizations of content in Web search criteria that reflect cultural preferences.

Localization refers to the issues of specific small-scale communities, often with unified language and culture, and usually at a scale smaller than countries or significant cross-national ethnic "regions." Examples include affinity groups (e.g., French "twenty-somethings" or USA Saturn automobile owners), business or social organizations (e.g., German staff of DaimlerChrysler or Japanese golf club members), and specific intra-national groups (e.g. India's untouchables or Japanese housewives). With the spread of Web access, "localization" increasingly may refer to groups with shared interests that will be geographically dispersed and use specific references, jargon, imagery, etc. (e.g., HotWired.com viewers).

In Web-based product and service development, managers must determine the proper balance of global vs. local characteristics based on market criteria and available data. For example, misapplied globalization efforts may produce generic solutions that are of minimal appeal to valuable particular markets (understandable to all but appealing to none), may consume too many resources producing too many local variations that delay time to market or limit functionality, or may achieve what 20% of the market asks for/demands but ignore 80% of potential sales to a primary early adapter, relatively well-educated, and/or relatively wealthy first-round market. The decision tradeoffs and cost-benefit analyses are beyond the scope of this paper, which concerns a UI+IV globalization process for those situations in which the effort has been evaluated as appropriate.

Globalization Design Process

The general Web user-interface and information-visualization development process, adjusted for globalization issues, may be summarized as follows. This process is generally sequential with partially overlapping steps. Note, however, that some steps are partially or completely

iterative. For example, the evaluation step described below may be carried out prior to, during, or after the design step:

Plan: Define the challenges or opportunities for globalization; establish objectives and tactics; determine budget, schedule, tasks, development-team, and other resources. Globalization must be specifically accounted for in each item or project planning; otherwise, cost-overruns, delays in schedule, and lack of resources are likely to occur.

Research: Investigate dimensions of global variables and techniques for all subsequent steps, e.g., techniques for analysis, criteria for evaluation, media for documentation, etc. In particular, identify items among data and functions that should be targets for change and identify sources of national/cultural/local reference. User-centered design theory emphasizes gathering information from a wide variety of users; globalization refines this approach by stressing the need to research adequately users' wants and needs according to a sufficiently varied spectrum of potential users. In current practice, this variety is often insufficiently considered.

Analyze: Examine results of research, e.g., challenge or opportunity (conduct market research), refine criteria for success in solving problem or exploiting opportunity (write marketing or technical requirements), determine key usability criteria; and define the design brief, or primary statement of the design's goals. Globalization targets should be itemized.

Design: Visualize alternative ways to satisfy criteria using alternative prototypes; based on prior or current evaluations, select the design that best satisfies criteria for both general good UI+IV design as well as globalization requirements; prepare documents that enable consistent, efficient, precise, accurate implementation.

Implement: Build the design to complete the final product or service, e.g., write code using appropriate tools. In theory, planning and research steps will have selected appropriate tools that make implementing global variations efficient.

Evaluate: Review or test results at any stage in the marketplace against defined criteria for success, e.g., conduct focus groups, test usability on specific functions, gather sales and user feedback. Identify and evaluate

matches and mismatches, then revise the designs to strengthen effective matches and reduce harmful mismatches. Testing prototypes or final products with international, intercultural, or specific localized user groups is crucial to achieving globalized user-interface designs.

Document: Record development history, issues, and decisions in specifications, guidelines, and recommendation documents. As with other steps, specific sections or chapters of documents that treat globalization issues are required.

General Guidelines for Globalization

Beyond the UI+IV development process steps identified in the previous section, the following guidelines can assist developers in preparing a "check-list" for specific tasks. Recommendations include ones grouped under UI+IV design components referred to earlier:

User Demographics

- Identify national and cultural target markets and segments of that market, then identify possible needs for differentiation of user-interface components and the probably cost of delivering them.
- Identify savings by re-use of attributes.

Technology

- Determine the appropriate media for the appropriate target markets
- Account for international differences to support platform population and software needs, including languages, scripts, fonts, colors, file formats, etc.

Metaphors

- Determine optimum minimum number of concepts, terms, and primary images to meet target market needs.
- Check for hidden miscommunication and misunderstanding.
- Adjust the appearance, orientation, and textual elements to account for national or cultural differences. For example, in relation to metaphors for operating systems, [Chavan] has pointed out that Indians relate more easily to the concept of bookshelf, books or notebooks, chapters or sections, and

pages than the desktop, file folders, and files with multiple pages.

Mental Models

- Determine optimum minimum varieties of content organization to meet target market needs.

Navigation

- Determine need for navigation variations to meet target markets requirements, determine cost-benefit, and revise as feasible.

Interaction

- Determine optimum minimum variations of input and feedback variations to meet target market requirements. For example, because of Web access-speed differences for users in countries with very slow access, it is usually important to provide text-only versions without extensive graphics and alternative text labels to avoid graphics that take considerable time to appear. As another example, some Japanese critics believe that office groupware applications from Northern European countries match personal communication needs of Japanese users more closely than similar applications from the USA.

Appearance

- Determine optimum minimum variations of visual and verbal attributes. Visual attributes include layout, icons and symbols, typography, color, and general aesthetics. Verbal attributes include language, formats, and ordering sequences. For example, many Asian written languages such as Chinese and Japanese contain symbols with many small strokes. This factor seems to lead to an acceptance of higher visual density of marks in complex public information displays than is typical for Western countries.

Specific Guidelines for Appearance

Because of space limitations in this introductory treatment of a complex topic, complete, detailed guidelines cannot be provided for all of the user-interface design terms listed in the previous section. Some detailed guidelines for one

important topic, visual and verbal appearance, appear below. Further details appear in [DelGaldo and Nielsen], [Fernandes], and [Nielsen].

Layout and Orientation

- As appropriate, adjust the layout of menus, tables, dialogue boxes, and windows to account for the varying directions and size of text.
- If dialogue areas use sentence-like structure with embedded data fields and/or controls, these areas will need special restructuring to account for language changes that significantly alter sentence format. For example, German sentences often have verbs at the ends of sentences, while English and French place them in the middle.
- As appropriate, change layout of imagery that implies or requires a specific reading direction. Left-to-right sequencing may be inappropriate or confusing for use with right-to-left reading scripts and languages. For example, an early version of a Web site called Arabia.On.Line, intended for Western readers to learn about Arab countries, mistakenly laid out its contents as though the text were written in Arabic for Arabic readers, with a primary table of contents on the right of the screen and details on the left, in opposition to most Western Web sites at the time. Even the red arrow heads pointed in a direction opposite of readers using Latin alphabets; expectations. (see Figure 1)

- *Figure 1: Partial view of www.arabia.on.line.com*

Check for misleading arrangements of images that lead the

viewer's eye in directions inconsistent with language reading directions.

- For references to paper and printing, use appropriate printing formats and sizes. For example, the 8.5 x 11 inch standard office letterhead paper size in the USA is not typical in many other countries that use the European A4 paper size of 210 x 297 mm with a square-root of two rectangular proportions.

Icons and symbols

- Avoid the use of text elements within icons and symbols to minimize the need for different versions to account for varying languages and scripts.
- Adjust the appearance and orientation to account for national or cultural differences. For example, using a post letterbox as an icon for e-mail may require different images for different countries. For example, these images from a prototype for Sabre's Planet Sabre, one of the world's largest extranets, whose UI+IV was designed by the authors' firm, shows variations of mailbox icons to account for national differences (see Figure 2)
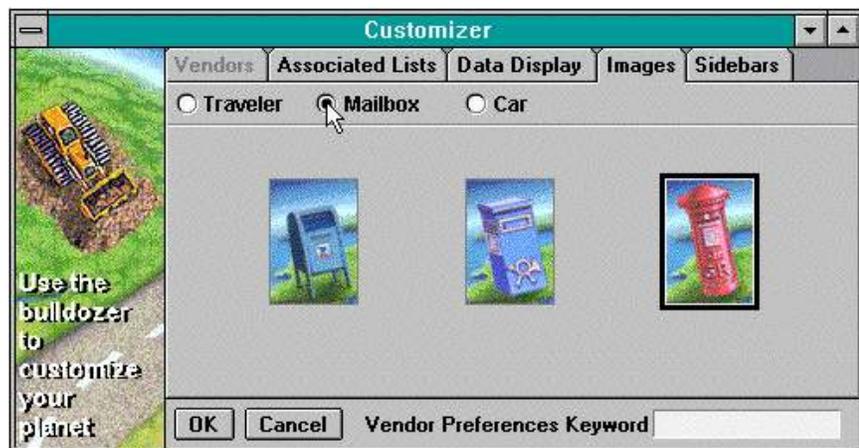
Figure 2: Planet Sabre prototype international mailbox icons

- As a universal sign set reference, consider using as basic icon/symbol references the signs, or signs derived from them, that constitute the international signage set developed for international safety, mass transit, and communication. See [AIGA], [ISO 1990, 93], [Olgyay], [Ota 1987], and [Pierce] for examples (see Figure 3, from [Pierce])

Figure 3: International pictograms from [Pierce]

- Avoid puns and local, unique, charming references that will not transfer well from culture to culture. Keep in mind that many "universal" signs are covered by international trademark and copyright use, e.g., Mickey Mouse and the Smiley smiling face. In the USA, the familiar smiling face is not a protected sign, but it is in other countries.
- Consider whether selection symbols such as the X or check marks convey the correct distinctions of selected and not-selected items. For example, some users may interpret an X as crossing out what is not desired rather than indicating what is to be selected.
- Be aware that office equipment such as telephones, mailboxes, folders, and storage devices differ significantly from nation to nation.

Typography

- Use fonts available for a wide range of languages required for the target markets.
- Consider whether special font characters are required for currency, physical measurements, etc.
- Use appropriate decimal, ordinal, and currency number usage. Formats and positioning of special symbols vary from language to language.
- Use appropriate typography and language for calendar, time zone, and telephone/fax references.

Color

- Follow perceptual guidelines for good color usage. Examples: use warm colors for advancing elements and cool colors for receding elements; avoid requiring users to recall in short-term memory more than 5±2 different coded colors.

- Respect national and cultural variations in colors, where feasible, for the target markets. [Dreyfuss], among other references, lists typical international semantics of colors. Some color references, as well as other cultural differences appear in Table 1.

Item	N. American/European Example	Middle-Eastern Example	Asian Example
Sacred colors	white, blue, gold, scarlet (Judeo- Christian)	green, light blue (Islam)	saffron yellow (Buddhism)
Reading direction	left to right	right to left	top to bottom
Item	**USA**	**France, Germany**	**Japan**
Web search	culture does not imply political discussions	culture implies political discussions	culture implies tea ceremony discussions
Sports references	baseball, football, basketball	soccer	sumo wrestling, baseball

Table 1: Examples of Differing cultural references

Aesthetics

- Respect, where feasible, different aesthetic values among target markets. For example, some cultures have significant attachment to wooded natural scenes, textures, patterns, and imagery, e.g., the Finnish and the Japanese, which might be viewed as exotic or inappropriate by other cultures. For example, TeamWare's workflow software, developed in Finland, showed background patterns such as those shown in Figure 4, which are typical for Finnish landscapes and culture. They would not necessarily be appropriate for users in warmer cliimate, e.g., southern California.
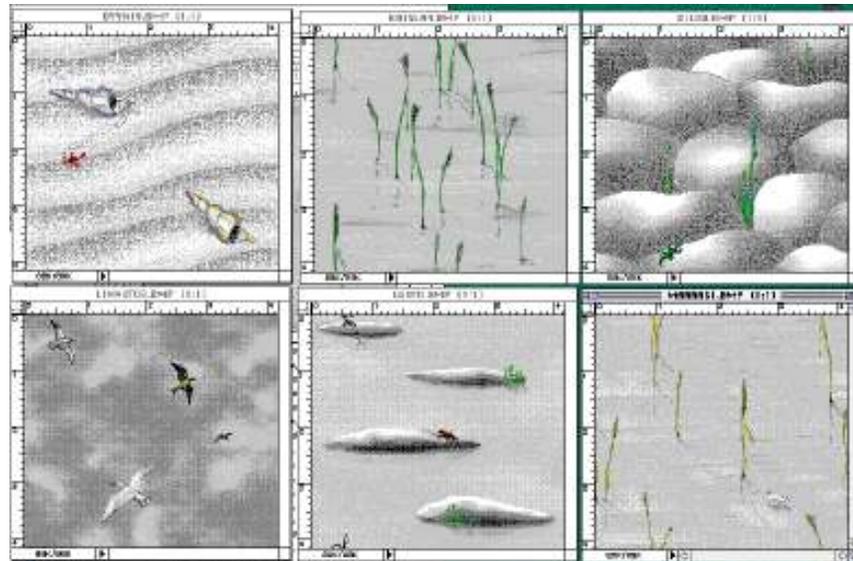
Figure 4: Typical prototype background patterns offered for a Finnish software product.

Consider specific culture-dependent attitudes. Example: Japanese viewers find disembodied body parts, e.g., eyes and mouths, unappealing in visual imagery.

Language and Verbal Style

- Consider which languages are appropriate for the target markets, including the possibility of multiple languages within one country. Example: English and French within Canada.
- Consider which dialects are appropriate within language groupings and check vocabulary carefully, e.g., for British vs. American terms in English, Mexican vs. Spanish terms in Spanish, or Mainland China vs. Taiwanese terms in Chinese.
- Consider the impact of varying languages on the length and layout of text. For example, German, French, and English versions of text generally have increasingly shorter lengths.
- Consider the different alphabetic sorting or ordering sequences for the varied languages and scripts that may be necessary and prepare variations that correspond to the alphabets. Note that different languages may place the same letters in different locations, for example, Å comes after A in French but after Z in Finnish.

- Consider differences of hyphenation, insertion point location, and emphasis, i.e., use of bold, italic, quotes, double quotes, brackets, etc.
- Use appropriate abbreviations for such typical items as dates, time, and physical measurements. Remember that different countries have different periods of time for "weekends" and the date on which the week begins.

Conclusion

User-interface design for the Web requires attention to globalization issues in the user interface development process. As technology increases the number and kinds of functions, data, platforms, and users of computer-based communication media, the challenge of enabling more people and more kinds of people to use this content and these tools effectively will depend increasingly upon global solutions. By recognizing the need for, and benefit to users of user-interface designs intended for international and intercultural markets, developers will achieve greater success and increased profitability through the global distribution and acceptance of their products.

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