CULTURE-BASED ADAPTIVE WEB DESIGN:
An Approach for Designing Culturally Customized Websites

Alao Olujimi Daniel, Adekunle Yinka, Ibikunle Frank, Shodiya Adesina

Abstract - In order for a website to be locally accepted, the design of the website should accommodate local users' cultural preferences or home culture. Also, websites, which is a form of marketing, must take place in the culture of the target audience or country. The aim of this paper therefore is to explore cultural issues that influence design of websites and to create a framework for cultural adaptation of websites. To achieve these ends, the research employs descriptive/interpretive studies of the literature and previous studies by academics and industrial institutions with regard to culture and web interface design. This paper introduces an approach for website cultural customization based on the core asset development of software product technique and aspect oriented programming. The main idea behind it is to develop websites, which is adapted to the user's culture by producing different variants of webpage's interface according to user's cultural preference.The main contribution of this study is the identification of what characterizes usable websites with reference to cultural needs of the users, specific web features applicable to cultural dimensions that can enhance cultural understanding and will also help web designers to customize their websites to specific cultures. The research findings also contribute to the general field of software/web localization and personalization.

Key words: Human Computer Interaction (HCI), Web interface adaptation, Websites, Culture.

1.0 Introduction

Since the advent of the World Wide Web (WWW), it has been customary for web developers to design website based on their personal ideas and concepts and usually use the 'one size fit all' approach for designing web pages. The 'one size fits all' approach may be appropriate for particular communities (like researchers) but in general it will be less successful. (De Troyer and Casteleyn, 2004).

As the number of users of the Web continues to increase, the one size fit all approach becomes ineffective hence there is the need to develop localized websites for particular localities. In order to develop these localized websites, the designer must put into consideration the cultural factors that are present in such a locality so as to develop websites that the customer will find usable.

According to Reinecker (2010), one of the largest impediments for the efficient use of websites in different cultural contexts is the gap between the software designs – typically following western cultural cues – and the users, who handle it within their cultural frame.

While research has shown that adapting user interfaces to cultural preferences can be a decisive factor for marketplace success, the endeavour is oftentimes foregone because of its time-consuming and costly procedure. Moreover, it is usually limited to producing one uniform user interface for each nation, thereby disregarding the intangible nature of their cultural backgrounds (Reinecker, 2010).

Sackmary and Scalia in (1999) noted that the tools of the Web are used in culturally specific ways within the domestic cultures in which websites are created, and that web-based communication is not neutral to culture, nor is it likely to be a progenitor of a cyber lingua franca.

The growth of the internet as a communication medium raises new issues and challenges for the standardization or adaptation of this mode of communication to cultural preferences of its user. (Singh and Baack, 2004).

Presently, only few information systems satisfy usability and cultural criteria, resulting in a lot of frustration among users. This is caused by technology centred designs with little consideration for the business and socio-cultural needs of users. (Alao, Awodele, Baguma, Weide, 2011)

Although, several methods to design web sites (e.g. The Object-Oriented Hypermedia Design Method (OOHDM), Web Modeling Language (WebML), Object-Oriented Hypermedia (OO-H), UML-based Web Engineering (UWE), Web Site Design Method (WSDM) exist, as far as we are aware of, none of these methods takes localization issues into account during the design process.(De Troyer and Casteleyn, 2004)

There is also a lack of in-depth research and appropriate methods to assist designers on how culture can be consciously integrated in product design. Current design approaches with their standards, rules and guidelines fall short with respect to issues relating to the cultural context. Also, there is no theoretical framework linking design and culture.

This paper will explore the main terms under consideration which are the meaning of culture, cultural issues that influence web design and also presents an approach for website cultural customization.

1.1 What is the problem?

While the Internet and websites have achieved standards for their physical infrastructure, much work still remains to be done to develop an equally robust cultural framework to support their understanding and proper use (Mantovani, 2001).
To date, the vast majority of studies in the website design arena have examined mainly Western and American culture, disregarding possible cultural discrepancies. Also, web users around the world have different requirements and their website understandings are influenced by the local culture.

Knowledge about cultures and implications for design is insufficient at all levels. Keiichi & Kuosiang (2008) Hence, there is a need to provide a methodology for developing usable culture based framework aimed at developing websites to meet the varied cultural and usability needs of users.

Another problem is how to develop different versions of a website interface by modifications to some part of the interface in order to adapt the website to a specific culture without creating a complete new website. This further instigated us to explore the idea of cultural adaption of websites and to present an approach which could be used to transform a website's design based on users' culture.
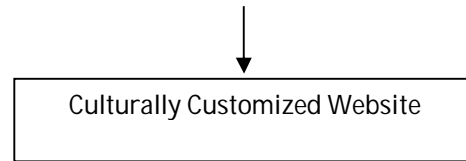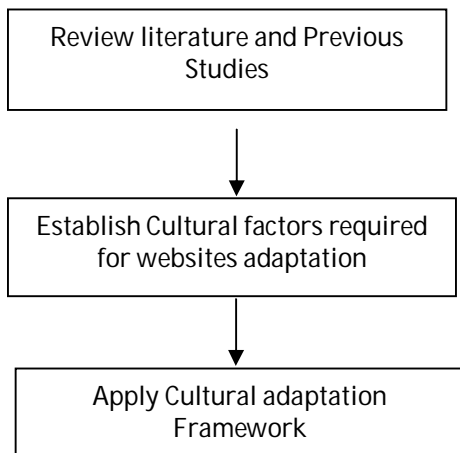
1.2 Objectives Of This Study

This paper proposes an approach to cultural adaption of websites. With respect to this, the research objective is to develop and utilise a framework that captures the cultural perceptions of users affecting web design. This framework, by assessing and identifying the common cultural values and beliefs affecting users provides a structure for adapting websites to cultural needs.

The specific objectives are to:

1.   find out cultural issues that influence Web design

2.   develop a suitable framework for designing culturally adapted websites

3.   provide cultural adaptation guidelines for an effective web interface adaption.

1.3 Research Approach

In order to achieve our goals, a multi-method approach was used. The research employed descriptive/interpretive studies of the relevant literature and previous studies by academics on culture and user interface design to find out cultural dimensions that are required for cultural-centred website design. We sought to also establish a framework for designing culturally adapted websites and the how this can be presented in a form consumable by the target stakeholders (people involved in designing websites).

Review literature and Previous Studies

Establish Cultural factors required for websites adaptation

Apply Cultural adaptation Framework

Culturally Customized Website

Figure 1: Model of the Research Process

1.4 CULTURE AND DESIGN

In order to understand the concept of culture and how it is related to human computer interaction, we review below the definitions of culture that have been proposed in the literature.

1.4.1 What is Culture

Among the many existing theories and definitions of culture, the following are considered relevant for web design:
As Kluckhohn (1962) states, culture is a set of definitions of reality, including language, values and rules that set the limits for behaviour, held in common by people who share a distinctive way of life.

Evers and Day(1997) affirms that culture shapes the way people behave, view the world, communicate and think. It is formed by historical experiences and values, traditions and surroundings.

 Hall(1959) sustains that culture stands for a frame of reference developed by a group of people used to understand each other. For him, key issues for developing this frame are ways of life, behavioural patterns, attitudes and material objects.

When a group of people, no matter its scale, start sharing common ways of thinking, feeling and living, culture emerges (Keiichi & Kuosiang (2008)).

Gellner (1997), gave the most commonly accepted meaning who calls culture "the socially transmitted and sometimes transformed bank of acquired traits".

Although culture is a social phenomenon, biological characteristics are often connected to it. For example, when we see people of a particular gender, age, skin color, or body type (height, weight, etc) and we assume they must belong to a particular culture (Sapienza, 2008).

One of the most exciting things about culture is that it is dynamic. It evolves. It transmutes. It is what meshes a society and gives it meaning. But above all else, it helps society transmit memory from one generation to another. It is the vehicle through which we study the past, absorb the present, and glean the future.

TABLE 1 The Web: A Cultural Document

Web characteristic	Cultural implication
The Web is an open network	The Web is viewed by people

with global access.	across ountries and cultures, thus lending itself to vast cultural variability.
The inherent interactive nature of the Web.	A medium that lends itself to culturally sensitive dialogue.
The Web is characterized by hyperlinks and self-search options.	Hyperlinks and self-search options rely on consumer motivation to browse; therefore, if web content is not customized for global customers on an individual basis, the interactive efforts might be wasted.
Web technologies can help capture customer data that can be used for customization.	Using customer databases and software,. country-specific and culture-specific profiles can be created and used to better meet diverse customer needs.
Media convergence and broadband technology make the Web an ideal medium to interact with audio, video, graphics, and text.	Media convergence on the Web can be used to develop culture-specific themes, pictures, videos, and sounds.
On the Web, the capacity to hold visitors' the "flow state," is an important challenge.	The web sites that are culturally congruent are more likely to engage the users.

Adapted from: Singh N., Zhao H., and Hu X. (2005).

1.4.2 Cultural Values Framework for Web Design

The Dutch cultural anthropologist Geert Hofstede (1991) introduced a framework for the cultural values (dimensions) that addresses the behavioural component of culture. Here we present the five cultural values and describe how to emphasized them in the design.

1- Individualism-Collectivism

This is the extent to which members of a culture pursue ends for other members of the culture or primarily for themselves.

To customize websites on this value, the following can be incorporated:

Individualism	Collectivism
• images with a single person	• Group images
• would provide individual paths (i.e navigation does not follow any grouping.	• would be group-oriented (Navigation is grouped with similar informative links forming a group)
• independence theme	• community relationships

2- Uncertainty Avoidance

This is the extent to which individuals accept uncertainty of future events, rules, measures, or guidelines to lessen the nervousness or danger of uncertainty. A culture with high uncertainty avoidance values predictability, structure, and order. A culture with low uncertainty avoidance values risk taking, ambiguity, and limited structure.

To customize websites on this value, the following features can be incorporated:

High Uncertainty Avoidance	Low Uncertainty Avoidance
• customer service section	• No customer service section
• link to frequently asked questions (FAQ)	• No link to FAQ
• providing simple navigation manner	• Complex navigation manner
• contact information	• No contact information

3- Power distance is the extent to which people accept unequal power distribution in a society. A high power-distance society believes in strict authority and hierarchy. A low power-distance society emphasizes equality

To customize websites on this value, the following can be incorporated:

High Power distance	Low Power distance
• Prominence given to leaders.	• Prominence given to citizens.
• vision statement	• No vision statement
• quality assurance and awards	• No quality assurance and awards
• Formal layout.	• Informal layout.
• More flashy outlook	• Less flashy outlook

4- Masculinity- femininity The extent to which a culture exhibits traditionally masculine or feminine value.

To customize websites on this value, the following can be incorporated:

Masculinity	Femininity
• Use of "Masculine" colors such as black, grey, brown, blue, green	• Use of "Feminine" colors (i.e soft colors as shades of pink, peach or rich shades of red,
• depiction of men as macho, and in positions of power	• depiction of women in traditional roles (wives, and mothers
• sport-oriented images	• family-oriented images
• limited choices for information	• Multiple choices for information

5. **Long-term orientation/Short-term Orientation**: Long-term orientation cultures have tendencies to practice behaviors aimed at the good of the society over a long period of time. Short-term orientation cultures tend to focus on characteristics aimed at creating immediate results with little or no plan for the future.

To customize websites on this value, the following can be incorporated:

Long term Orientation	Short term Orientation
• Long term vision and mission of an organization.	Daily routine indicators of an organization
• Long term institutional goals.	Short term institutional goals.

2.0 Review of Related Research

A 2011 study performed by Hagag on The E-Cultural Adaption Framework (E-CAF): Adapting the Local Travel Interface for Egyptian Consumers. Hagag introduces the electronic cultural adaption framework or E-CAF, as a structure for adapting local Web interfaces. The E-CAF is utilized as a means for developing questions that can help designers to collect the clients' designing requirements. This helps the designers to build an effective local interface based on an understanding of each client's special design requirements. Hagag work did not provide a deeper insight into the unique cultural variables that can influence online consumers' behaviour.

Reinecker (2010) developed a culturally adaptive user interfaces called MOCCA, which requires knowledge about culture, a user model which contains this information, a rule-base that formulates adaptations for an uncountable number of different cultures, and a
flexible user interface, which is able to automatically trigger the modifications. Reinecker evaluated her approach with a culturally adaptive system. The results of her evaluations
showed that MOCCA is able to anticipate the majority of user preferences in an initial
adaptation, and that users' performance and satisfaction significantly improved when using the culturally adapted version of MOCCA, compared to its 'standard' US interface.The problem with Reinecker's approach is that information systems designers should not place the burden of content structure on the users.
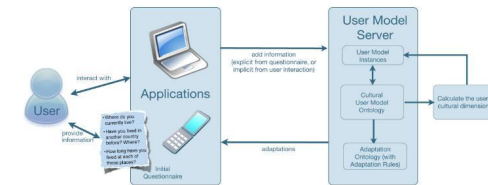

Fig 2: Reinecker's framework for cultural adaptivity

The work presented by [Kamentz, 2006] in the area of e-learning relies on a questionnaire to classify the user into one of a set of pre-defined cultural groups, and this classification triggered adaptations to an e-learning system. Since the adaptations were mainly aimed at improving the user's learning experience, she focussed on the learning style (e.g. an adaptation of instructions), and symbols. The adaptations did not comprise a full re-arrangement of user interface components, as we anticipate is necessary for culturally adaptive software. Kamentz directed her work at only a few countries, therefore new adaptation rules would have to be generated when extending the number of (national) groups targeted by the e-learning system.

Drawing on the mainly visual aspects of online information units, Amant (2005) uses *prototype theory* to create more culturally relevant Web sites. Prototype theory suggests that each person has a specific ideal representation for objects, against which other objects are measured and categorized. Hence, if a person is shown a visual representation of a dog, that representation is compared to that person's own representation. If enough similarities present themselves, then the individual can agree or assume that the representation is a dog. Amant argues that such representations are culturally based, and that understanding and using representations similar to those used within the target culture, make the Web site more usable and culturally acceptable.

Kondratova and Goldfarb(2005) in their paper on Cultural Visual Interface Design focused on the identification, harvesting and analysis of culture-specific visual web interface design elements. They developed a new approach to user interface development that utilizes a cultural "look and feel" tool. The tool is based on

the analysis of the data collected by the web crawler that allows for automated "harvesting" of visual elements of web design for several thousands of Internet domains for several countries. The cultural "look and feel" interface design tool could be used to help web development teams quickly produce the first draft of the culturally appropriate, "look and feel" user interface design for a particular culture or country.

Andy Smith et al (2003) introduced the concept of cultural attractors to define the interface design elements of the website that reflect the signs and their meanings to match the expectations of the local culture. The cultural attractors typically comprise of: colours, banner adverts, trust signs, use of metaphor, language cues, navigation controls and similar visual elements that together create a 'look and feel' to match the cultural expectations of the users for that particular domain.

Echoing a call for user-customizable interfaces to increase usability, Perlman (2002) suggests that Web designers build templates from which users can pick and choose elements to create their interface. Again, his suggestion is that an interface that can be tailored to specific users is more usable than a generic interface that tries to match every user's needs. The term "*user-customizable*" denotes the ability of a Web site to be changed or modified by the site's users rather than by the designers.

According to Perkowitz and Etzioni (2000), customization with regard to a Web site refers to "adapting the site's presentation to the needs of [the] individual visitor, based on information about those individuals". Further, the term "customizable" is meant to suggest a user experience in which the user has control over changes in the online content. This definition is not the same as that of Brusilovsky's "*adaptive*" technology. For Brusilovsky (1996), a technology is adaptive when it builds a model of the user and then applies that model to the user's experience by automatically adapting the content to the said user (as the technology has modeled him/her). When a user begins interacting with an adaptive interface, the interface adjusts itself to what it suspects the user wants or needs, without consent from the user. Such an interface can cause problems when it builds a model of a user that the user does not agree with and then delivers information the user does not want or need.

The main gaps that were found in these researches are:

- Most of the studies did not conclude whether their various dimensions of culture applied for their research has an influence on overall understanding and usability of a website or an interface.

- The result of their numerous researches on culture and web design did not provide sufficient guidelines on how culture can be utilized to develop a culturally adapted websites.

- While the research done so far has made an important contribution, it has not
focused on the actual features of web sites that vary due to cultural differences.

In this study we sought to fill those gaps and provide a template for future development more readily accessible to designers and other non-social scientists. The next section discusses cultural factors that influences web design and how understanding the culture of a given community can be utilized to develop more usable websites.

3.0 Cultural Factors Affecting Web Design

Several frameworks (Barber & Badre,2001), (Sapienza,2008), (Tanveer et al, 2009),(Smith et al 2003), to mention a few exists to show that there is a linkage between culture and web design/usability. The impact of the following cultural design elements colour, metaphor, language, icon and page layout on web design will be discussed next.

3.1 Color

Color is connected to feelings of people and it has different meanings in different cultures. "Colors also have important meanings in web design. Color could be used for background, frame, images, hyperlink, etc. Website designers need to take into consideration the color preferences and the meaning of various colors for the targeted audience. Barber and Badre (2001) gave an example of the color-culture of different countries. For example, the red color means different things to different people: for the Chinese it means happiness; for the Japanese, anger/danger; for Egyptians, death; and for Americans, danger/stop.

3.2 Metaphor

The metaphor is a powerful tool for translating the technical happenings that take place beyond the interface into a concept that makes sense to the average user. The majority of software are developed in, or contracted by the USA, and its interfaces have therefore been based primarily on American metaphors (Shen et al. 2006). Often a metaphor applied out of context is open to misinterpretation. For example. In some cultures the idea of something that can be retrieved from the trash bin after it has been deleted seems illogical and degrading (Shen et al. 2006). Successful interface metaphors should be developed or adapted through cultural requirements by, or with reference to, representatives of the culture for which they are intended (Shen et al. 2006).

3.3 Language

Language is the building block from which users gain information from a website. Even though most websites users can speak English, they are almost always more comfortable in their native languages. While some countries, especially Asian or developing countries, like to display their English speaking abilities, other countries prefer to maintain their own native language for reasons of national pride. This is especially true in some European countries. Due to the fact that English is one of the most popular languages all over the world, it is advisable to design a site in English and then incorporate a translator to translate to the local language of the intended users.

3.4 Icon

Icons are an important element denoting culture (Marcus and Gould, 2000). Icons vary and may represent a wide range of features from currency to time (Fernandes, 1995). Icons are "metaphors" denoting actions of the user (Barber and Badre, 2001). Icons have increasingly been used for the communication of information or instructions on labels, packaging, in manuals and user interfaces. Many icons have even become standardized and carry a silent authority that is rarely questioned. Interestingly, a new phenomenon has appeared whereby established global icons have been adopted and some have been localized or glocalized to meet local requirements or reflect and represent local traditions and values. For instance, in India the standard ISO-type man has been adapted to one in traditional Indian dress with a white turban and a sarong.

3.5 Page Layout

This is the physical arrangement of text elements and graphical elements on a web page, this also vary from one culture to another. it can therefore be described as a cultural component.. A good design layout will enhanced a better understanding and hence usability of a website. For example, France has a centered orientation, suggesting that features on a French site would most likely be centered on the page. While in the Islamic countries, page layout will flow from top to bottom . The design of a website must take into account text flow which also varies from one culture to another. The direction in which text in some languages is written can be unidirectional, such as English, or bi-directional such as Arabic. Also, some languages are read from left to right, others right to left, this must also be taken into consideration when designing a web page layout.

4.0 Approaches To Websites Cultural Adaptation

The majority of the sites which offer pages in different languages have decided for a strategy lying somewhere in between the extremes of standardization and creating a completely new home page for every country they want to address.(Husmann, 2001). A very common practice is to internationalize an original site or initiate it with an international base design. Within this base design local versions might be provided. (Galdo, 1990).

Cisco Systems and Yahoo have internationalized sites which subsequently have been localized. Cisco systems site is available in over 12 languages and has been culturally adapted to each of the target countries.

Yahoo, however, has implemented technical and national localization, Cisco technical, national and cultural localization. Yahoo works in 14 languages; Europe accounts for 7 of these. Yahoo opted for a strategy which puts a strong emphasis on the user being able to recognise their page in every country and in every language they offer.

Google is also a prominent example of the high interest in adapting user interfaces to different target nations.

4.1 Web Localization and Content Management

A web content management system (WCMS) is a software system used to control a dynamic collection of Web material (HTML documents, images and other forms of media). A WCMS typically has: Automated templates, Create standard output templates (usually HTML and XML) that can be automatically applied to new and existing content, allowing the appearance of all content to be changed from one central place.

A WCMS typically requires an experienced coder to set up and add features, but is primarily a Web-site maintenance tool for non-technical administrators [Wikipedia, 2011.) Some notable WCMS based on PHP and MySQL are Avactis, Amilia CMS, Accrisoft Freedom, Jadu etc. Localization is central to content management and to implement localization in a CMS. A "Cultural Content Management System" could be use to localize a default user interface as depicted in the diagram of Figure 3.
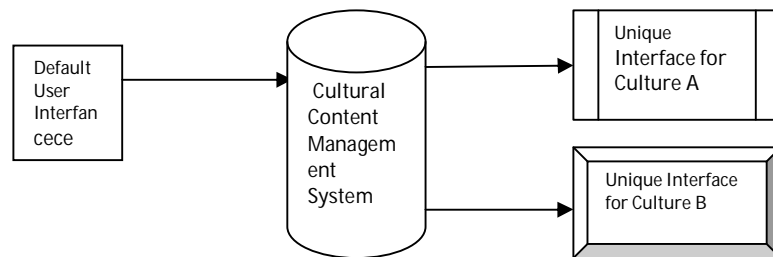

Figure 3: Cultural Content Management System

Assuming a user-interface for a product that is supposed to be localized for a certain country, we can think of a database that handles this localization process by (1) looking up a table for the cultural values of the target country. In a second step (2) a comparison with the country of origin is made and (3) the tool has to decide if a change for a certain feature is necessary. If such a change is needed, a lookup table (4) – can provide the information, what the changes are to build an appropriate interface. Content Management Systems (CMS) for web sites usually provide support for multinational web production. A company utilizing a CMS-system may experience limited possibilities for localization. There may, however, still be potentials for some level of localization, e.g. variation in colours and image motives etc. However CMS does not provide a methodology for designing a culturally customize web site.

4.2 User-Customizable Online Content

Clinton (2010) presents a method for customizing user interfaces of an online tutorial with culturally specific rhetorical strategies as shown in fig4 Users A and B would begin by selecting from choices they had been given about how they wanted the information presented based on their cultural preferences. The choices would result in calls to the server for specified modules.
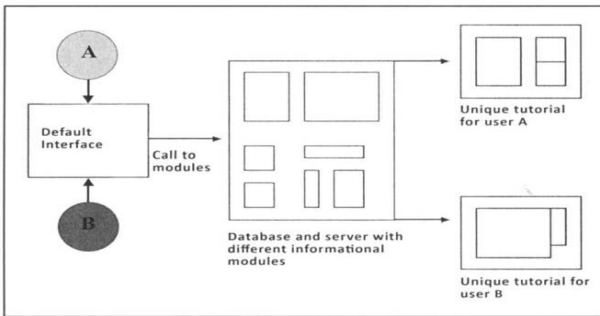
Figure 4. Process by which different users culturally customize their own interface.
Source: Clinton R Lanier (2010) Making the User the Localization Expert: Employing User-Customization Strategies in Globalizing Online Content Ch2 pages 39-61

5.0 The Framework for Cultural Adaptation

(Sommerville, 2001) highlighted a number of software development process models including the waterfall model, evolutionary, formal systems, reuse-based, incremental and spiral development. These models are intended for software rather than website development, and they do not take into consideration how culture can be integrated into the design process. The proposed framework aims to remedy this shortcoming of the existing process models. The framework is based on the core asset development of software product using Software Product Line Engineering and Aspect-Oriented Programming. The approach can be used for identifying, and managing variability of web application such as website cultural customization. We will established cultural dimensions that are required for cultural-centred website design and for designing usable localized websites .The contribution of this approach is that the construction of two or more different versions or a cultural customization of the website interface can be done by reusing the core assets of an original one (default interface).

5.1 Software Product Line Engineering

Software Product Line Engineering (SPLE) is "*an emerging software engineering paradigm, which guides organizations toward the development of products from core assets rather than the development of products one by one from scratch*" (Kwanwoo, Kyo. Kang and Jaejoon , 2002). This is achieved through feature modeling.

Feature modeling is defined as "*the activity of modeling the common and the variable properties of concepts and their interdependencies and organizing them into a coherent model referred to as a feature model* " (Lengyel, Levendovszky and Charaf, 2004). A feature model represents the common and the variable features of a concept or product and the relationships between the variable features by a hierarchical structure of the features. By modeling of commonalities and variabilities between product variants and exploiting the commonalities allows reusing the core assets, which implement most product functionality, where the variabilities are the new features. The commonalties are some requirements or features of a specific product in the product line that are the same in all product variants. Since different versions of a web application will share

similar behaviours, designing these applications by reusing the common features between them is more efficient as it reduce the time and effort. Feature modelling can therefore be used for specifying and modelling the variability among the different versions of an application.

5.2 Aspect Oriented Programming for Java: AspectJ

AspectJ is an aspect-oriented extension to Java. It provides flexibility to java programmers as it has the following compatible properties:

- All legal Java programs are considered as legal AspectJ programs.
- All legal AspectJ programs run on standard Java virtual machines.
- The existing tools for java can be extended to work with Aspect.

Aspect-oriented programming consists of two concepts: components and aspects. The components form the atomic and loosely coupled concerns of the system, and the aspects implement additional crosscutting functionality of the system. Aspects consist of the following constructs :

- pointcut designators: these are definitions of interception points in the system where the aspect could possibly take action.

- advice: an advice defines the functionality to be executed before, during, or after a defined joinpoint, or even possibly instead of the defined joinpoint.

Aspect Oriented Programming allow us to capture the variable features in the stage of variants implementation of an application by defining aspects for the variable features to modify the original code. Aspects can add or modify the variable features of an application.
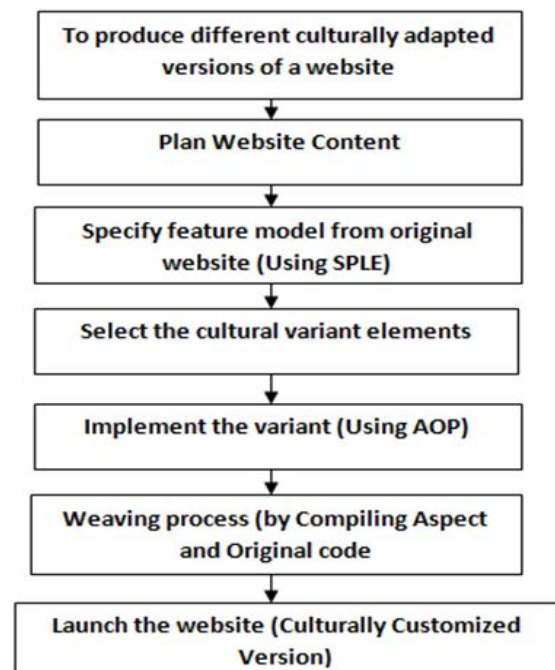
Figure 5. The framework for Websites cultural adaptation (Adapted from Alsarraj, 2009)

5.3 THE WEB CULTURAL ADAPTATION PROCESS
(Adapted from Alsarraj, 2009)

5.3.1. Aim

To produce different versions of a website interface, where each version to customized to culture of the target customers

5.3.2. Plan Website Content

- Specify the context of use.
- Specify user requirements from user's cultural model.
- Choosing HCI components for presentations (icons, images, metaphors…etc).
- Specify website content.
- Plan website design and structure (navigational style, menus…etc).
- Design original web interface using java servlet

5.3.3. Specify the feature model from original website:

When specifying the feature model of the webpage interface, include all the feature and components (buttons, menus, pictures) the page could include (mandatory, optionally, Or group, Alternative) in addition to specifying the cultural values as optional features.

Link cultural values with some features by means of a cross tree relationship between the specified cultural value and the features related to it. This implies that selecting a specific cultural value requires selecting the specific features.

The relation between two opposite cultural values can be expressed by an exclude relationship between the two features of these values.

5.3.4. Select the cultural variant elements:

Since each country has its own mix of the culture values, thus all cultural values must be included and presented in website to be culturally customizable. However, it is not the mere existence of these features on the page that makes it customized, but the degree of emphasising it. So to see which features should be included in the websites to be culturally customized, start by selecting the desired cultural value and then see what features are required to be included in a webpage to be customized to that culture value with the application of the guidelines of the cultural values framework

5.3.5. Implementing the variant:

The original interface is implemented as usually. For the modified interface, write aspects for all of the modified features with aspect oriented programming language.

5.3.6. Weaving process:

The waving process is done automatically at the compile time, collect all the related classes and aspects and compile them as usual (Eclipse or any other platform can be used as tool for building the application with Java Servlet).

5.3.7. Launch the website (Culturally Customized Version)

6.0 Further Design Guidelines For Web Cultural Adaptation

Designing a website interface that presents information and allows actions which are culturally appropriate is not an intuitive process. Therefore guidelines are often effective reminders of areas to examine.(Trillo,1999) The following are design guidelines are recommended for designing culturally adapted websites :

Design Rule 1: Understand the local culture
- Study the local culture specific demands in terms of culturally specific metaphors, visual and representational aspects and use of colours.

Design Rule 2: Language factor
- According to Fernandes 1995), Languages vary in the use of scripts (Roman, Kanji, Cyrillic) and size. The direction in which language is written can be unidirectional, such as English, or bi-directional such as Arabic. Furthermore, some languages are read from left to right, others right to left. Language use must incorporate all these diverse physical variations.

Design Rule 3: Basic Web Design Elements (visual)
- Simple symbols or icons that are commonly understood in one culture may confuse, or even insult, visitors from other regions. Use the appropriate icon for the targeted culture.

Design Rule 4: Data format
Use the appropriate data format for following items.
- Date
- Currency and symbols
- Number
- Address
- Phone Number
- User Name

7.0 General Research Contributions

Different parties will benefit from the research findings, outcome and the developed approach (i.e. the web cultural adaptation process/framework), for example, researchers can use the outcome of this research to conduct further research.
Software/web designers can use it in the process of localisation or customisation of their products. Cultural adaptivity in web design provides a feasible way of addressing the problems of localization with a more holistic adaptation of user interfaces and design rather than the conventional "one size fits all" approach.
Another contribution of this approach is maximizing code reuse by reusing the code of the core assets of the original application

(or website). By writing aspect codes and weaving the original system code with the aspects to obtain the desired new culturally customized website. The research findings also provide academics and industry with information on the degree to which cultural localisation is needed to ensure usability. In addition, these research findings could be adapted to enable their use in different countries worldwide.

8.0 Conclusion

The Web is a rapidly evolving global medium and to meet the demands of its diverse users, it has been observed that undeniably culture should be accounted for when designing websites. This study has sought to contribute that culture is an integral part of Web communication and provides a starting point for future research to explore the issue of Web standardization or localization. Also, there seems to be a gap between notions of technology and culture, and a lack of appropriate and valid approaches to their synchronization. It is likely that a deeper understanding of culture, human cognition and perception followed by the evolution of technology, may help to bridge the gap. This paper is the first stage of a multistage study, and the next phase will be to design a prototype website and produce a culturally customized version of it according to the guidelines of the newly developed framework.

References

1. Alao, O. Awodele, O. Baguma, R. Van der Weide, T (2011): Cultural issues and their
relevance in designing usable websites, International Journal of Innovative
Technology & Creative Engineering Vol 1, No. 2

2. Alsarraj, S (2009). An approach for experimenting with web design. Msc Thesis

3. Ali, H. Al-Badi,1. and Mayhew, P. (2010)   A Framework for Designing Usable
Localised Business Websites, Journal of Communications of the IBIMA Vol. 2010

4. Amant, K. (2005). A prototype theory approach to international Web site analysis
and design. *Technical Communication Quarterly, 14,* 73–91.

5. Andy Smith, Lynne Dunckley, Tim French, Shailey Minocha, Yu Chang (2004):
"A process model for developing usable cross-cultural websites", Interacting with
computers 16 (2004) pp.63-91

6. Barber, W. and Badre, A. N. (2001). Culturability: The merging of culture and usability.
Proceeding of the Fourth Conference on Human Factors and the Web. Basking Ridge, New Jersey.

7. Brusilovsky, P(1996).: Methods and Techniques of Adaptive Hypermedia. *User*
Modeling and User-Adapted Interaction 6(2-3) pp87-129.

8. Clinton, R. L. (2010) Making the User the Localization Expert: Employing User-
Customization Strategies in Globalizing Online Content Ch2 pages 39-61

9. Dieterich, H., Malinowski, U., Kuhme, T., and Schneider-Hufschmidt, M. (1993).
State of the art in adaptive user interfaces. Adaptive User Interfaces, pages 13–48.

10. De Troyer, O. and Casteleyn, S. (2004) Designing Localized Web Sites. In *5th*
International Conference on Web Information Systems Engineering (WISE2004),
Brisbane, Australia, pages 547-558.

11. Dunckley, L. & Smith, A. (2000). Cultural Factors and user interface design. In
Proceedings of the IEA 2000/HFES 2000 Congress.

12. Evers, V. (1997) Human - Computer Interfaces: Designing for Culture masters
Thesis

13. Evers, V.(2001): Cultural Aspects of User Interface Understanding, Phd
Thesis

14. Evers,V. and Day,D. (1997): The Role of Culture in Interface Acceptance,
Human Computer Interaction, Interact'97. Chapman and Hall, London

15. Fernandes, T. (1995). Global interface design: A guide to design international user
interfaces. Boston: AP Professional

16. Galdo, E. (1990). Internationalisation and translation: some guidelines for
the design of human - computer interfaces. In J. Nielsen (Ed), Designing User
Interfaces for International Use, 1-10. New York: Elsevier.

17. Gellner, E. (1997). *Nationalism.* New York: New York University Press.

18. Hagag, W. (2011) The E-Cultural Adaption Framework (E-CAF): Adapting the
Local Travel Interface for Egyptian Consumers   Phd thesis.

19. Hall, E. (1959) *The Silent Language,* Doubleday, New York

20. Hofstede, G. (1991). Cultures and Organisations: Software of the Mind, 125. New
York: McGraw-Hill.

21.   Husmann, P.(2001) Localization of web user interfaces. Cross-cultural differences
in home page design. Msc Thesis

22.   Kamentz, E. (2006). Adaptivit¨at von Hypermedialen Lernsystemen - Ein
Vorgehensmodell f ¨ur die Konzeption einer Benutzermodellierungskomponente
unter Ber¨ ucksichtigung Kulturbedingter Benutzereigenschaften. PhD thesis,
University of Hildesheim.

23.   Kang, O and Araujo, P.(2006) Cultural and Requirement Aspects on International E-
commerce sites Las Vegas Nevada, USA, June 26-29, 2006

24.   Kang, K. C., S. Cohen, J. Hess, W. Nowak, and S. Peterson. (1999) Feature Oriented
Domain Analysis (FODA) Feasibility Study, Software Engineering Institute
(Carnegie Mellon), 1999.

25.   Keiichi, S & Kuosiang, C (2008), "Special Issue Editorial: Cultural Aspects of
Interaction Design. Vol. 2 No 2, 2008.

26.   Kluckhohn, C (1962) : Culture and Behaviour, University of
Arizona Press Tucson, 1962.

27.   Kondratova, I., and Goldfarb, I. July 2005: Cultural Visual Interface Design
published in the Proceedings of EdMedia 2005, World Conference on Educational
Multimedia, Hypermedia & Telecommunications. Montréal, Québec, Canada. June
27 - July 2 2005. pp. 1255-1262. NRC 48237)

28.   Kwanwoo L, Kyo C. Kang and Jaejoon Lee. (2002). Concepts and Guidelines of
Feature Modeling for Product Line Software Engineering , IEEE Software, 2002

29.   Kyo, C. Sajoong, K. Jaejoon, L. Kijoo, K. Euiseob, S. and Moonhang,
H. (1998): A feature-oriented reuse method with domain specific reference
architectures, Annuals of Software Engineering, 5, 1998.

30.   László Lengyel, Tihamér Levendovszky, Hassan Charaf, 2004 Constraint handling
in Feature Models, 5th International Symposium of Hungarian Researchers on
Computational Intelligence.

31   Mantovani, G (2001) "The psychological construction of the Internet: From

information foraging to social gathering to cultural mediation," CyberPsychology &
Behavior vol. 4 pp.47 – 56, 2001.

32.   Marcus, A., & Gould, W. (2000). Cultural dimensions and global Web user- interface
design: What? So what? Now what? *6th conference on human factors and the Web Web*
 site. Reterived October 7, 2011, from

http://www.amanda.com/cms/uploads/media/AMA_Cult uralDimensionsGlobalWebDes
ign.pdf

33.   Perkowitz, M., & Etzioni, O. (2000). Adaptive Web sites. *Communications of the*
ACM, 43, 152–158.

34.   Perlman, G. (2002). Achieving universal usability by designing for change. *IEEE*
Internet Computing, 6, 46–55.

35.   Reinecke, K.(2010) Culturally Adaptive User Interfaces Phd thesis

36.   Sackmary, B. and Scalia, L. (1999), 'Cultural patterns of World Wide Web business
sites: A comparison of Mexican and U.S. companies', paper presented to the *Seventh*
Cross- Cultural Consumer and Business Studies Research Conference, Cancun,
Mexico, 1999.
http://marketing.byu.edu/htmlpages/ccrs/proceedings99/ sackmary.htm

37.   Sapienza, F (2008) Culture and Context: A Summary of Geert Hofstede's and
Edward Hall's Theories of Cross-Cultural Communication for Web Usability.

38.   Singh, N and Baack, J (2004) Web Site Adaptation: A Cross-Cultural Comparison of
U.S. and Mexican Web Sites. JCMC 9 (4).

39.   Singh, N. & Pereira, A. (2005), *The Culturally Customized Web Site:*
Customizing Web Sites for the Global Marketplace (Burlington, US, Oxford UK:
Elsevier Butterworth, Heinemann.)

40.   Singh, N., Zhao, H. and Hu, X. (2005). Analyzing the cultural content of Web sites: A
cross-national comparision of China, India, Japan, and US. *International Marketing*
 Review , 22 (2), 129-146.

41.   Siu-Tsen, S. Woolley,C Prior, S(2006): Towards culture-centred
design. Interacting with Computers xx p 1-33 Publish by Elsevier B.V

42.   Sommerville, I. 2001. Software Engineering, London, Addison Wesley.

43.   Tanveer, A, Haralambos, M. Preston, D (2009): Website Design Guidelines: High Power Distance and High-Context Culture. International
Journal of Cyber Society an Eucation. Pages 47- 60, Vol 2, No.1 June 2009

44.   Trillo, N. (1999): The Cultural Component of Designing and Evaluating
International User Interfaces Proceedings of the 32nd Hawaii International
Conference on System Sciences – 1999 45. Http://en.wikipedia.org/wiki/Web_content_management _system, accessed Mar.
2012.