ELSEVIER

WCIT 2010

Cross-Use Pattern Language: Cross-Cultural User Interface Development Tool

Jasem M. Alostath[a], Meshal Kh. Metle[b], Lamia Al Ali[c], Laila R. Abdulhadi Abdullah[d]

The Public Authority for Applied Education and Training (PAAET), College of Business studies,
PAAET, Kuwait, P.O.Box 23167, Safat, 13092, Kuwait.

[a]*jm.alostad@paaet.edu.kw*, [b]*dr_metle@hotmail.com*, [c]*ls.alali@paaet.edu.kw,* [d]*lr.abdullah@paaet.edu.kw*

Abstract

This paper discusses the Culture-Centred Design (CCD) method and the integration of its result in developing a tool that can help designers to develop user interfaces for cross-cultural user websites. CCD method identifies the role of culture in the design of user interfaces. In order to determine the role of culture in the design of Cross-cultural user interface, two approaches were used and these are CCD and Pattern Language, and presented in this paper as two phases. The first phase focuses on the development of a cultural profile that is based-on CCD, whereby several investigating approaches were applied for three national cultures - Kuwait, Egypt and UK (*Brazil was investigated in the cultural profile*). These approaches were applied to determine the link between users' culture and user interface design specifically for e-banking systems. The second phase introduces the Pattern Language as a tool to transfer the knowledge perceived from CCD method to designers. The results of the first phase were exploited in the development of pattern language for e-banking UI design. This language is used to share successfully proven solutions that are usability tested and evidence based for specific cultures (Localization) or for multi-cultures (Globalization).
ⓒ 2010 Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
Selection and/or peer-review under responsibility of the Guest Editor.

Keywords: Usability; Cross-Cultural Design; Pattern Language; Localization; Globalization.

1. Introduction

Culture is becoming one of the most important factor for the design of usable systems in the era of globalization. The globalization of artefacts has confronted users with usability problems, and as a result many e-commerce systems have failed due to designers' lack of understanding of users' local culture. This raises the issue of how to design products for other cultures [3,5,6,7]. Many cross-cultural design evaluations use existing websites designs in identifying cultural design differences. However, these design evaluations are not supported with a cultural model, or adopts cultural models that are not design oriented [5,6,7,8]. In our research of CCD, we have conducted design evaluations based on the identified subjective cultural attributes (CA) that characterize similarities and differences within and between user groups of different nationality of the cultural model that were developed based on HCI design [9,13]. In order to determine the role of culture in the design of Cross-cultural user interface two approaches were used and presented in two phases as shown in Figure 1. The first phase focuses on the development of a cultural profile. The development of this profile is based-on CCD method, whereby several investigating approaches were applied for three national cultures: Kuwait, UK and Egypt to determine the link between users' culture and user interface design specifically for e-banking systems. The second phase introduces the Pattern language as a tool to transfer the knowledge perceived from CCD method to designers. In the following sections, the two phases' methods and results are elaborated.
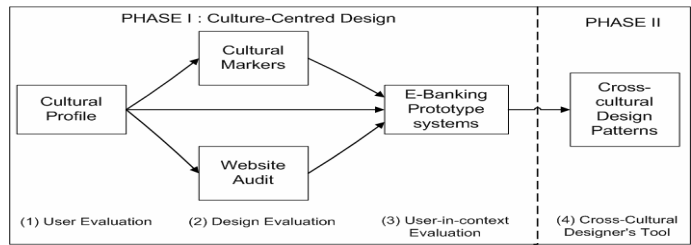
Fig. 1. The development method of the Cross- Use Pattern Language

2. Phase I: Culture-Centred Design Method and Results

CCD method consists of user culture evaluation, cross-cultural website evaluation, and user-in-context evaluation approaches (Figure 1).

2.1. User Culture Evaluation: Culture Profile.

The user culture evaluation approach uses a questionnaire to collect the cultural data required to build up the cultural profile, which uses 27 design specific CA instantiated from the work of Hall [15], Victor [16], Hofstede [17] and Trompenaars [18]. The result of this questionnaire presents several level of information that will show the similarities and differences among cultures. This is done through applying several statistical analysis, which are Discriminant Analysis, and MANOVA [2]. Cultural profile (CP) is reporting the questionnaire data based on cultural differences [26]. Cronbach's Alpha values shows that the questionnaire is high reliable ($\alpha = .75$, n = 709). The data collected involved 706 participants from diverse background, mainly in universities involving Kuwait (156, 22%), Egypt (303, 43%), UK (150, 21%), Brazil (97, 14%). Applying DA, the first level results is presented through the Total Score for Cultural Profile, which shows how cultures are different from a higher level of three clusters around the four centroids. Kuwait and Egypt cultures are clearly differentiated by this graph, and likewise the Kuwaiti and Egyptian are clearly differentiated from UK and Brazil. However, there is no differentiation between Brazil and UK. In order to identify the differences (unique and shared cultural attributes) between the case study cultures, the MANOVA analysis test was conducted and the results show that there are significant effects of nationality on items for each cultural attribute. Table 1 also shows a sample of the detailed CP for the case study cultures, which shows how cultural attributes are presented for each culture. These cultural attributes are shown in descending order with the highest mean score first. This list helps designers to determine which attribute has a higher design consideration for each culture.

Table 1. Partial summary table showing all the attributes for each culture and their mean scores (the highest scores on the top)

Kuwait	Egypt	UK	Brazil
R1. Relationship Type (4.429)*	I5. Information Diffusion (4.386)*	R5. New Technology Acceptance (4.063)** (KU)	R11. Work Quality (4.144)*
I3. Information Travelling Speed (4.276)** (EG)	I3. Information Travelling Speed (4.380)*	I3. Information Travelling Speed (3.84)** (BR)	T2. Task Performance (4.041)*
T8. Information Structure and Navigation (4.058)** (EG)	I2. Information Type (4.320)*	T6. Task Rules Compliance (3.63)*	T7. Communication Medium Preferred (4.010)** (EG)
* Differs significantly from other cultures (p < .001). ** Not significantly different (p>.001) from the culture that appears in brackets.			

2.2. Design Evaluation

The purpose of cross-cultural website design evaluation approach is to identify cultural differences at the user interface level and uses these differences to generate new websites as prototypes that are more sensitive to culture and genre variability. For this purpose two design evaluation approaches were conducted, the Cultural Markers

(CM) [5], and the Website Audit [8] approaches.

Cultural Markers Study- In the Cultural Markers approach, Barber and Badre [5] employ the Cultural Inspection Method (CIM) that uses a data collection template. In addition, this approach was enhanced to fuse cultural understanding (e.g. cultural profile) with design markers that are predicted to be culturally related. The basic principle of the CIM is to determine the genre markers first, which reveals the genre design requirements (e.g. e-banking). Determining these genre requirements makes designers less apt to mix genres and other requirements (e.g. culture requirements) during CMs investigation. The CIM procedure consisted on three main stages these are: (1) Foraging: This stage involves identifying and categorizing a number of websites based on country, and genre; (2) Identification of CMs: In this stage, the culture templates are used as a checklist for detailed manual inspection of the websites identified in stage 1, then data are cross-listed by country and genre. The data collected here are considered as dependent variables. (3) Genre and Cultural Patterns Identification: The data collected in stage 2 are checked for emergent patterns within culture, genre, and genre within culture (culture-genre). The e-banking genre markers are presented first and this followed by the CMs specific to e-banking websites. In this case study, 172 websites were manually inspected, and the collected data were categorized by country and genre. The percentages of websites examined are: 38.37% (N=66) Kuwaiti websites, 35.47% (N=61) UK websites and 26.16% (N=45) Egyptian websites. These websites present 10 major genre types across all the three case study cultures, and focus here on two languages of interest - Arabic and English.

E-banking Genre Design Markers- In order to identify the e-banking genre markers, a DA was performed to identify a number of significant genre markers for each genre type. Using this categorization it is possible to identify which design markers are unique for any given genre relative to other genres. The categorization value was used to categorize frequency of occurrence as high, average or low. *Cultural Markers specific to E-banking-* DA was conducted to identify the cultural-e-banking design markers. The DA identifies a number of significant CMs for each type of national culture for e-banking. In order to identify unique design markers, the frequency of occurrence of each of the identified cultural markers was tallied across e-banking genre websites of each culture. This value was used to categorize frequency of occurrence as high, average or low. This verifies that the CM approach when used in conjunction with DA is able to identify design markers which make that culture-e-banking uniquely distinct from other culture-e-banking.

The CM approach only shows the constraint of being forced to focus on supporting the link of culture with tangible sides of website design using a bottom-up approach. However, there are cultural design elements that are less tangible and primarily reside behind the interpretation of design content, known as intangible designs. A website audit approach is then applied to explore the design markers of those unravelled cultural attributes; this is done through a top-down approach from cultural attributes to design components.

The Website Audit Study- To investigate the effect of subjective culture on intangible design aspects. A modified Website Audit (WA) approach was used [8], which attempts to develop a method and a process for investigating subjective culture at the design level. In this study, the Website Audit Design Template (WADT) was developed. This approach is based on a detailed expert analysis of a small number of websites, which are identified as good examples of locally optimized sites. The WA was carried out in four stages: the identification of CAs, selecting websites to be audited, developing WADT for the selected CAs and carrying out the audit [9]. Through reviewing many e-banking websites, nine websites were selected for evaluation three from each culture [9]. The results of the CP, the website audit and the developed design claims that are combined to provide design models for e-banking system prototypes for the studied cultures and their design requirements. One model is provided for each culture, and each model is presented with the cultural design aspects and features that distinguish it from other cultures' designs. There are two design views: (1) localization view which is identified from the WA study results and presented by design-A and design-B, and (2) globalization design view that neglects the localized design cues and provides a design as neutral as possible.

User-in-context Evaluation (UICE) study- aims to evaluate the mapping between website design elements and cultural attributes using a user-in-context evaluation approach. This is done by developing three prototype UI

designs developed by the researcher from scratch, and applying them to 63 local participants from the case study cultures to substantiate the cultural design claims [9,12,14], which have been substantiated earlier in design evaluations approaches [9]. This experiment further substantiates these claims based on UICE, and aims to provide two types of results. In this study, the DA and Chi-Square statistical analysis methods were used to analyse the questionnaire data, which involves a 189 observations -- 63 observations for 3 designs. The DA is used to show the most important or interpretive independent variables, which discriminate the dependent variable or affect it [11], while the Chi-square is used to determine whether the groupings of cases on one variable are related to the groupings of cases on another variable [2]. To achieve the study objectives, two analysis need to be applied: (1) the ability of the developed user interface designs to classify the cultures differently; and (2) the identification of those DMs that play a significant role in causing these differences. The key factors in this analysis are usability and preferences.

(1) Culture classification: Cross-cultural design preferences **-** The data collected from the experiment were used in this analysis to classify the three cultural groups of users according to their preferences for the identified cultural designs. DA was performed with national culture as the dependent variable, and the DMs as independent variables. The results shows that when given a choice between a website designed for a different target culture and one designed for their own target culture, users will prefer the website designed for their own culture. (2) DMs of each culture: Culture and usability relation - A Chi-squared analysis shows that there is a significant relation between national culture and design usability ($\chi 2 = 19.08$, df = 4, Sig. < 0.001). Certain website designs are found to be more usable by certain national cultures is shown. In validating the hypothesis stipulated: *websites that have been designed for a particular target culture (e.g. Kuwait, Egypt, UK) using the cultural design claims will produce better usability results when tested by members of that particular target culture*. The Chi-squared analysis results shows a clear tendency for high usability by Kuwaiti participants in using their cultural design (design-A), but there is an exception to the hypothesis for Egypt and UK. Egyptian participants show high usability in using design-A, while UK participants have a usability score that is split between design-B and design-C. To further investigate the cause of this unexpected result, in the following section, the DA is used to identify which specific variables were affecting usability scores for each of the cultures (see [26]).

The classification of the three designs using DA test

DA was performed with usability factor as the dependent variable, and the studied CMs (58 variables) as independent variables. This test provides two types of results. The first result is the classification of the three designs (A, B, and C) based on the usability factor for each case study culture to determine the usability level on different designs. The second result is in identifying the DMs, which cause usability improvements among specific national cultures. The DA results shows that the total validity of the proposed model is 100% for observations, which indicates that all cases were adequately categorized in all cultures. The design classification based on usability factor across cultures shows that design-A seems not to discriminate between Kuwaiti and Egyptian cultures. This confirms the result stresses that at the cultural usability level, Kuwaiti and Egyptian participants show some similarities in usable DMs. This indicates that, based on usability, Kuwait and Egypt could share design-A and that the UK site (design-C) should be redesigned to have cultural DMs from design-B, in addition to design-C DMs. Reviewing the complete list of the usability DMs (see [9]) indicates that the shared DMs and cultures based on the cultural usability factor shows that there are more shared cultural usability DMs between Kuwait and Egypt, followed with Kuwait and UK. However, between Egypt and UK, there are no shared DMs. In addition, the DMs related to preferences and usability levels, the analysis shows that the identified DMs for preferences are higher than usability (see [9]). Furthermore, some usability markers appear to be different from preferences related DMs.

3. Phase II: The Development of Cross-Cultural User Interface Patterns.

The second phase of this research is to describe a tool which supports the CCD process by visualising the relationship between design guidelines and underlining cultural profile and empirical data. This is by investing the evidence gathered from Phase I of this study in the development of Pattern Language. There are many guidelines

and PL's available for designers [20,22]. However, very few have tackled cross-cultural aspects of the UI design. In addition, rarely or almost none were supported their guidelines or patterns with evidence that prove that the developed designs can improve usability for the targeted culture. In the next sections, a description of the developed tool is presented.

Extending the Cross-Use evidence-based guidelines with pattern language

Phase I provided evidence-based guidelines that are usable by cross-cultural users. However, there is clear evidence that cross-cultural User-Interface designers are seeking more concrete design examples that capture the user context to guide their work [19]. As a result, pattern language is adopted in this research to model user experiences and provide a common language between multi-disciplinary design team members, to make available more concrete and situation dependent solutions. This can be achieved by integrating pattern language into the Cross-Use tool to capture proven successful design knowledge in terms of the problem context and situation [21]. The Cross-Use tool can be used to support these patterns, and the patterns are delivered to designers, which guide them to design for cross-cultural user interfaces. In the following section, the adopted Pattern Language model is described and presents the way how it can be integrated with the Cross-Use experiment results.

The Cross-Use tool is based on the Compendium tool (www.compendiuminstitute.org). Compendium was developed to support the QOC method [24] and is designed to help capture actual design questions (Q) asked during design meetings. This design question is associated with options (O) of alternative solutions to the design question. Finally, the Criteria (C) are generated, which represents the strengths and weaknesses of each option based on a set of criteria [1,21]. The Compendium tool represents the QOC concepts using a graphical representation of typed nodes and arcs [24,25]. In some cases, there are designs that show different evidence. This leads to an argument node, which extends the QOC concept. This QOC concept is adopted to link culture and design variables. This link is represented in the form of questions that show different design options arising from the cultural design claims. These claims generate different design options depending on the cultural differences described by the claim. For every culture, the CP study [9] provides the initial evidence in support of the various design options. Then, several CM , Website Audit (WA) [9], and Cross-Use experiment provide additional evidence which is added to the visual representation (see Table A-1 in [9]). The evidence can support (Pros) or oppose (Cons) the initial design claim. Furthermore, on some occasions, different results show contradictions, and in this case, the contradiction is represented using the argument node. The outcome of the Cross-Use tool is presented in a map shown in Figure 2. This map shows the visual representation of the CCD method [9][14] used to link the concepts of culture and design. This map presents an example that is used here to illustrate the tool's structure.

In Figure 2, the first level presents the culture attributes concepts of this research. Each culture attribute has relations with user interface design aspects of the UI language, Metaphors, Mental Models, Navigation, Interaction and Appearance as shown in level 2. This relation is presented in the form of a design claim such as the C16 node [9]. Each design claim shows the design options for each of the case study cultures as shown in level 3, where the expected culture design is indicated by the link supported by the CP results. For example, for Kuwait design option 1 is the predicted design as indicated from the CP, while design option 2 is the predicted design for UK. In level 4, the results of the studies conducted in this research are represented by three types of evidence. These are: pros indicated by '+', cons indicated by '-‘, and argument indicated by '+/-‘. The pros indicator represents a response in favour of a design option. The cons indicator represents a response against a design option. Finally argument represents a general argument, usually in response to a design option. These results represent the supporting or opposing results to various design options provided. As shown in Figure 2, the CA and UI design aspect, and how these two factors affect each national culture are represented as question nodes as follows: (*Q1*) CA node question: "How does the Religious Relationship Symbols (R6) CA affect the User-Artefact relationship for the selected design or function?"; (*Q2)* Metaphor node question: "What is the effect of the Religious Relationship Symbols (R6) CA on the selection of the design metaphor (text or images)?"; (*Q3)* Culture (KU) node question: "What is the effect of the religious metaphors on the Kuwaiti culture users?". Then, the possible answer to Q3 will provide different design options for design claim C16. For example, the Kuwaiti (KU) culture in level 4 shows design option 1 representing the expected solution for claim C16 as indicated by the CP results. In this example, the CM and WA results show

some argument in which some results appear to be in favour of the selected design, but some others are against the selected design. This argument needs more robust evidence on which design should be chosen. Here, the Cross-Use experiment (Exp.) results present this robust evidence, which in this example supports the expected design indicated by the CP. This support makes this design claim become an evidence-based guideline for the Kuwaiti culture based on the guideline process.
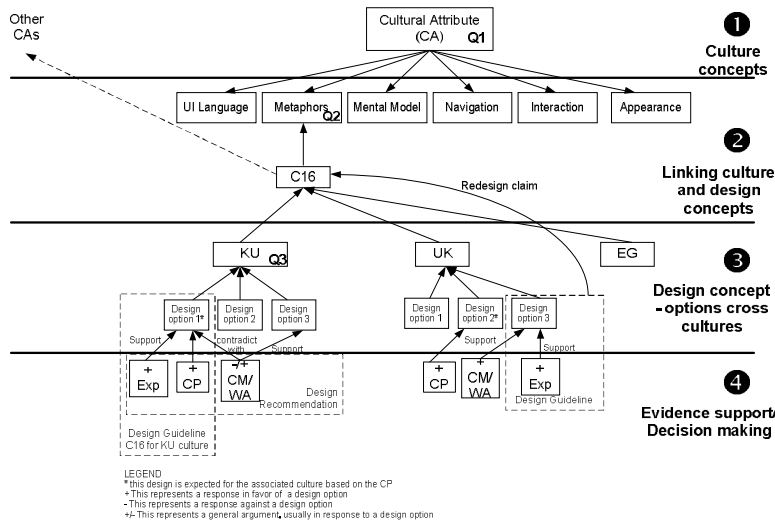

Fig. 2. The visual map showing the relation between culture and design concepts (This figure is for illustration only and not based on real data)

However, if the evidence contradicts the design claims, the guidelines are compared with the existing websites to identify their shortcomings. These are then represented as design recommendations. Figure 2 shows another scenario for the UK culture, where design option 2 is the expected design. However, the design evaluation of CM and WA and the user-in-context evaluation are all supporting design option 3, these results are shown as opposing evidence presented by the cons sign to the predicted design option. In this case, design option 3 is adopted to develop the guideline and redesign the original claim. The new claim becomes C16* (as shown in Table A-1 in [9]). by the redesign claim arrow. Figure 2 also shows that each design claim as shown by C16 could be linked to many CAs. The map presented in Figure 2 shows the basic structure of the developed tool, which is presented here as one hierarchal structure level to help illustrate the example. However, the actual structure of the map comprises many maps that are hyper-linked. The following section shows a real example of the developed tool. The developed tool presents the culture and design relation in a visual representation using the Compendium tool. An example of the developed tool is presented diagrammatically in Alostath and Abdullah work [26].

3.1. Cross-cultural User-Interface Design Pattern Template

The use of pattern design varies in different study fields [29,30,31]. However, in HCI, there is consensus on the three main fields of a pattern template. These are: problem, context and solution, without any one of which pattern cannot be constructed [22][32]. The purpose of the pattern language use in HCI is to deliver a usable example of user interface design and within this research scope is to deliver usable solutions for multiple cultures design [28]. The end product of the Cross-Use tool is presented in a pattern language (PL). The pattern example shown in Table 2 presents the use of metaphors in e-banking websites pattern for the studied cultures. The uniqueness of this PL compared to other PLs is its ability to show usable designs for each culture, and presents the rationale behind selecting each design. This is presented through a hierarchal structure (as shown in Figure 2), which tends to show

the link between culture and design at one level, and at the second level identifies the appropriate design solution for each culture based on the applied test, and the provided evidence.

Table 2. An example of the developed patterns describing the use of metaphors in e-banking systems for the targeted cultures.

Title:	Metaphors use in websites.
Rank:	Level 5[a]
Culture/Country:	UK, Kuwait, and Egypt
Genre:	E-banking
Problem:	The website should be enhanced with metaphors users' culture, to make it real-life look and feel. What type of metaphors (religious, national, neutral) should be used in each domain to increase usability?
Context:	A designer want to design local and global UI for e-banking system. The user interface that is targeting local users, should adopts users' local culture. Where in the case of designing a global website the users' culture should be eliminated. Many design elements could be added to the UI design to foster or eliminate cultural appearance. One of these design elements is metaphors. Design metaphor are strictly affected by users' culture. As design metaphors are perceived differently among users from different cultures.
Usability Principle:	The experiment presents the participants with 6 tasks to be performed on three websites, one maximized for their target culture the others maximized for the other cultures. There are several differences related to metaphors in designs used for each target culture are shown in Table 1. Website usability was tested by requiring users to complete each task quickly. After performing each set of tasks (simple and complex), a questionnaire was administered to measure the cultural usability factors such as the ease-of-use, usefulness, frustration, satisfaction, appropriateness of design to the participants' culture and perceived level of trust. Then the cultural usability factors were aggregated into 'usability factor' variables, which were used for statistical analyses.

The design markers as applied in the Cross-Use three UI prototypes for Relationship metaphors

Design marker	Design A	Design B	Design C
Religion metaphors	Y	-	-
National metaphors	-	Y	-

Forces:	Refer to Cross-Use Experiment [9].
Solutions:	Captured design solution that balances the various interests (or forces) in a useful way.

Local design view for *Religious Metaphors:*
KU: Medium focus on religious metaphors (design-A)
EG: Medium focus on religious metaphors (design-B)
UK: Low (or no use) avoid using religious metaphors as possible (design-C)

Local design view for National Metaphors:
EG: High focus on national metaphors (Design-B†)
KU: Medium focus on national metaphors (Design-A)
UK: Low focus on national metaphors (Design-C)

Global design view
Design-C is the proper design that fit for the three cultures as a global website.

Rationale:	Comparing the experiment results with CP, CM and WA shows:

Religious symbols				
	CP	CM	WA	Exp
KU	✗ (H)	✗ (H)	✓ (M)	M
EG	✗ (H)	✗ (L)	✗ (N/A)	M
UK	✓ (L)	✓ (N/A)	✓ (N/A)	L
✓ Conforms with experiment result ✗ Contradicts experiment result				

National symbols				
	CP	CM	WA	Exp
KU	✓ (M)	--	✓ (M)	M
EG	✓ (H)	--	✓ (H)	H
UK	✓ (M)	--	✗ (N/A)	M
✓ Conforms with experiment result ✗ Contradicts experiment result				

Diagram:	Refer to Cross-Use Experiment [9], and [32]

_____

a Pattern design degree of confidence. the Evidence-based Theory ranking system was adopted. This ranking system is based on six levels, where level five has the strongest evidence level and zero has no evidence (see http://www.usability.gov/guidelines/3 for more details).

Test scenarios & results:	Refer to Cross-Use Experiment [9]
Known uses (Examples):	There are several successfully used websites that uses the metaphors identified in this pattern. An example of each metaphor type is presented in following Figures.

(a) Kuwait – www.nbk.com – show high use of religious metaphors

(b) Egypt – www.nbe.com.eg - show high use of national metaphors

(c) UK- www.hsbc.co.uk – No use of religious or national metaphors

Result Context:	in-progress.

4. Conclusion and Future Work

This paper discusses the effect of culture in designing websites for cross-culture user interface for Kuwait, Egypt and UK culture. The study was divided into two phase – (1) culture-centered design method design and result, and (2) the development of cross-culture user interface patterns. In phase 1, culture differences were identified using Cultural Profile, Cultural Markers Study, Website Audit Study, and User-in-context Evaluation Study. The results of phase 1 are used in phase 2 in developing the cross-culture UI design patterns by developing an evidence-based guidelines with design patterns using the Cross-use tool. The design patterns will serve as an important guide to web developers in incorporating local design and global design views, design markers, metaphors and other cultural elements when design for a particular culture. This will enhance the usability of these websites as it is based on the users own cultural requirements and not directly adopted or adapted from other culture. The future work involves developing design patterns for various cultures in different countries in a regional culture such as the Gulf countries, Arabic speaking countries, and North African countries as people in these culture share the same language but have different cultural. Furthermore, the internet usage in these countries are growing and the demand for e-commerce is increasing especially in e-banking.

Acknowledgements

References

1. Dix, J. Finlay, G. Abowd, and R. Beale (2003). Human-Computer Interaction. Essex, England, Prentice Hall Europe.
2. J. Pallant, "SPSS Survival manual," New York, USA, McGraw, 2005.
3. V. Evers and D. Day, "The Role of Culture in Interface Acceptance." Human-Computer Interaction, Interact'97, London, 1997.
4. L. Constantine and L. Lockwood, "Software for Use: A Practical Guide to the Models and Methods of Usage-Centred Design," New York, Addison-Wesley, 1999.
5. W. Barber and A. Badre, Culturability: "The Merging of culture and usability," proceedings of the 4th Conference of Human Factors and the Web, 1998.
6. Marcus, "User Interface Design and Culture. Usability and Internationalization of Information Technology," N. Aykin. Mahwah, New Jersey, Lawrence Erlbaum Associates, Inc, 2005, pp 51-78.
7. P. Bourges-Waldegg and S. A. R. Scrivener, "Applying and Testing an Approach to Design for Culturally Diverse User Groups." Interacting with Computers, vol. 13, pp 111-126, 2000.
8. Smith, L. Dunckley, et al., "A process model for developing usable cross-cultural websites," Interacting with computers Vol. 16, pp 63-91, 2004.
9. J. Alostath, "Culture-Centred Design: Integrating Culture into Human-Computer Interaction," Doctoral Thesis, The University of York, UK, 2006.
10. V. Evers, "Cultural Aspects of User Interface Understanding: An Empirical Evaluation of an E-Learning website by International User Groups," Doctoral Thesis, the Open University, 2001.
11. N. Brace, R. Kemp, and S. Rosemary. "SPSS for psychologists: A guide to data analysis using SPSS for Windows," Mahwah, N.J., L. Erlbaum Associates: vii, p. 287, 2003.
12. M. B. Rosson and J. M. Carroll, "Usability Engineering: Scenario-Based Developement of Human-Computer Interaction," USA, 2002.
13. J. Alostath, J. and P. Wright, "Integrating Cultural Models into Human-Interaction Design," Conference on Information Technology in Asia (CITA2005), Kuching, Sarawak, Malaysia, 2005.
14. J. Alostad and A. Khalfan, "Cross-Use: Cross-Cultural Usability User Evaluation-in-context," 12th International Conference, HCI International 2007. Beijing, China, July 22-27, 2007.
15. E. T. Hall, "Beyond Culture," New York, An Anchor Book, 1989.
16. D. A. Victor, "International business Communications," New York, NY, HarperCollins, 1992.
17. G. H. Hofstede, "Cultures and organizations: software of the mind," New York, McGraw-Hill, 1997.
18. Trompenaars and C. Hampden-Turner, "Riding the waves culture understanding cultural diversity in Business," London, Nicholas Brealey Publishing, 2001.
19. S. Henninger,. "A methodology and tools for applying context-specific usability guidelines to interface design," Interacting with computers vol. 12, pp 225-243, 2000.
20. M. V. Welie, G. C. V. d. Veer, and A. Eliens, "Patterns as Tools for User Interface Design," International Workshop on Tools for Working with Guidelines, pp. 313-324, 7-8, Biarritz, France, 2000.
21. J. Alostath and P. Wright. "Pattern Language: Towards A tool for Cross-Cultural User Interface Development," Conference on Information Science, Technology Management, CISTM2004, Alexandria, Egypt, 2004.
22. L. Barfield, W. V. Burgsteden, et al, "Interaction Design at the Utrecht School of the Arts," SIGCHI Bulletin, 1994
23. MacLean, R. M. Young, V. M. Bellotti, and T. P. Moran, "Questions, Options, and Criteria: Elements of Design Space Analysis. Design Rationale: Concepts, Techniques and Use," T. P. Moran and J. M. Carroll. New Jersy, Lawrence Erlbaum, 1996.
24. Shum, "Hypermedia Support for Argumentation-Based Rationale: 15 Years on from gIBIS and QOC," Rationale Management in Software Engineering. e. a. Dutoit. Berlin, Springer-Verlag, pp. 111-132, 2006.
25. Shum, S. B. and N. Hammond, "Argumentation-Based Design Rationale: What Use at What Cost?" International Journal of Human-Computer Studies vol. 40(4), pp. 603-652, 1994.
26. J. Alostath, and L. Abdullah, "Identifying, Measuring, and Implementing Cultural Difference in Cross-Cultural User Interface Design"

International Journal of Computer and Network Security, volum 1, No. 3, pp 64-76, 2009.

27. Dix, J. Finlay, G. Abowd, and R. Beale (1998). Human-Computer Interaction. Essex, England, Prentice Hall Europe.
28. M. J. Mahemoff and L. J. Johnston, "The Planet pattern Language for Software Internationalisation," PLoP1999, 1999.
29. Alexander, "A Timeless Way of Building," New York, Oxford University Press, 1979.
30. Alexander, S. Ishikawa, M. Jacobson, I. Fiksdahl-King, and S. A. Angel, "A Pattern Language," New York, 1977.
31. Lawson and S. Minocha, "Guidelines versus Design Patterns for Cultural Localisation," Proceeding of the Second British Computer.
32. K. Van Duyne, J. A. Landay, and J. Hong, "The Design of Sites: Principles, and Processes and Patterns for Crafting a Customer-Centred Web Experience," Addison Wesley. 2002.