

From Global Terminology to Local Terminology: A Review on Cross-Cultural Interface Design Solutions

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Abstract. This paper provides a brief overview of cross-cultural interface design solutions combining cross-language information retrieval and cross-cultural designing. Language is a part of culture in a sense, but most of researchers deal with these two issues separately because they have many different issues and solutions in nature. The diversity of sources and perspectives taken into account for the review including practitioners'(software localization) and technical (e.g. semantic web, ontologies) solutions, design processes (e.g. cultural finger print), design elements (e.g. cultural markers), and philosophically informed discussions (e.g. semiotics).

Keywords: Software localization, semantic web, ontologies, design processes, cultural finger print, design elements, cultural markers, semiotics, human-computer interaction, globalisation, localisation, cultural inclusion.

1 Introduction

The potential of the internet as a global access tool for knowledge, goods and services is undisputed. However, this potential cannot be fully realised, as long as the information and services of one culture are less accessible for those who from other cultural groups. This does not only arise from obvious matters such as language translation, currency, formats of numbers and dates, but also from deeply rooted cultural differences that can cause misunderstanding and misinterpretation of information. For example, if the user searches for “Lamb”, the relevant information could be found as meat, red meat, Halal meat, kosher, or a non-vegetarian item. So the main problems are what the user is actually searching for, how relevant information can be retrieved and how the user can use a global interface as a culturally aware interface. What can be seen here is that the explosion of knowledge has forced researchers to devise new mechanisms to accommodate cultural classification. It is difficult to provide consistent information in such diverse environments. The user resists accepting non-familiar terminology which is a barrier to the effective and efficient use of global interactive design. This research was carried out to bridge the cultural differences gap.

2 The Available Solutions

The cultural differences raise research issues ranging from usability to methodological and evaluation studies in relation to product design and process involvement in development [61]. In this context, the following sections discuss available solutions regarding the problems discussed in the above sections.

Researchers and designers always look at the ways to improve usability access to users. They proposed different solutions to improve global interface design. A few of them are discussed here. There are various technical and cultural issues which need to be considered to design products as culturally neutral as possible. Byrne [9] explains a process called by GILT framework which consists of Globalization, Internationalization, Localization and Translation.

2.1 Globalisation, Internalisation, Localisation and Translation

Designers need to consider whether to develop a global, cultural-free interfaces or localised versions. In this context, Day [16 cited by 62] describes three stages of specialisation:

- Globalisation: Less culturally standards use across different cultures,
- Internationalisation: Early stage of local customisation,
- Localisation: interfaces for specific local markets.

Globalisation mainly deals with the necessary technical, financial, managerial, and staffing software to sell in a global market with minimal revision. The globalisation process has concentrated primarily on translating objective aspect of cultural, ignores subjective cultural aspects which are a necessary parts of cultural interfaces [20].

Internationalisation is a technical level of localisation and does not require remedial engineering or redesign. It has easily adopted design for international users after the engineering phase [41]. Internationalisation provides a common understanding to use design universally [51][44]. Therefore we need to design architecture which does not need further modification for every local market. Maroto and Bortoli [45] suggested that appropriate measures in the early design phase enhance the effectiveness of internationalisation. Marcus [45] advised that simplification of contents improve the internationalisation. Russo and Boor [58] define internalisation is to identify the culturally specific elements of the product whereas localisation to substitutes it with local content.

Localisation: The use of a global website is not convenient due to cultural perceptions and expectations of diverse users. The process of localisation makes websites suitable for target audiences. It generally addresses non-textual components of product and services [41] to cater to the need of local market. According to [25 cited in 13] localisation is a combination of language and technology to produce a cross cultural product. This definition only considers a “product” whereas the Localisation Industry Standards Association [41] extends the reach of localisation by including “services”. LISA [41] describes it as “the process of modifying products or services to

account for differences in distinct markets". According to LISA [41] localisation needs to analyse linguistic issues, physical issues, technical issues, business and cultural issues to make a decision not to localise or to localise.

Localisation as a "high-tech translation" [41] is a complex process and requires linguistic, technical, cultural, commercial and legal expertise [9]. The key languages technologies Terminology Management Systems, Translation Memory (TM), Machine Translation (MT), Localization Workbenches, and Global Content Management Systems (GCMS) are not the substitution for a human translator [41]. Localisation of design means to enhance its effectiveness for a particular culture [45][52][44]. The possible options for localisation are language, time zones, currency, colour, navigation, etc., [15][49] divided this into the following groups:-

- Linguistic: This process involves translating dates, time, currency, etc.
- Cultural: This process includes cultural aspects of the target audience i.e., images, terminologies, metaphors, colours etc.
- Technical: This comprises the above-mentioned aspects by redesigning the current website to make it more culturally acceptable.

In this context, there is a need for a website to cater for the local context of one culture or a cross-cultural website.

Translation is the replacement of text from one language to another language. A culturally localised interface is more than translation of text. Other important challenges are tangible factors, such as language and infrastructure. However, most studies are related only to language translation [56][17].

Choong, Plocher and Rau [11] grouped cultural dimensions into cognitive (internationalisation and localisation of display elements, information architecture and user interaction, organising and searching information, time), affective (colours and graphics), perceptual (use of metaphors), and functional (uncertainty avoidance). These processes need an analysis of both objective and subjective cultural issues [20][62]. Internalisation and localisation are widely used perspectives in HCI [19][28][44][27][7][3]. Sun [65][66] defined two levels i.e. surface level which covers translation, punctuation, dates, weights, measurements, addresses, currency, etc. issues. Whereas the cultural level deals with images, colours, logic, functionality and communication patterns.

2.2 Cultural Marker

Barber and Bader [4] identified localised elements "cultural markers" by usability inspection of several hundred websites belong to different countries and languages. They proposed that incorporation of cultural markers improve the usability for local users. Sheppard and Scholtz [58] proved their research by two mock websites (North American version and Middle Eastern version) as they found the positive effects of cultural markers on user's performance.

The studies on cultural markers effect on website usability by [66][38] found that users prefer websites with cultural markers from their own cultures. Both studies did not produce any statistically significant results. Sun's study [66] found cultural

makers play an effective role as culture is constantly changing therefore designers need practical observation from users. Mushtaha and De Troyer [49] emphasised the importance of cultural markers and divided cross-cultural markers for designing cultural based website and localization into five levels; context-dependent, settled, broad, variable and vista. Designer can choose a cultural marker among five cultural markers according to their cultural adaption needs.

2.3 Semiotics

The studies by [10][71][33][31] found that the designers use their own cultural specific icons and standards to represent culturally specific things. Different cultures prefer different signs or symbols according to their culture [29]. Semiotics, are 'science of signs' deals with the meaning of signs and symbols through an understanding of the acts of signification. The signs and symbols are assigned to conceptual categories to represent important aspects and ideas. As an infinite process influences user perceptions and give meanings to 'signs' through acts of semiotics (unless otherwise stated most of the work is cited from [30][33].

Concept of Semiotics is an act of interpretation [2][18] cited by [64]. The semiotic modelling is based on "the space of interactions", and "the significance of the user-organisation relationship". Semiotic theories help to find the deep explanations of user attitudes and behaviours and how the dialogue between user and system establish and maintain elements of the user-organisation relationship. They are described as the deconstruction of the interface to detect 'acts of signification'. They emphasise the need of actual meanings of as they can refer to different properties of the interface. Previous studies [53][57][5] cited by [62] did not get success to differentiate between a sign and its meaning. However, [30] applied semiotic principles to the user interface design.

Krippendorff [39], cited in Myers, 1997) defines semiotics as "content analysis". In his context, it is a research technique to find structure and pattern to make inferences from data. Wynn [72], cited in [50] takes semiotics as "conversation analysis." He defines that context of exchange is an important factor to shape the meanings. Therefore researchers need to immerse themselves to understand the context. Discourse analysis [50] is a combination of content analysis and conversation analysis.

2.4 Ontology

One of the ways to solve cultural and design issues is that users a raise query in their own language against a foreign language and the result comes in their own language [22]. In ontology, the semantics of terms is defined in terms of axioms and is interpreted in hierarchical relations between terms. However, ontologies do not translate textual input from a source language into a target language [13]. Ontology is an expression based on a specification of concepts, relationships among concepts. The following sections are adopted from [35] unless otherwise stated. Ontology localisation defines as an adoption of ontology of particular language or culture [36] cited in [13]. The advantage of ontology localisation is to reduce the cost as compared to build a new ontology. Ontology localisation is based on software localisation [25] thesauri translation and machine translation.

Ontology Localisation

It is a process that takes ontology as input and produces a new ontology extended with labels in addition to the languages [24][13].

Lexical layer: It affects the surface level as it just conceptualisation itself and does not consider functionality and behaviour of the software. This layer is language-specific and provides a 1:1 translation for each label, dependent on the localised purpose. It also comprises documentation and online help related to a particular culture.

Conceptualisation Layer: In this layer, software functionality and behaviour needs conceptualisation according to the processes and rules related to particular culture. Apart from translation of labels, conceptualisation is also important element of ontology localisation. It is driven by the inexistence of conceptual equivalents in the target culture.

Thesauri Translation: Thesauri translation is reuse of existing thesauri or a reasonable translation system that can provide support across the languages. As compared to ontology localisation, it does not need conceptualization. During Thesauri translation contents lose their structure as compared to ontology therefore the relevancy of meaning is always questioned.

Machine Translation: Translation of sentences and documents etc., with the whole context from source language to target language is called machine translation. It is difficult to find the most appropriate translation of a target language according to the ontology context. Therefore translations obtained from multilingual lexical resources compare ontological contexts with the original label. A plug-in Label Translator [24] is an ontology editor supporting a semi-automatic functional translator for English, Spanish and German languages. A number of linguistic resources are available to obtain automatic translation such as multilingual lexica (EuroWordNet), multilingual terminologies (IATE10, a multilingual term base of the EU), and translation services (Babelfish, GoogleTranslate) [25] cited in [35]. LabelTranslator has been developed to translate terminology and reuse them in multilingual or cultural ontology (for more details [23][24]).

Ontology Mappings

Conceptual level: Ontologies describe and construct in different languages by either taxonomical relations (i.e., owl: equivalent Class, owl: sameAs, rdfs: subclass Of, etc.) or domain dependent relations (i.e., ontology properties coming from other ontologies). The Conceptual cross-lingual mappings establish a correspondence between or among concepts including in different ontologies or languages [35].

Instance Level: The instance cross-lingual mappings are about individual links instead of associated concepts and are represented by owl: sameAs [35].

Linguistic Level: The linguistic cross-lingual mappings establish concepts between their associated linguistic information. This mapping is used where conceptual and

linguistic information is a major requirement. There are no semantic relations between the concepts as mappings established between the linguistic descriptions of their concepts are not necessarily exact culturally equivalents but may be the closest correspondences between culture-specific concepts. Cross-lingual ontology mappings are a sub-case of ontology mappings [35].

Vocabulary elements can be captured rdfs: label property but is not sufficient for syntactic variation across languages. The, multilingual lexical information models e.g., LexInfo [8][14][12] or LIR [48][54] cited in Gracia et al., 2012) are complex and need lexicon models for ontologies like the lemon model by [46] cited in [35]. Some models with the combination of first generation ontology localization for translation support to ontology are available. They use multilingual lexical (EuroWordNet), terminological resources and extant translation services for mappings. Multilingual lexical information integrates with ontology localisation tools to support queries in any language and is available via Semantic search engines.

Deeper multilingual lexical knowledge requires supporting cross-lingual natural language processing. However, users interact in different ways such as keyword-based queries. In this context, it is still a research question that how a natural language query can transform into a formal query [40][42][68][6]. Therefore localised semantic information can play a vital role to the serve user. The main problem is how to represent cross-lingual mappings as there are not many approaches to identify mappings between different languages [26]. Semantic Web languages and ontology matching both support cross-lingual ontology mappings.

The main objective of cultural ontology is to create explicit mutual and different perspectives to share understanding [55] cited in [1] i.e., researches [47][37][21] show promising results. However there is a need to develop a more detailed theoretical and empirical research in this area to support multiple languages by integrating machine translation systems [69][34][63] and measures of semantic similarity [35]. Further, it is not always possible to reuse in different linguistic and cultural scenarios as they are domain specific. Ontology localisation needs more research to increase the accuracy of current approaches. Further research also needs to look at how cost can be reduced and how the design could be more users friendly.

2.5 Cultural Attractors

Smith [62] describe cultural markers as cultural attractors. These are element of web-site design that reflect the signs and their meanings of a local culture for interface design. The studies by [32][62] presented the “cultural attractors” after auditing the e-finance websites of India and Taiwan. They developed a generic catalogue of cultural attractors and embedded in to E-commerce sites to help the local audience of India and Taiwan. The cultural attractors are combination of colours, cultural specific symbols, linguistic cues and religious iconography and local oriented identities. These cultural attractors can help the designers and usability evaluators to design cultural specific Web sites for specific cultures or countries. The proposed attractors match the expectations of the users for that particular culture.

2.6 Cultural Fingerprint

Smith [62] developed “cultural fingerprint” to compare cultural profile with target cultures. Their user study in cultural usability is influenced by Taguchi’s work in Total Quality Management [67] cited by [62]. This bases the concepts of optimisation through the design of experiments. Taguchi is a cost effective method for researchers in cultural diversity [59][60].

The term “culturability” (combination of culture and usability) deals with language, social context, time, currency, units of measure, cultural values, body positions, symbols and aesthetics [4][28]. A study that supports culturability found that visual elements have a direct impact on the user’s culture [70].

The studies discussed in this section have attributed differences to various cultural styles, including searching style, cognitive style, language use, perceptions of search systems and information sharing. The main problem in this area is the global acceptance of cultural factors for User Interface (UI). The researchers have a consensus that interface elements affected by culture need to be adjusted and designed according to locale-specific users.

3 Conclusion

The above mentioned observations indicate that the research relating to culture and technology with respect to classification needs more attention. Human-Computer Interaction (HCI) experts face the challenges to understand the target culture and its influence. The major problem is how a huge amount of information can be organised effectively. To achieve this, getting an effective access to information is needed. As there is no particular arrangement for the dissemination of knowledge to every culture while widening the access requires resource classified in a cultural context, it becomes the major potential barrier for designers. Consequently, it is time to study how information can be organised for different cultures.

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