

Cultural and Linguistic Localization of the Shop-Owner Interfaces to an E-Commerce Platform for Rural Development

S. Dyakalashé, H.N Muyingi, A. Terzoli and M. Thinyane
Telkom Centre of Excellence in Developmental E-commerce
Computer Science Department, University of Fort Hare, Alice, South Africa
sdyakalashé@ufh.ac.za, hmuyingi@ufh.ac.za, aterzoli@ufh.ac.za, mthinyane@ufh.ac.za

Abstract – The virtual shops allow the shop-owners/administrators to load up their products to advertise and sell them on the front-end of the e-commerce platform. In a multicultural environment failure to adopt modes of expression and culture of the different stakeholders may reduce the level of benefits of e-commerce initiatives. This paper presents an improved design and re-implementation of the culturally and linguistically localized virtual shop-owner interfaces of an e-commerce system for the rural community of Dwesa in Transkei, South Africa. Localization of communication technologies increases the usability and adoption rate of services provided.

Index Terms – Cultural localization, linguistic localization, interface usability, virtual shops, web-based e-commerce, rural development

I. INTRODUCTION

There are eleven official indigenous languages in South Africa, English and Afrikaans being the most commonly used languages for communication. This applies in both working and studying environments, including colleges, universities, technikons etc. and this is a problem to people living mostly in rural communities. The use of Information and Communication Technologies (ICTs) in South Africa is increasing, with many projects supporting the implementation of ICTs in marginalized communities for rural development. Due to illiteracy and the increasing power of computers, there is a need for localizing and designing intelligent human-computer interfaces to increase the usability of the system and the adoption whose applications are still Western world oriented.

By intelligent user interfaces we refer to adaptive interfaces and interfaces that offer better explanations, guidelines, and suggestions for the users' activities. Intelligent interfaces are based on how the information is intelligently communicated to the users to improve the usability and understanding of the system functionality [1]. Designing these intelligent interfaces simplifies the adaptability issues encountered in multilingual and multicultural societies such as in South Africa.

It is commonly experienced that humans are natural experts in social interactions and will interact and communicate easily and effectively with each other when using their home

language [2]. Therefore if the users can communicate and interact with computers in their mother tongue, the risk of marginalization with respect to ICT could decrease dramatically. The communication can either be spoken, written, or may take other forms of expression [3]. This means there is a need to intensely concentrate on the usability of the interfaces by translating and adapting the languages commonly used in them to a language suitable for the targeted area or audience.

Designing these interfaces does not only require translating the language for a targeted audience, but also includes adapting to the audiences' culture. This requires the need to identify cultural differences and specific requirements within the culture. These cultural differences in interface design are commonly referred to as cultural markers and are used to improve the ease of use of an interface. Cultural markers refer to the interface design elements and cultural factors or common knowledge shared within a culture of the targeted audience [4]. These include colors, content, icons, fonts, images, layout, text/symbols, shapes and importantly, metaphors etc.

In this paper we will discuss the design of intelligent web-based user interfaces for entrepreneurs in a rural area, Dwesa, a region of South Africa where a FOSS based e-commerce platform is undertaken [5]. These interfaces will ensure the use of an e-commerce site for artifacts sale and tourism to be used more easily and directly by the local people.

II. RELATED WORK

The term culture is complex and has many definitions from different researchers. Hofstede [6] defines culture as “the collective programming of the mind which distinguishes the members of one group or category of people from another”. When designing for a specific audience it is important to understand their beliefs, values and attitudes so that the interfaces design is culturally meaningful, user-friendly and user-attractive. The design and display of information for a specific area may differ in effectiveness and usability because of the difference in culture, not just for the buyer, but for the

seller as well [7]. In the case of the system deployed in Dwesa, there is a vast gulf between buyers and sellers.

Failure to understand the cultural differences by the system designer may lead the user to make unnecessary mistakes due to misunderstanding [8]. Software development for a rural community differs from that of urban community due to many factors, including low or non-existence levels of literacy. These software need to be localized and adapt to the needs of the local community [5].

Language is naturally deeply intertwined with culture but here we will distinguish it from culture for simplicity and better understanding. Cultural localization is the adaption of cultural factors or markers of one culture into the user model designed for a different culture [4]. Culturally localizing a system includes considering the layout, content, navigation, colors, graphics, text/symbols, metaphors, etc. The designer should consider the graphical representation of the functionalities for the users. Linguistic localization requires the adjustment of a product features including translation, punctuation, graphics and icons, date, time, weights and currency. Most of the rural communities in the Eastern Cape region are illiterate and some community members cannot read nor write even in their home language. Thus even if the interfaces can be translated to their native language they cannot be able to understand and use them.

However the level of culture orientation in linguistic localization may differ from pure textual translation e.g. using standard language, to culture-related concepts translation. Studies show that humans react more to imagery rather than words and understand a concept better when images or icons, which are often culture-related, are used in place of words.

A. Autocompletion and Autosuggestion

As most rural communities have members who are computer illiterate, they lack knowledge on the use of computer equipments (i.e. input devices such as keyboard, mouse, microphone, scanner, etc.) for communication and as a marketing resource. The problem is that most of rural communities are computer illiterate and do not know about these devices. Therefore, for community members to be introduced to using computers there should be user assistance from the system. Thus, the solution is to use autocompletion or autosuggestion to assist the users. With autocompletion, the user types initials of a word and the system tries to complete it for the user. Autosuggestion is slightly different because instead of completing the word it provides possible suggestion for the word typed and it is usually in a drop-down form. As the use of computer and technologies increases everyday, new technologies are being invented and one would refer autocompletion and autosuggestion as old hat even though it is still as much effective for user assistance.

B. Text-to-Speech (TTS) and Automatic Speech Recognition

Illiteracy makes it difficult for individuals to interact with even simple user interfaces [9]. Text-to-speech tools allow a system to communicate with the users by developing audio interfaces. Because people mostly communicate and interact through their social life with the aid of speech, such voice enabled systems will allow users to understand computer systems [2]. This also helps those with reading and eyesight disabilities. The most commonly used web text-speech technique is the automatic speech recognition. This refers to web interface links that are used to guide the user to performing a set of actions or commands. This sort of interaction is more effective if the user possesses earphones or computer speakers. This is referred to as auditory information communication.

Auditory or audio communication is different from cultural and language localization. Audio communication can expand the knowledge and understanding of using interfaces better than translated scripts. Audio communication can be a unidirectional or bidirectional communication between the interfaces and users. A unidirectional communication is incomplete because it can only be an input or output type of communication. It can either produce audio information output to the user or allow the user input by speech recognition and convert it to text. Although bidirectional audio communication is complex and difficult to implement in multilingual interfaces, it can better improve the communication between the interfaces and users [10].

III. PROBLEM DOMAIN

An e-commerce prototype or shopping mall has been deployed at Dwesa, a rural community located on the Wild Coast of the former homeland of Transkei in Eastern Cape Province in South Africa [11]. The prototype aims at motivating the local entrepreneurs to engage in trade activities and only supports three types of users, the system administrator, the micro-tourism operators or shop-owners, and the customers [5],[12]. The artifacts being sold on this e-commerce platform are beaded crafts ranging from necklaces to anklets. The crafters or shop owners who design these artifacts are mostly educationally challenged and computer illiterate and are often older people age ranging between 50 and above. Earlier, the shop-owners were using an interface that was semi-translated and was mostly using English as the media of communication and interaction to perform certain functionalities [13]. Because the system was semi-translated this required some training session to be conducted for the shop-owners on how to use the interface.

The system administrator registers a shop for a certain group of crafters and the crafters can therefore monitor their registered shops on the shopping mall. Due to the illiteracy, it is a challenge for the shop-owners to monitor their stores because of cultural and linguistic barriers experienced when

using the interface. Thus this requires adapting and suiting the interface to the shop-owners linguistic and cultural needs. The following section illustrates the re-implementation of the shop-owners interface to a localized interface targeted for the shop-owners.

IV. SYSTEM DESIGN AND DEVELOPMENT

The shopping mall deployed at Dwesa supports two types of user interface: the front-end (buyers) interface and the shop-owners (sellers) interface. The previously deployed e-commerce system was developed using LAMP (Linux, Apache, MySQL and PHP) [12] and in addition the system is re-developed using the following open source technologies:

- JavaScript
- AJAX (Asynchronous JavaScript and XML)
- GNU gettext tools, version 0.17
- CSS (Cascading Style Sheet)

The combination of AJAX and javascript is mostly used when the user is viewing the uploaded items or viewing the customer orders. This combination allows the user to edit the details of individually without having to refresh the whole page and saves creating an extra page for editing the details.

The previous deployed shop-owners interfaces had some limitations with respect to cultural and linguistic localization. The interfaces were designed in the form that was only understood by the designer but could not help or assist users to perform their tasks. The interfaces were mostly limited to translation and the shop-owners did not have a choice of choosing their language of preference.

The front-end interface can be used by any user that visits the shopping mall (system administrator, shop owner, customer) whereas the shop-owners interface is accessible only to the system administrator and shop-owners. (The shop-owner interfaces are accessed with the aid of a login panel via the front-end interface). The system administrator is responsible for creating, deleting, and updating shops and also provides the shop-owners credentials for login from the front-end. Shop-owners are allowed to perform certain actions including editing and viewing of the details about the items being sold, deleting of items, uploading new items to their shops, and viewing the item orders made by customers.

A. Translating the virtual shop-owners end

This is the part where we linguistically localize the system according to translation of text, time and date, currency and weight. Therefore it is important to translate to the targeted language as to adopt the media of communication to the language used by the community at Dwesa. The translation is not only limited to language(s) used in Dwesa but, in general, can also be replicated in other regions using different languages. In the previous version the translations made were hard-coded into the scripts. This is a tedious strategy to use and is also untidy. Thus, we re-implement the shop-owner interfaces using the GNU gettext framework for user interface text translation [14]. GNU gettext utilities provide a

framework to which other free packages such as PHP may produce multilingual messages and it fully supports PHP. When using gettext with PHP to get the translated string we have to make use of `_()` or `gettext()`:

```
echo _("Hello") or echo gettext("Molo");
```

poEdit, kLabel, gTranslator etc. are translation tools used to provide a simple GUI that is used to automatically scan source file for translatable strings using a catalog manager and is used to edit PO (Portable Object) files [14]. A PO file is created for each target language. Fig. 1 demonstrates how gettext operates to translate a string and the conversion between different file formats.

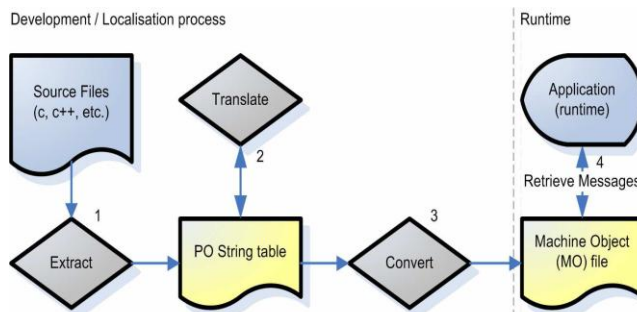


Fig. 1. Gettext based localization process [15]

From the source file a PO template (POT) file is created which is later used to create a PO file by using `xgettext` and `msginit`. The PO file is compiled into a Machine Object (MO) file using `msgfmt`. When changes are made to the source, adding a new string, edit existing string, delete string, a new POT file is created and `msgmerge` program allows a comparison between the new POT file and the existing PO file [14],[15]. The catalog manager re-scans the source file and updates the data changed if the source file was updated.

The deployed e-commerce system makes use of time, date, currency and weights which also need to be localized. For example, the front-end interfaces use the European currency (€) and it is converted into rand (R) in the shop-owner interfaces as euros are not understood by the shop-owners. In most isiXhosa speaking rural communities, people especially the elders express the amount in words. For example, currently [16]:

1euro = 11 .67 rand \approx R12;

where R12 is expressed as “Iiponti ezintandathu” in isiXhosa. But as most of them are unable to read or write using the language, they will not be able to understand how much the price is if it expressed in words. This means we do not need to translate the cost but we only convert it to a currency understood by the targeted audience. This concept also applies to the weight of an item, time and date.

The system also supports a limited level of vocal interaction, via text-to-speech assistance in the form of talking links. When a user moves the mouse over a link, the link is read out to the user and when the user moves away the system stops reading the link. It is important to stop reading the link when the user moves away from the link because if there are several links on a web page, the system starts to be annoying to the user.

B. Culturally adapting the shop-owners end

As we said above, by culturally localizing a system we allow the user to easily understand how a system operates and also improve the performance and ensure reliability as the performance is not only based on cultural localization. We thought that it would be better if the system allowed the user to choose the preferred layout and content presentation. Thus the user would be able to play around with the interface and organize the interface the way he/she would prefer.

The system allows the user to change the layout of the interface by dragging and dropping elements in different positions of the interface. The users are also able to the background color for graphical representation. The interface uses graphical hyperlinks and buttons that are more understandable than text hyperlink to people with low level of literacy (the graphical hyperlinks are also labeled to assist the user about what the link is for).

1. Viewing the Uploaded Shop Items

Fig. 2 displays the interface used by the user to view the items on the shop which have been uploaded into the shopping mall so as to be displayed in the front-end. For simplicity the interface for micro-tourism operators, designed according to the same principles, is not shown here. The items are displayed in an image gallery and slideshow. The slideshow displays all the images of the items which are being sold in the shop and the user can navigate easily through them. The user can navigate from left to right and back again by using the left and right arrows with the mouse flying over. When the user clicks on one of the thumbnails in the slideshow, the details of the items are displayed along with the larger image of the thumbnail.

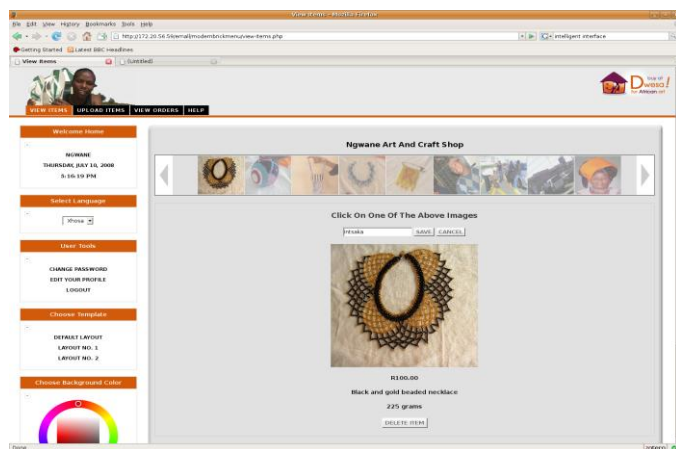


Fig. 2. Viewing the shop items

The interface above also allows the user to edit the details (item name, price, image, description, and weight) about the item or delete the item from the shop. Instead of having an extra interface for performing these actions, we allow the user to make the changes on the same page. When the user wants to edit the item name, he/she should click on the current item name and the name will be replaced by textbox with a button for updating or canceling. The user can then use the textbox to edit the item name and by clicking the save button. The user can use the cancel button if he/she wants to exit the editing. A similar approach is also replicated to the editing of item price, description and weight.

The user can also edit the current image of the item by clicking on the image and a file upload form will replace the image. The user can then browse to the directory where the new image is located and when the user saves the changes the image is resized and stored into a thumbnail folder so that it can be displayed in the slideshow with the correct width and height.

When editing an item, the system autocompletes and autosuggests the new value for the shop-owner. So the user does not have to type the whole word or number. This is important because they are not familiar with the use of a keyboard. All this is done without reloading the web page but refreshing certain parts of the page when a certain action is performed.

2. Viewing Customer Orders

When the customers make an order on the front-end, the shop-owners are able to see it on the shop-owner interfaces and are alerted via email and, in the future, SMS. The shop-owners are also able to view pending and delivered orders that have been made on their online stores. Fig. 3 illustrates how the orders are displayed on the shop-owner interfaces. The shop-owner has a choice of viewing the pending orders or the delivered ones and he/she can naturally change the status of the order when appropriate. An order is never deleted from the database because an order history is being kept and would be used on the front-end to display for purchasing statistics of a specific customer.

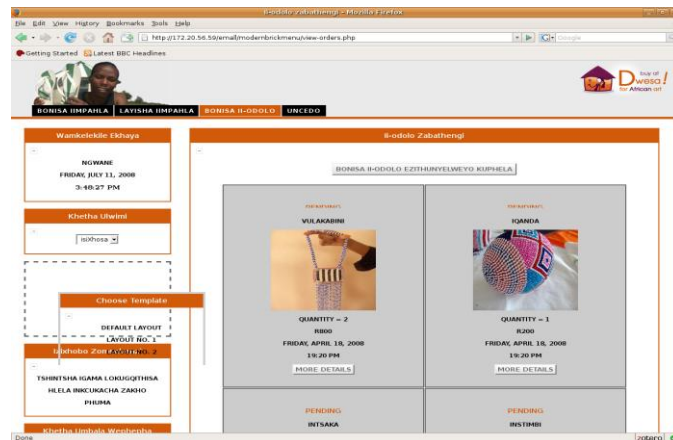


Fig. 3. Viewing customer pending orders

3. User Interface Guideline

A navigation tool and guidelines assist the user to know how the system works. They track the position of the user on the system using the system diagram. Therefore, an interface diagram is presented and when the user clicks the help menu, the system shows the exact position and where the user is and can possibly navigate to. This also acts as user activity tracker on the system.

V. FUTURE WORK

The design of a fully interactive-system for the users is planned so that they can self design the interfaces. This means allowing the users to configure the interfaces design the way preferable to them using a GUI design. After the interface configurations, the settings can be locked so that the user configurations do not change when using the interfaces. The user performance or usability of the system will be tested by conducting interviews and questionnaires to the community members in the form of a lab experiment. After the experiment, some changes will be made to the system, re-evaluated, and the final version will be deployed. Developing audio interactive interfaces for text-to-speech and automatic speech recognition voice I/O communication through the use of speech standards such as VoiceXML.

VI. CONCLUSION

In this paper, we discussed the design and re-implementation of a proposed user-attractive, user-friendly, and meaningful interface design for the shop-owner interfaces of the deployed e-commerce system for the entrepreneurs in Dwesa. The interfaces are designed so that when the system is replicated in another region, the users can easily configure the interfaces so as to adapt to their culture and language. We noticed that culturally and linguistically localizing the interfaces allows the shop-owners to easily manage their stores.

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S. Dyakalashe is currently pursuing his 2nd year M. Sc degree at the University of Fort Hare, Alice, South Africa. He is a Telkom CoE bursar. His area of interest is Software Development and Localization.

H.N Muyingi is a Professor in the Department of Computer Science at the University Of Fort Hare. His areas of academic interest are ICT for development, networking, and communications technologies for power utility industry. Professor Muyingi is the Head of the Fort Hare Centre of Excellence.

A. Terzoli is the coordinator of the University Of Fort Hare Centre Of Excellence in Developmental eCommerce. He is also the project director of the Rhodes University Centre of Excellence in Distributed Multimedia. His research areas of interest are real-time multimedia over packet networks and Developmental ICT.

M. Thinyane is currently a Doctorate candidate in the Department of Computer Science at Rhodes University. His areas of academic interest are ICTs in rural development, wireless networking technologies and e-learning solutions.