ELSEVIER

Interacting with Computers 13 (2001) 497–512

Interacting with Computers

www.elsevier.com/locate/intcom

Human–computer interface design issues for a multi-cultural and multi-lingual English speaking country — Botswana

E.A. Onibere, S. Morgan*, E.M. Busang, D. Mpoeleng

Department of Computer Science, University of Botswana, Private Bag 0022, Gaborone, Botswana

Received 10 January 2000; revised 8 August 2000; accepted 19 September 2000

Abstract

This paper reports on research carried out to determine whether a localised interface is preferred by users in a multi-cultural and multi-lingual country where a non-local language is nationally used,. We attempted to discover whether local symbols are more acceptable to users as icons and also whether the current phrases used in menus and icon descriptions are clearly understood by the various communities.

A survey was conducted nation-wide among computer end-users in Botswana. The results indicate an overwhelming desire from users for a localised interface. However, there appears to be little need for localised icons and no agreement as to which language to use for text-based interfaces.

Keywords: Usability; Culture; Localised interface; Interface design

1. Introduction

The concept of personal computing has been pursued seriously since the late 1970s. However, the usage became widespread when the Personal Computer (PC) became more available and affordable. The ease of use increased with the introduction of graphical user interfaces (GUIs). However, much of the effort invested, was focussed in developing software that could be accommodated by the limited computer hardware available. Such limitations included slow processing power and low memory and storage capabilities (Onibere, 1981, 1986).

At this time both hardware and software were mostly produced in the United States. In

* Corresponding author. Tel.: +267-355-2129; fax: +267-355-2784.
E-mail address: morgans@mopipi.ub.bw (S. Morgan).

0953-5438/00/$ - see front matter
PII: S0953-5438(00)00052-7

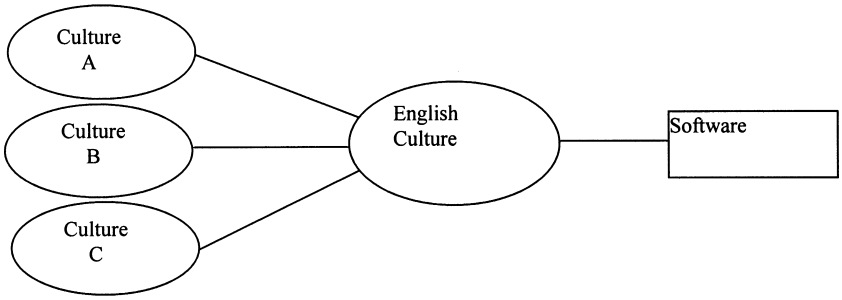


Fig. 1. English language interface for a multi-cultural and multi-lingual community.

the recent past, 75% of installed packaged software world-wide was produced in the United States (Miller, 1994) and oriented towards western industrialised nations. The situation is now changing since — for the most part — Asian countries have emerged as serious competitors to western industrialised nations in an increasing global economy. In connection with this development, the market for computer products has become increasingly international too. International sales make up half the revenues for the top 100 US software companies (Miller, 1994). Because of the increased competition between software companies, the usability of a software product is becoming ever more important, relative to its functionality. With the overabundance of software products on the market that are similar in functionality, the usability of an application may indeed be the decisive factor in consumers choosing one product over another. This is why efforts are being made to improve on the design of user interface (Maguire, 1999; Magnus Lif, 1999).

The cultural background of the user has a role to play. According to Berner (1998), "because every system…reflects the cultural background of the system designer…who developed it,…aspects of usability are prone to be influenced by the users cultural background in relation to the system". Cross-cultural issues have continued to be addressed (Griffith and Olin, 1998). Culture can be defined in a simple form as the behaviour typical of a group or class (of people) (Yeo, 1996). However, in a more complex form, culture can be defined as the collective programming of the mind which distinguishes the members of one human group from another (El-Shinnawy and Vinze, 1997). Averaging these two, Portigal (1997) defines culture as the organising behaviour and shared beliefs that define a group. We shall adopt this last definition of culture.

Ito and Nakakoyi (1996) show how culture can affect human–computer interaction. They divided human–computer interaction into two modes: listening mode in which people are presented with a computer's reactions, and speaking mode in which people give instructions to a computer system. Each of these modes is again divided into three phases, namely: perception, semantic association and logical reasoning. They show that logical reasoning followed by semantic association are greatly affected by culture. Fernandes (1995) concluded that iconic representations are problematic among different cultures. However, from what is happening in the computing industry, iconic representations will be with us for some time. This is buttressed by the fact that research is still being

carried out for easier generation of icons (Gennaro Costalgliola et al., 1999). Usability problems that can arise from cultural differences are mainly representational variations between cultures. Such variations can be found in colour, icons, character set, pictures, symbols, phrases/jargons, time format and abbreviations. These may vary between cultures due to factors such as language, taste and religion.

2. Aims and objectives

There are countries where the English language is used as the official language, but have their own local languages and varying cultures within the same country. Such countries are likely to have been colonised by the British. They might have also imbibed some of the culture of those who colonised them. The conceptual view of this situation is shown in Fig. 1 (adapted from Bourges-Waldegg and Scrivener (1998)).

The interface of the software being used in such communities is in the English language. In the environment under consideration which is depicted by Fig. 1, the English language is taught from primary school. Users therefore have no problems with character set, time format (if day/month/year is used), etc. As shown in Fig. 2, the effect of colour is comparatively small. We shall therefore not consider it and limit our investigations to commonly used phrases/jargon and icons.

The listening mode is greatly affected by culture. This is shown in Fig. 2 (adapted from Ito and Nakakoyi (1996)). As stated earlier, phases of understanding can be expanded to

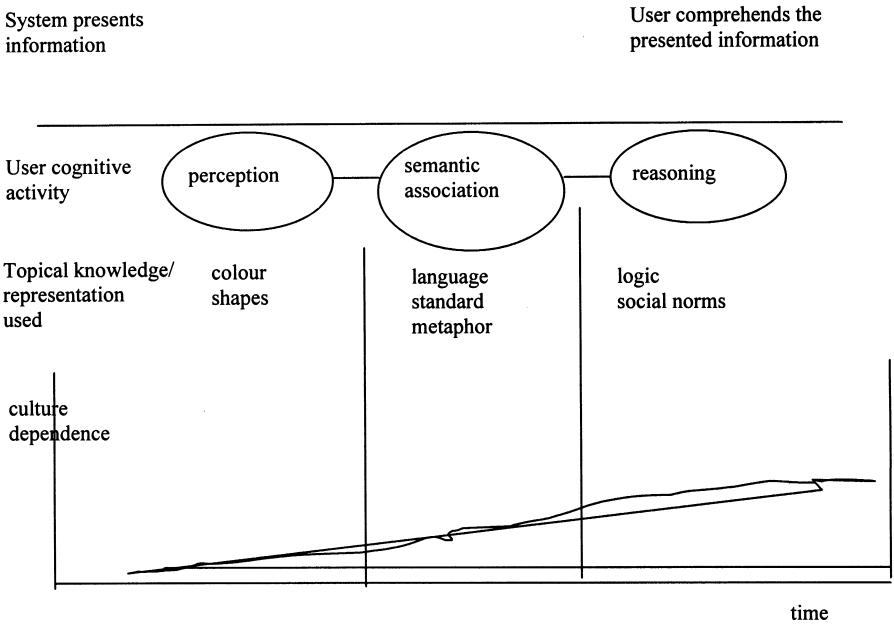


Fig. 2. Cultural impact in the listening mode.

perception, semantic association, and logical reasoning. Here we shall concentrate on the semantic association between representations and their underlying concepts. This is influenced by the choice of language, standards used and metaphors chosen and how they relate to phrases/jargon and icons used in the interface (Ito and Nakakoyi, 1996).

Our aim is to determine the effect of culture on the understanding of commonly used phrases/jargon and icons in such a multi-lingual and multi-cultural society. Our findings will obviously help in the design of a more usable interface in such a multi-cultural environment. We hope to answer questions such as:

- are local symbols more acceptable to users as icons?
- do users understand clearly the phrases/jargon currently commonly used?
- would users prefer a localised interface?

We shall use Botswana as an example of an English speaking country with many local cultures and languages (there are in excess of 14 ethnic groups). The two official languages of Botswana are Setswana and English, both being taught throughout school years.

3. Methodology

Software engineering investigations can be carried out in three ways namely:

(i) experimentations, which is research in a small scale in a controlled environment.
(ii) case studies, which is research in the typical.
(iii) surveys, for research in the large.

Since our investigations were to be nation-wide so as to cover all local languages, people with different levels of education and working in different organisations, we decided to use the option of a survey. A team of eight of us made up of four researchers and four research assistants mostly from the Department of Computer Science, University of Botswana, carried out a survey of 324 end-users over a two-month period in June/July 1999. The survey took the form of structured interviews conducted in the workplace and recorded onto a questionnaire (in English) by the interviewer. This approach was adopted to ensure an adequate and consistent response. Each interview lasted approximately 45 min. Almost all interviewers were Batswana[1] (approximately 3% of interviews were conducted by a non-Motswana).

The survey attempted to capture both quantitative and qualitative data covering

- the respondents themselves;
- their computer use (hardware, software, tasks);
- their computer training;
- the user support mechanisms available to them;
- their preferred interface style and features.

[1] A Botswana citizen is a Motswana (plural, Batswana).

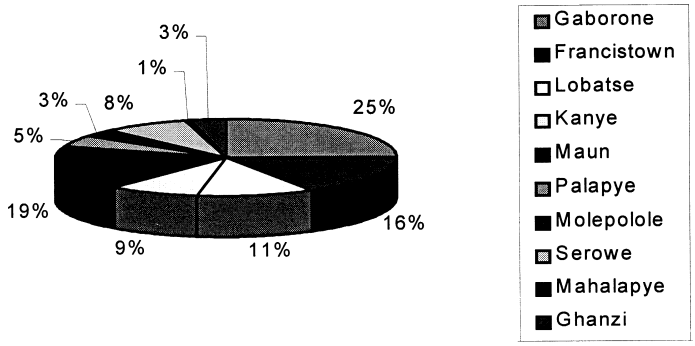


Fig. 3. Breakdown of respondents by location.

3.1. The process

The research team is multinational and multicultural, consisting of two Batswana, one Nigerian and one British National. Design of the questionnaire and survey sample involved the whole team. Four Batswana research assistants with computing experience (they are Computer Science undergraduates with an interest in Human–computer Interaction) were employed to conduct the interviews. This ensured that the respondents understood the questions and would be more open to discuss their opinions (in Setswana if they so wished). The research assistants also provided input into the icon design aspect of the questionnaire. This ensured a strong local input to the cultural aspects investigated in the survey. Target organisations were identified by the team and formally approached in writing (to the Head of the organisation/department). The organisations themselves then identified who they felt were suitable typical end-users.

3.2. The sample group

An attempt was made to obtain input from a cross-section of the Botswana community. The following categories were therefore considered when selecting respondents:

Gender: approximately 50% split by gender were selected.

Urban/Rural location: ten centres were selected to cover the diverse groups across the country. These were selected based on population spread, rural versus urban mix and cultural spread. Each centre was selected as a focal point for their area. Fig. 3 shows the breakdown.

Ethnic group: respondents were asked to identify the town they grew up. This was used as an indicator of their likely ethnic group.[2] By comparing the data received with a list of locations of main ethnic concentrations, it was possible to approximate that all ethnic

[2] There are 14 plus main ethnic groups in Botswana, each traditionally based in a particular part of the country. While it was felt contentious to ask respondents outright which group they belonged to, their main home town could be used to estimate their likely ethnic group.

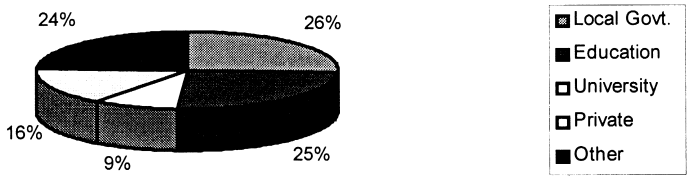


Fig. 4. Breakdown of respondents by type of organisation.

groups were covered in the sample. All those interviewed were from one ethnic group or another within Botswana and can speak Setswana.

Age: although as expected the vast majority (75%) of the sample fell in the age scale of 26–45 years, 19% of the sample were under 26 years and the remainder over 46 years.

Education level: the sample attempted to include users of all educational backgrounds. A fairly even spread was obtained (from Junior Secondary level through to Postgraduate) with a small percentage (less than 2%) of respondents only having Primary level education. The subject specialisms of graduates and postgraduates indicated a wide spectrum (some 66 subject areas identified).

Organisation: the sample covered users spread across private and public sectors, NGOs, education, and charities. This ensured that the experience and expectations of computer users from all sectors were represented. Fig. 4 shows details (note: "Other" encompasses charities, NGOs, community groups, etc).

Main area of work: as stated above, the organisations themselves identified the respondents who they felt were typical computer users. It was important to analyse the sample in terms of the functional role of the respondents to ensure adequate input from different types of users. Fig. 5 gives such a breakdown. As can be seen a reasonable spread of user groups was achieved.

3.3. Questionnaire design

A questionnaire to capture the desired data was designed by the research team. This consisted of 28 closed questions divided into four sections covering: (i) Background Information (about the respondent); (ii) Computer Use; (iii) Training and Support; and (iv) Interface Issues. Question formats for quantitative data were largely a mix of multiple choice and true/false answers. For capturing qualitative data, questions used ranked order lists, Lickert Scale forms, and multiple choice. Opportunity was also provided at the end for any additional comments.

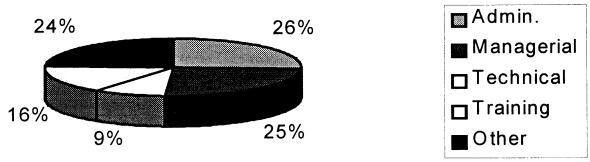


Fig. 5. Breakdown of respondents by main role in work.

The section covering Interface Issues is our main focus here. Essentially, this section was designed to capture data covering four User Interface categories. The nature of this data is qualitative since it draws on the user's subjective views and understanding.

Multiple choice questions asked the respondent for their *current preferred style of interface*. Rather than using descriptive terms (and HCI jargon) which may be confusing to the respondent, this was asked in the context of a typical task (the task chosen was "Saving some data").

Two further sets of questions were designed to determine the respondent's *semantic association with typical interface objects*. The first focused on *text-based* commands. Seven typical Windows tasks were selected. For each task, the respondent was presented with a one-word identifier for the activity (the standard Microsoft Windows name) together with a description of its meaning. They were asked to select from a list of optional text-based commands which one they felt *best represented* that activity.[3] The second question relating to semantic association followed similar lines but focused on *iconic representations* instead of text-based commands and listed eleven activities. The design of the options offered for each activity in both of these questions was heavily influenced by the Batswana members of the research team (and the research assistants), who suggested and rejected options based on the local culture. Two objects in particular in the iconic representation question contained images particular to Botswana in style. In all option lists for both questions, the standard Microsoft Windows choice was included. (Samples can be found in Appendix A.)

The fourth User Interface category concerned *user views on localised interfaces*. Using a Lickert Scale format, the respondent was asked whether they would like to use a localised interface (i.e. using a local language and/or local images). A further question specifically asked views about using the Setswana language instead of English when communicating using text based commands. Setswana is the official language of Botswana though there are several regional languages spoken.

After initial design, the questionnaire was piloted using a small sample of respondents based at the University. A few minor changes were made.

4. Analysis

After completion of the survey, all questionnaire data was coded for analysis using SPSS. Frequency tables were produced for all questions. A series of cross tabulations were also produced to address the questions posed in Section 2. Specifically, these analysed the data in terms of the categories listed in Section 3 above. These tables of data were then visually analysed by the research team and discussed.

In addition, research assistants went through a debriefing session (after interviews were completed) where their own general impressions were noted and discussed.

[3] Each menu of options included "Other" where they were asked to suggest their own command if they so wished.

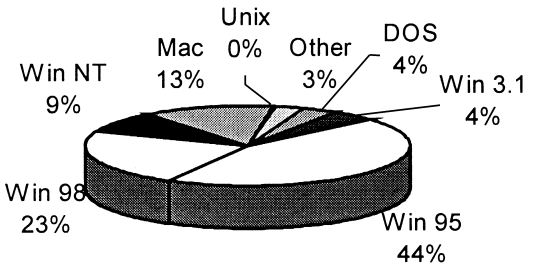


Fig. 6. Breakdown of main platform used.

5. Results

Some general points on computer usage are worth noting here first.

5.1. Computing experience

By far the most common platform in use among our sample is a PC with GUI. Fig. 6 shows the breakdown in detail. This indicates that 80% of respondents are using a Microsoft Windows interface. Even when asked what previous platforms have been used, only 10% reported MS DOS — all other respondents, either using another GUI or no other platform. This is further supported by the fact that more than 70% of respondents have been using computers regularly in their work for less than four years.

Of the software used, MSOffice is the popular choice with 72% of all respondents using Word, 59% using Excel and 26% using Access. Only 37% of respondents use the Internet and 38% use electronic mail.

5.2. User training

While 95% of respondents feel that computer training is necessary in order to effectively do their job, and some 84% reported they have received training of some sort, a breakdown

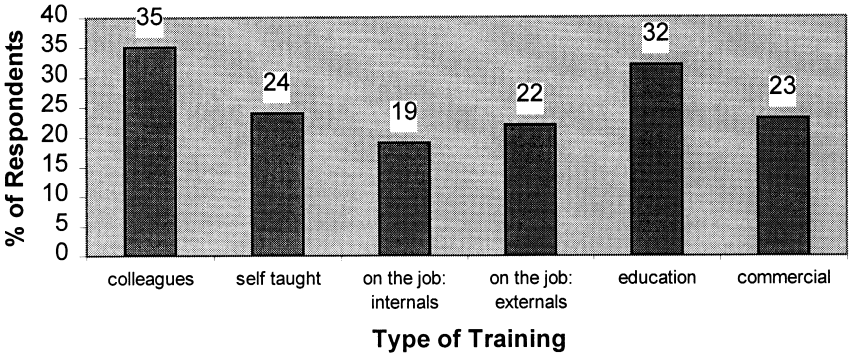


Fig. 7. Training received.

of the nature of that training indicates a reliance on non-formal training and previous education — see Fig. 7.

These results show that most users have only experienced a GUI, the vast majority using Microsoft Office. They recognise the importance of training in computer use yet have relied largely on colleagues and their formal education programs as the main source of training.

We will now look at the results concerning Interface issues.

5.3. Preferred style of interface

By far the most popular style of interaction appears to be using menus (57% of respondents) with ease of use cited as the reason by most of those. Using icons came second but is only favoured by 21% of respondents. This is rather surprising since HCI designers tend to prefer iconic representations.

5.4. Semantic association of text-based commands

Fig. 8 shows a summary of the results obtained for the seven objects listed in the question based on textual commands. The figure only shows the percentage of respondents who selected the "correct" or standard default command name.

Two of the terms used here, namely "Recycle Bin" and "Home Page" require some explanation since their meanings may not be obvious. Recycle Bin is where we keep files which we hope to finally delete from the computer. Such files can, however, be recalled if need be. On the other hand, Homepage stands for the first page of a website from where a user can gain access to all the items or information in the website.

Closer analysis of these results, shows some interesting points. The Refresh command shows a wide spread of choices, indicating a distinct lack of consensus as to its semantic interpretation. The favourite choice among women, for instance, is Restart (26%) while among men it is Redo (also 26%), neither of which is the standard default command name. Factors such as the platform used by the respondent, the type of organisation where they work, or even the fact that they have received training appear to make little difference. It seems this command is not well understood by all users.

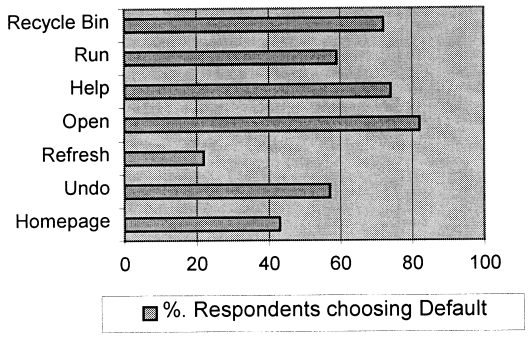


Fig. 8. Text-based commands.

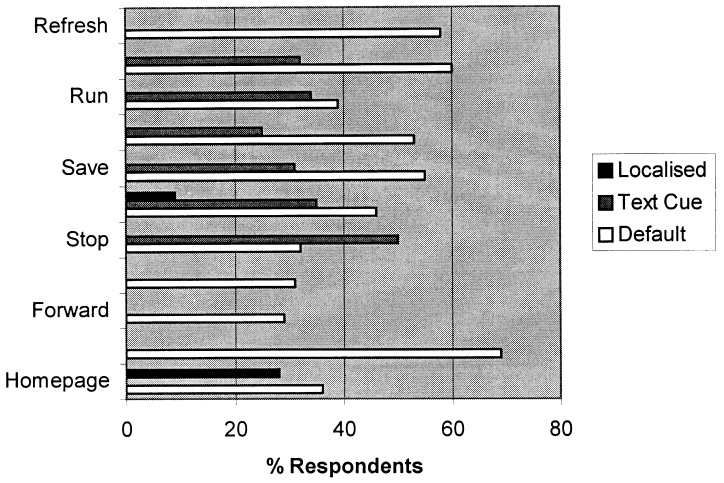


Fig. 9. Icon-based commands. Here we can see that only one iconic representation (Undo) achieved more than 60% confirmation from respondents.

The lack of significant consensus for Homepage (also spread across all options presented) is perhaps a reflection of the low Internet experience of most users.

5.5. Semantic association of icon-based commands

Analysis of the preferred icon representations for the eleven objects listed under the question addressing icons seems to indicate that most users choose either the default (or standard Microsoft Windows) iconic representation or a one containing textual cues. Again a summary of the results obtained for the objects in this question is shown in Fig. 9. As before, the percentage of respondents who selected the standard (default) representation is shown. Also shown are details of options chosen which contained textual cues, and for two of the activities (Homepage and Open) the results obtained for the "localised" option.

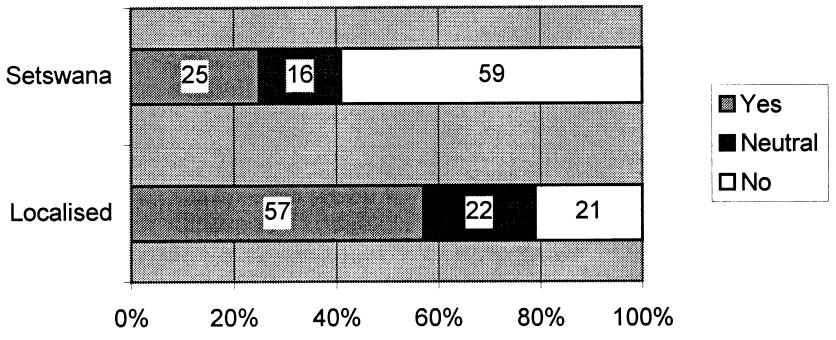


Fig. 10. Views on desirability of a localised interface and the use of Setswana.

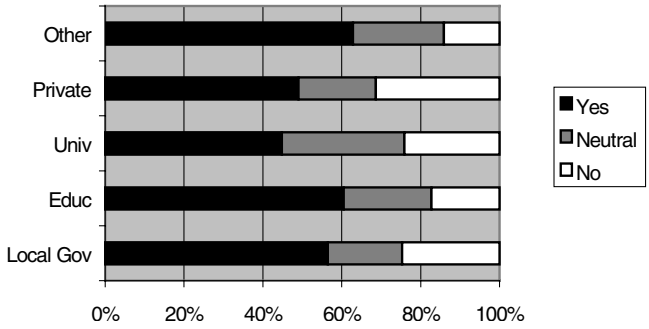


Fig. 11. Views on a localised interface by organisation.

These results indicate that localised icons are not necessarily popular with users. A closer analysis of the data indicates that generally gender makes no distinction other than for Homepage, where the localised icon (of a traditional Botswana house) was the most popular choice among women (52%). On comparing these results with the same objects in the text-based commands, respondents were generally less likely to pick the default icon if there was an alternative containing a textual cue. Interestingly, the Refresh icon appears not to have the same confusion as the text-based command (58% selecting the default icon as against 22% selecting the default text command). The iconic options presented for Refresh did not include any textual clues.

5.6. User views on localised interfaces

The results appear to indicate quite a contradiction over this issue. While 57% of respondents actively welcome a localised interface for Botswana, only 25% would like to use Setswana words for commands. Fig. 10 illustrates the strength of feeling on this issue.

On further analysis we find that while gender appears to have little or no impact on these views, other factors do. A breakdown by organisation type indicates that the private sector

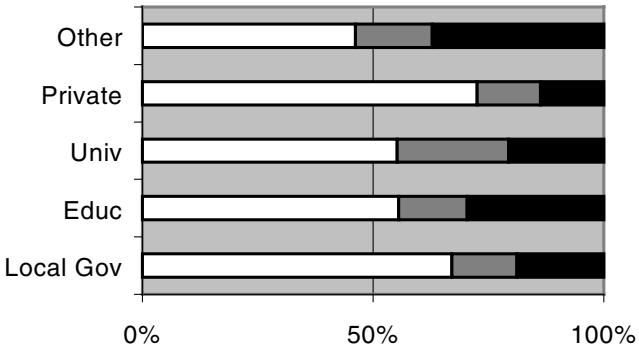


Fig. 12. Views on use of Setswana words by organisation.

organisations are less supportive of a localised interface of any kind, as indicated in Figs. 11 and 12.

Analysis among ethnic groups and locations also indicate that the more rural centres welcome a localised interface to a greater extent than the urban capital and in terms of using Setswana in particular, groups are more polarised in their views than other. For instance, respondents originating from the Francistown area appear more strongly against using Setswana than say those from Maun. The reason may be that in Francistown there is a language other than Setswana that is spoken by a large percent of the population, whereas in Maun no single alternative to Setswana is common to much of the population. Further research is required to obtain a deeper analysis of these findings.

6. Discussion

The findings regarding Interface Issues have revealed that the preferred style of interaction across users is using menus rather than buttons or hot keys. The fact that almost all users have used the technology for less than four years and have "grown up" with a GUI (Microsoft Windows, in fact) interface may lead one to expect that they would be more comfortable with using icons than text based menus. However, the findings concerning semantic association appears to indicate that users do not attach much semantic meaning to commonly used icons. They almost always seek cues to the icon's meaning via textual indicators. What can be the reasons for this language-based preference rather than to a graphical representation? Perhaps this is a cultural aspect of the Botswana community. As stated, these users have not had the history of familiarisation with common computing ideas and representations that users in other environments have had. For instance, the standard icon for Save is a graphic of a floppy disk — rather outdated in the present technological climate. In the west even novice computer users experience a very graphical environment in other aspects of life. Road signs, maps, interfaces to appliances are all rich in symbolic graphical representations. In the Botswana environment, technological development is relatively new to most communities and many individuals have not rehearsed their use to a great extent. This is an area to be investigated further.

The issue of the desirability of a localised interface has shown to be complex. The "loud voice" in favour of such an interface cannot go unnoticed, particularly from the more rural areas where perhaps English is not used to the same extent as in the urban centres. However, the poor response to localised icons used in the survey appears to contradict this view. One theory has been suggested that culturally in Botswana there is a clear distinction between the world of work and home life. (Perhaps this is reinforced by the point made above concerning the short history of exposure to technology experienced by most Batswana.) Inclusion of icons reflecting village culture therefore can appear unnatural and out of place in the work environment and fail in their intended semantic association.[4] What then is understood by users by the term "localised interface"?

[4] According to the criteria for "good" icon design suggested by Preece et al. (1994), semantic association may be poor for the HOME icon due to irrelevant context.

What aspects of Botswana life can lend themselves to metaphorical uses for interface design?

If the community prefers (or relies heavily on) language based interfaces, then the choice of language must be an important one. English is used in business in the country; Setswana is the official language, though several different languages are used by the population as a whole. The survey highlighted strong feelings on the issue of the choice of language. The question in the survey regarding using Setswana words was perhaps ambiguously worded. In retrospect it may have been better to ask for views on using the respondent's mother language instead of specifically naming Setswana since this issue proved to be contentious exposing local ethnic tensions. Again further investigation is required.

7. Conclusions

It has been shown that the user community in Botswana is more disposed to the use of menus and language-based interfaces. This is buttressed by the fact that they understand text-based commands better than icons.

It is also clear that locally motivated icons are not better understood or liked by the community who seem to prefer the currently used (default) icons. This is being associated with the idea that, at the place of work, users tune themselves to the work environment, where the context of "home" is not relevant. Although there is an overwhelming agreement on the desirability of a "local" interface, there is no agreement as to which local language to use. Even the nationally adopted local language is not acceptable to most users.

Although users have different local languages and cultures, the learning of the English language and its use in everyday life, have to a large extent subdued their cultural differences. There is a common platform for expression in their offices. The interpretation of icons used in interfaces is perhaps taken as part of learning how to use the new technology: the use of locally oriented icons does not come in. This corresponds with the ideas put forward by Searle (1995) that persons from cultures A and B may understand a representation in the same or similar ways if they both share context C. If we regard the English language and culture as our context C, this will obviously be common to all users.

Our sample included a wide range of users, including novices. However, we did not include those who have never used a computer at all. We have concentrated on people who have been using computers to know their disposition towards the current interfaces. A similar survey will need to be conducted for non-computer-users if we wish to determine the effect of rehearsed computer use has on users' views.

In conclusion, it appears from our findings that there is no need for localised icons. Perhaps as IT use expands beyond the office, more local culturally relevant contexts will emerge to form the basis of icon design. More work needs to be done to establish whether users prefer to use their different local languages for text-based interfaces rather than any one particular local language. It would also be interesting to establish whether these findings transfer to other multi-cultural and multi-lingual English-speaking countries,

since it may depend on how much the English (or American) culture has eroded the local cultures.

Acknowledgements

This research was funded by the University of Botswana.

Appendix A. Samples from the questionnaire

A.1. Semantic association of text-based commands

Question 26 was designed to determine how much the respondents associated command names with various common tasks. Seven activities were listed. Below shows a sample from this question:

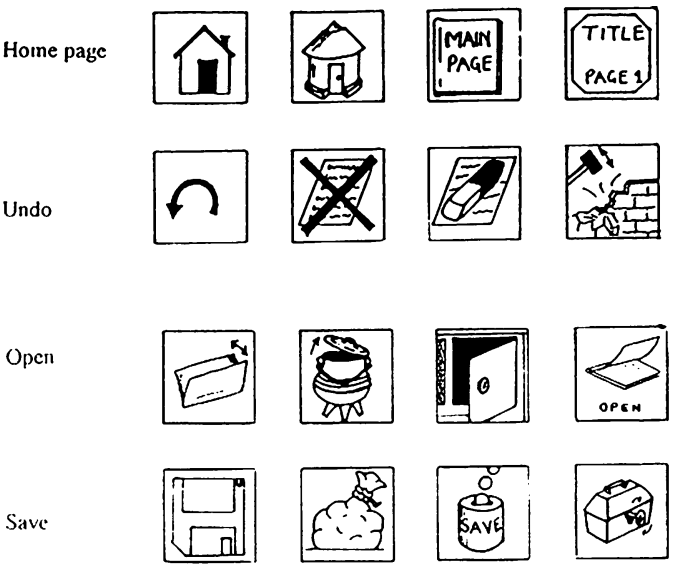
26. In the table below, for each object, indicate which of the commands offered best represents the activity described:

Object	Definition	Commands
		tick one
Homepage	In a Website, the first page that is opened is referred to as the homepage	Start page Home page Main page First page Other Specify
Undo	To cancel out the last task performed.	Undo Cancel Restreat a step Reverse Destroy last step Other Specify
Refresh	To repeat the last operation carried out. This becomes necessary when the last operation is not yielding the full results expected.	Repeat Refresh Restart Try again Redo Other Specify

A.2. Semantic association of icon-based commands

Question 27 was designed to determine how much the respondents associated icons with various common tasks. Eleven activities were listed. Below shows a sample from this question:

27. Based on your experience, for each of the following commands indicate which of the icons offered you feel best represents the activity described (if you don't know then make a guess based on your interpretation of the options given):



References

Berner, M.P., 1998. Cross-cultural Issues in Human–Computer Interaction From: www.students.uiuc.edu/~berner/ie393pjF98/ie393draft.htm.

Bourges-Waldegg, P., Scrivener, S.A.R., 1998. Meaning, the central issue in cross-cultural HCI design. Interacting with Computers 9 (3), 287–309.

El-Shinnawy, M., Vinze, A.S., 1997. Technology, culture and persuasiveness: a study of choice-shifts in group settings. International Journal of Human–Computer Studies 47 (3), 473–496.

Fernandes, T., 1995. Global Interface Design. Academic Press, London.

Costalgliola, Gennaro, Orefice, Sergio, Polese, Giuseppe, Tucci, Maurizio, Tortora, Genoveffa, 1999. International Journal of Human–Computer Studies 50 (5), 363–390.

Griffith, T.L., Olin, J.M., 1998. Cross-cultural and cognitive issues in the implementation of a new technology: focus on group support systems and Bulgaria. Interacting with Computers 9 (4), 431–447.

Ito, M., Nakakoyi, K., 1996. Impact of culture on user interface design. In: Galdo, E.M., Nielson, J. (Eds.). International User Interfaces. Wiley, New York, pp. 105–126.

Lif, Magnus, 1999. User Interface modelling-adding usability to use cases. International Journal of Human–Computer Studies 50 (3), 243–262.

Maguire, M.C., 1999. A review of user-interface design guidelines for public information kiosk systems. International Journal of Human–Computer Studies 50 (3).

Miller, L.C., 1994. Transborder tips and traps. Byte 19, 91–102.

Onibere, E.A., 1986. Writing Portable FORTRAN programs for Microcomputers. Software Practice and Experience, pp. 321–326

Onibere, E.A., 1981. Mathematical software for microcomputers. PhD thesis.

Portigal, S., 1997. Visual interaction design activity. SIGCHI Bulletin 29 (3), 00.

Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., Carey, T., 1994. Human–Computer Interaction. Addison-Wesley, Reading, MA.

Searle, J.R., 1995. The Construction of Social Reality. Penguin, London.

Yeo, A., Worldwide, C.H.I.:., 1996. Cultural user interfaces — a silver lining in cultural diversity. SIGCHI Bulletin 28 (3).