RESEARCH

Scoping the Availability of Software in Ethnic Minority Languages Within the United Kingdom

Global Consulting UK Ltd

department for
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The study, commissioned by the Department for Education and Skills (DfES), was undertaken by Global Consulting (UK) Ltd to establish the availability of software applications and web services in ethnic minority languages within the UK.

The study was undertaken by a team of researchers and consultants from Global Consulting (UK) Ltd. The work was carried out in consultation with the project manager Ann Claytor of DfES and with the advice and guidance of members of the Steering Committee for the DfES-funded programme of research and development in the area of ICT and ethnic minorities[1]. Past and present members of the Steering Committee who have contributed include:

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We thank all software and web service providers who extended their cooperation in providing us with the requested information.

[1] The programme of research comprises three projects:

Project 1. A large interview survey into the use of and attitudes towards ICT amongst minority ethnic groups.

Project 2. Good practice case studies of eleven community organisations successfully using ICT to help ethnic minority communities.

Project 3. Scoping the availability of software in ethnic minority languages.

EXECUTIVE SUMMARY

Introduction

1. This research was commissioned by the Department for Education and Skills (DfES) in March 2002 and was undertaken by Global Consulting (UK) Ltd. The research was carried out to establish the level of availability and usage of software and multi-lingual web services in ethnic minority languages within the UK.

Objective and Scope of the Study

2. The aim of the research was to:
    - Scope the availability of software in ethnic minority languages and multi-lingual web services within the UK
    - Identify the types of available software and web services and gaps in provision
    - Identify any hardware issues, which might affect utility of software and web services in practice

- Check the actual usage conditions and make preliminary comments on a selected subset of existing software and web services.

3. The scope of the project included paid as well as free software and web services.
   NOTE- The research did not include software applications that teach ethnic minority languages.

4. The research study covered the following sixteen ethnic minority languages: Bengali, Punjabi, Gujarati, Hindi, Urdu, Turkish, Arabic, Chinese/Cantonese, Akan (Ashanti), Tamil (India-Sri Lanka), Farsi (Persian), Vietnamese, Igbo (Nigeria), Tagalog (Filipino), Kurdish and Swahili.

   Data Source and Database

5. Data for the research study was obtained from the World Wide Web. Information on software applications and web services in the ethnic minority languages was also sought:
   - By posting queries in news groups
   - By writing to directory service providers of languages covered
   - From some of the major national community organisations working with those languages, wherever the available resources on the web were limited.
   - From the websites of software industry associations in countries where the ethnic minority languages are widely spoken.

6. Mailers with structured questionnaires were sent to software and web service providers, requesting additional information on their application or web service. Data gathered was subjected to series of checks to ensure accuracy and validity of information incorporated into the database.

7. A research database was established as a one-stop repository of data collected and analysed during the various stages of the research. Apart from providing a ready reference to all relevant links profiled by the researcher, the database also includes data in various languages submitted during the various stages of the project phases.

8. The relational and searchable database enabled users to search based on single or multiple parameters with the help of an interface developed solely for this purpose.

Research Methodology

9. Research was carried out in two phases. Phase I was restricted to identification and exploration of the nature of software and web services in the ethnic minority languages. The main aim was to scope the availability of software applications and web services in the ethnic minority languages. Phase II involved a more detailed analysis of short-listed software and web services to identify any hardware issues that might affect the utility of software and web services in practice.

Phase I

10. Search for and identification of web services and software applications: Internet-based searches were conducted to identify software applications and web services available in the ethnic minority languages. Searches were conducted by employing various combinations of keywords to obtain the relevant web sites with several search engines and iterations to ensure that all indexed websites were traced by the human intensive search process.

11. Classification of web services and software applications as relevant or irrelevant: Perusal of the web sites identified during the search process enabled their classification as relevant or irrelevant. Relevance of the web site was judged based on the terms of reference of the project specifications and guidelines set. This was done in an inclusive process of matching the context of the site to the broad terms of reference. So many sites in English without the ethnic minority language version were also put into the database. They were ultimately classified as irrelevant, as they did not meet the criteria of non-dependence in English language proficiency. Relevant web sites were subjected to further scrutiny and details were taken out from the website, under the next stage, which we called "profiling". The websites that were beyond the scope of the project were marked as "irrelevant" and stored in the database for review purposes.

12. Profiling of information obtained from the web services and software applications: Profiling involved capturing information pertaining to the identified web service and software applications. Information such as the nature and type of software

application or web service, technical specifications and provider information were captured in the database using an interface developed for this purpose.

Phase II

13. Based on the findings of Phase I, the Steering Committee wanted to ensure that there is indeed sufficient material for further analysis. From the database generated in Phase I, 10 software applications and 30 web services were short-listed for each of the ethnic minority languages for detailed study. However, three ethnic minority languages - Akan, Igbo, and Swahili were eliminated from moving on to this phase due to lack of development in ICT-based web resources as identified in Phase I of the study.

14. 'Detailed study' comprised of evaluating the software on General and Specific Evaluation criteria set by the Department for the study, focussing on aspects such as user-friendliness, hardware compatibility, accessibility options, etc. (Refer Tables 3.3 and 3.4 for the specific evaluation criteria set for each of the categories software and web services.) The evaluation of web services focused on aspects such as language relevance, user-friendliness, and accessibility options.

15. For evaluation purposes, software applications were either downloaded or procured from suppliers willing to provide an evaluation copy of the application in floppy disk or CD-ROM. They were then installed in the test computers with the Windows Operating System, a critical phase for software applications. Web service evaluation was carried out using a suitable browser interface. Some services needed pre-registration and it was done for those web services.

Summary of Findings - Phase I:

16. Though some of the sixteen ethnic minority languages were evidently well established in the web, others were not. This judgement was based on the number of links and websites found, which is only an indicator of the magnitude of resources available. The quality and nature of such resources for different languages were not assessed. Hence, the researchers had only attempted to provide their opinion with respect to the spread of the ethnic minority language in the Internet, based on their experience in searching and identifying relevant resources.

17. A web-based search for ICT resources on each of the ethnic minority languages revealed a good number of resources for Arabic, Hindi, Tamil, Chinese and Farsi. Languages such as Turkish, Bengali, Urdu, Punjabi and Gujarati were found to have moderate ICT resources in web. But Kurdish (4%) and to a greater extent African languages such as Akan, Igbo and Swahili (2% each) had lesser ICT resources. This was evident from the initial phases of the research.

18. The vastness of resources in Chinese and the ethnic minority languages of the Indian sub continent could be attributed to the fact that the number of people speaking these languages throughout the world is much higher than the rest. Studies reveal that the online users of Chinese and some of the Indian languages such as Hindi and Punjabi are growing at an exponential rate, contributing to the resource explosion in this medium.

19. As a general trend, it was observed that the number of web services offered in each of the languages exceeded the number of software applications made available in that language. A total of 2878 web services were identified as against 879 software applications across the ethnic minority languages, accounting for 76.6% of the total relevant links established. The software to web services ratio across the ethnic minority languages was greater than 1:3.

20. The Arabic language had the highest percentage (12%) of total identified web services followed by Tamil, Hindi, Chinese and Farsi in that order. Akan, Igbo and Swahili had the least (2%). Other ethnic minority languages were moderately represented.

21. In the case of identified software applications, Chinese, Arabic and a few of the Indian languages such as Hindi, Tamil and Bengali had a higher percentage than other ethnic minority languages. Akan and Igbo had lesser presence on the web with less than 1% of the total software identified.

Types of software applications identified

22. Word processors (21%) were found to be the most popular software developed in the ethnic minority languages, followed by Fonts (20.7%) and Translation software (11.6%). The three together accounted for 53.58% of the total software identified. The wide availability of word processors and fonts is probably because they are the most commonly used software for both individuals and corporations. In contrast

were applications like database tools, networking tools, and desktop publishing tools, which seem to have very limited presence in the web. The specialised nature of such applications and their focused target group may explain this. Often, they need to be customised to user requirements and are mostly used in businesses, and not by individuals. The technical knowledge required at the users' end in maintaining and handling these applications could be another explanation.

23. Analysis of the software applications identified shows that Chinese has the highest number. This seems to conform to the results of other independent studies, which indicate the growing resources for this language in the web, probably because. Chinese/Cantonese is one of the most widely spoken languages. To a lesser extent, the same can be said about Arabic, the languages of the Indian subcontinent and Farsi.

24. Word processors and Fonts, the two most popular software categories, were not so well represented in Akan, Igbo, Kurdish, Swahili, Turkish and Tagalog. The bulk of these were identified in Chinese and the languages of the Indian sub continent. Also more than half of the ethnic minority languages did not have any resources for the software categories of Database tools, Operating System and Software Development Tools.

Types of web services identified

25. Of the 2878 identified web services, 80% fell under the broad classification of non-interactive web services and the other 20% under interactive web services. Among the various categories in web services, 'Directories' were found to be the most popularly offered web service followed by 'News and Magazines', 'Entertainment' and 'Translation' in that order. The translation was done off-line and not offered as an interactive web service. Only simple words were translated from the ethnic minority language into English and vice-versa.

26. Directories, news/magazines and entertainment (all classified under non-interactive web service) accounted for 52.64% of the total web services identified. The fact that these non-interactive services can be easily developed and offered to the users may be seen as one of the reasons for their wider presence in the web. None of them require high-end inputs with respect to technical resource, making it convenient for the providers to offer these services. More specialised and interactive services such as Search engines, Chat and Discussion forums had

lesser presence in the web. Of 2878 web services, there were just 9 search engines (0.3%), 74 chat services (2.6%), 85 E-greetings (2.9%) and 87 discussion forums (3%). The fact that these services required a high-end technical resource could explain their low presence.

UK Presence of software and web service in the ethnic minority languages

27. The UK presence of software applications was based on the number of software providers who originated from the UK, or provided technical support in the UK, or those who have dealers or distributors based in the UK. 13% of the total software identified was found to have UK presence. Analysis of UK presence reveals some variance from this percentage. 25% of the Swahili software applications had UK presence and in case of Vietnamese, Punjabi and Urdu the percentages were 20%, 18.5% and 18.2% respectively. In sharp contrast, Akan and Igbo did not show UK presence. Others like Bengali, Hindi and Gujarati were found to have modest presence in the UK. Web services, on the other hand, having a global reach by virtue of their global network connectivity do not warrant the UK presence for their effective usability and support. Hence this aspect has been excluded, as it adds no additional value to the report.

Software Format

28. The study reveals that 39.4% of the software applications identified provided a download option in the site, of which 28.2% could be freely downloaded. The remaining 11.2% of this software could be downloaded upon payment. The bulk of the software identified in the research process (60.6%) did not provide download options. However, 31.6% of the non-downloadable software applications provided for online payment in which case the applications were delivered as CD-ROM or floppy disk or in any other format. 29% of the software applications could neither be downloaded nor purchased online. The websites in such cases provided only the information regarding the software applications.

Summary of Phase II findings:

Operating System

29. Most of the software applications in the ethnic minority languages were developed to work with the Windows operating system. Some printing-oriented applications were developed purely for the Macintosh Operating System. The bulk of the

software (87%) in the ethnic minority languages supports the Windows operating system, followed by Macintosh (8%) with other operating systems combined accounting for 5%. The study shows the domination of the Windows operating system over other operating systems.

Pre and Post installation issues identified

30. The process of downloading and installing software revealed grey areas that affect the use of software by ethnic minority groups. The key issue was that the dynamic nature of the web meant that web pages might be removed between searches. Poor maintenance and irregular updates by the provider also resulted in outdated and obsolete data existing in the web. Of the 134 software applications short-listed, such instances had been observed for 9. Another 10 software applications had to be skipped, as they did not support Windows. Thus, within the time frame of 10 weeks, only 115 software applications were taken-up for installation.

31. A detailed study carried out for the 115 software applications successfully downloaded, found 10 software items, which could not be tested due to ambiguous instructions, inadequate support documents, or OS compatibility problems.

32. Product support was evaluated through help and support documents for both software and interactive web services, but not for non-interactive web services, for which support is redundant. Most applications were accompanied by help documents, easing the process of use. Help documents were provided in either English or in the ethnic language. In a very few instances the help was in a language other than English or the Native language, usually that of the country of origin of the provider. Product support for web services were found for interactive web services such as E-mail and Chats where the user required higher technical knowledge and input for the efficient use of the service.

33. As font support was found to be commonly provided for software, it was only analysed for web services. Inbuilt font support whereby the user can view the page with no additional effort was common for interactive web services. Non-interactive web services such as Art and Culture, Entertainment, etc., provided a font download option, requiring the user to download the fonts to view the page. Some non-interactive web service providers used scanned images to present the text, mainly in 'News' and 'Art and Literature'. Here, the objective of the provider was merely to cater to the information requirement of the ethnic minority group.

However, Font support had minimal impact on languages such as Tagalog, Kurdish and Turkish whose text could be presented using English scripts. An interesting finding during the research was the absence of scripts (fonts) for the Akan and Igbo ethnic minority languages whose web pages were in English.

34. Software applications downloaded and evaluated were studied for their interoperability with other, primarily Microsoft, applications. The study revealed that more than three quarters of the applications evaluated lacked interoperability, and the applications that had it, did so by virtue of their Rich Text Format.

35. Three ease of use features were analysed. These were: an interface in the native language, a Phonetic keyboard layout, and a soft keyboard. Keyboard layout is a feature provided by a few software providers, where the application lacked a phonetic feature.

36. Findings from the study reveal that most software applications in ethnic minority languages provide an interface that has a blend of English with the ethnic minority language, requiring the user to have basic knowledge of English to use the application. Applications with a user interface purely in the ethnic minority language were few.

37. A phonetic keyboard layout was offered by a few of the software providers, wherein the keyboard layout appears as an on-screen reference providing the equivalent of the English alphabet in the ethnic minority language. Users practiced with the conventional English keyboard can refer to this layout to type text in the ethnic minority language. A phonetic keyboard feature was more prevalent in the software applications of Indian languages.

38. The soft-keyboard is an advanced feature wherein the provider offers the keyboard layout in the ethnic minority language with the application. This soft-keyboard is evoked with a primary key and the layout of the keyboard appears on the screen and can be used in a similar way like an external keyboard by clicking the letters with the mouse. This is a good option for those users who are not trained in ethnic minority language typewriting skills and where dual language keyboards are not available. This feature was found to be scarcely available.

39. Restrictions on downloaded software applications were analysed. Most applications were made available freely with no restrictions on the number of days of usage or

limitations in the features. For restricted software applications, the general practice was to offer the application for an evaluation period of 30 days after which time the application was made dysfunctional

40. Most interactive web services, such as E-mails and Discussion Forums, required registration. These registrations were free and used by most providers to keep track of their customer base. Interestingly, whilst 59 of the 73 web services that required registration used English as the medium, only 7 used the ethnic minority languages and another 7 carried the option to use both English and the ethnic minority languages.

General Observations

41. Unavailable software: Some of the software identified only existed on a web page as an outdated description, the software no longer being produced. 'Tango' software in Chinese was one such example.

42. Targeted software: Certain software had specific target groups that did not match the needs of the study and hence had to be sidelined. In one case, for example, the software in Arabic was specifically targeted at Arab countries and only supported the billing and charging methods of the telecommunications authorities in those countries. Software of this nature was eliminated from further analysis.

43. Software in English: Software currently provided in English with plans to develop for ethnic minority languages was identified during the initial phase of the research. ACE POS is one such application, where the provider plans to develop a Chinese version.

1. INTRODUCTION

Research Background

1.1. The Department for Education and Skills (DfES) (UK) commissioned Global Consulting (UK) Ltd. in March 2002, to carry out a survey to scope the availability of software in ethnic minority languages within the UK. The research aimed to establish the level of availability of software and multi-lingual web services in ethnic minority languages and their usage within the UK.

1.2. The scope of the research included:

- All software applications and web services that are commercially and freely marketed
- Multi-lingual web sites

1.3. The research covered the following sixteen ethnic minority languages:

1	Akan (Ashanti)	7	Hindi	13	Tamil (India-Sri Lanka)
2	Arabic	8	Igbo	14	Turkish
3	Bengali	9	Kurdish	15	Urdu
4	Chinese/Cantonese	10	Punjabi	16	Vietnamese
5	Farsi (Persian)	11	Swahili		
6	Gujarati	12	Tagalog		

1.4. The scope of the research excluded software intended to teach ethnic minority languages to people whose first language is English. Areas of particular interest included software applications and web services that would enhance educational or vocational learning, community participation, sports, cultural activities, etc.

ICT and Ethnic minorities within the UK

1.5. The UK is an English-speaking country, with small regions where the indigenous languages[2] are more or less as widely spoken as the first-language. However, a more realistic linguistic profile of the United Kingdom must take into account the large areas of the country where there are significant groups of people speaking non-indigenous minority languages. According to the 1991 census, ethnic minorities form about 6% of the population of the UK. In its quarterly Population Trends report (2001) the Office for National Statistics (ONS) estimated the number of people from minority ethnic groups in the UK had hit four million - 7% of the population - for the first time. Data collected by the ONS between 1992-1994 and 1997-1999 also revealed that the number of people from minority ethnic groups grew by 15% compared to 1% for white people.

1.6. A recent survey of London schools[3] revealed that more than 300 different languages were spoken by more than 850,000 children, making the capital the most linguistically diverse city in the world. Although English remains overwhelmingly the most common first language, for more than one third of these children it is not the language they speak or hear spoken at home. Linguistic diversity in London can be taken as a good indicator of the multilingualism existing in the UK, as information on other parts of the UK is more limited. However, it is generally agreed that settlers from the Indian subcontinent - and in particular Punjabi, Urdu, Gujarati and Bengali speakers - form the largest linguistic minority communities. The Chinese form another numerically important group, although - unlike the large south Asian communities - their patterns of settlement are more dispersed. Across the country, Cantonese as well as languages from the Indian subcontinent are widely spoken while others are more regionally concentrated, e.g. Kurdish and Turkish in London. While second and third-generation immigrants are largely proficient in English, having received their schooling in this country, new immigrants as well as older members of the immigrant communities - especially women - are often illiterate in English, even if they are long-term residents.

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[2] ♦ Indigenous languages include Irish, Welsh, etc., and do not refer to the ethnic minority languages identified for the research work.

[3] ♦ More information on the survey of London schools' can be obtained from http://www.britishcouncil.org/multilingualuk/who.htm

1.7. On the other hand, the ICT scenario in the UK as well as in the world shows an ever-increasing number of people accessing the Internet every day. Analysis from the leading Internet research company, Jupiter MMXI, reveals that between April and June 2001, over 33 million Britons used the Internet. Though the analysis does not examine the languages of the Internet use, this information suggests that considerable number of the UK population are now looking towards the Internet to meet their varied information requirements.

1.8. Research by the marketing communications consulting company, Global Reach, provides information on the spread of various languages in the web. The research reveals that the language most heavily represented online is English (68.4% of the web content being presented in this language) followed by Chinese, Japanese, German, and Spanish (in that order). Chinese accounts for 3.9% of the total content in the World Wide Web. More recently ethnic minority languages such as Arabic, Urdu, Hindi, Punjabi and Gujarati are making their mark in this sector. African languages such as Swahili, Akan, and Igbo etc. are yet to make their mark as little data on these languages can be found in the study, indicating their insignificant presence in the web.

1.9. For the world's "major" languages the availability of software applications and web services, including database tools, fonts, online dictionaries, thesauri, and so on, steadily increases. But there remains a vast gap as regards less widely used languages. Not only these kinds of products, but even simple tools like spelling and grammar checkers, and even word-processing applications are missing.

1.10. An attempt is made by the researchers here to provide a bird's eye view of the software and web services available and their pattern of availability to the ethnic minority groups within the UK.

2. SOFTWARE AND WEB SERVICES DEFINITION

Definition of web service

2.1. The term "web services," as broadly applied, has two levels of meaning: specific and conceptual.

- Specifically, web services are a stack of emerging standards that describe service-oriented, component-based application architecture.
- Conceptually, web services represent a model in which discrete tasks within e-business processes are distributed widely throughout a value net.

DfES PAT 15 Project 3: Web service Definition

2.2. Given the scope of the project, the definition of web services is to be taken at a much lower technical level. Within this project, web services are to be found in the public domain (the Internet), where users can get and exchange the required information and do online transactions using B2B or e-commerce technology.

2.3. Unlike software applications, web services need not be downloaded as they can be accessed online. Web services were broadly classified into two, for the purpose of the research as:

- Interactive services
- Non-interactive services (Information provider and Directories)

2.4. Mails, Chat, Translation, Discussion forums, E-commerce, etc., fall under interactive web services, enabling users to interact and exchange information or transact online (See Table 3.2). Mostly the Internet contains web pages that are passive and just provide information on various topics such as news, health, religion, sports, culture, art and literature. Users can only read the content available in such sites. These are classified as non-interactive web services for the purposes of research. Similarly, websites related to Directories or Portals provide information on various topics of interest to the users. Directories have also been classified under non-interactive services. The web

service may be either a free service or a paid service, for which the users have to register with the site providers.

Definition of Software

2.5. "Software" is a general term for the various kinds of programs used to operate computers and related devices. It can be thought of as the variable part of a computer. Software is often divided into application software and system software.

2.6. Application software is software that performs a specific task or function, such as word-processing, creation of spreadsheets, generation of graphics, facilitating electronic mail, etc. System software is software that controls the computer and runs the application. System programs include operating systems, database managers, drivers, communications and messaging protocols, basic input/output systems, etc.

DfES PAT 15 Project 3: Software Definition

2.7. Given the scope of the research, the definition of software has been limited to that of the application software definition as given above. As application software caters to the end user requirements, it has been considered to fit well within the aim of the study. These software items have been broadly sub-classified into various categories based on the functionalities made available by them to the users (see Table 3.1). System software requires high-level technical orientation for its deployment and use. Considering the scope and limitations of the research, software applications of this nature have been deliberately excluded from the detailed study. However, software tools that support or function in tandem with the system software have been profiled.

3. DATA SOURCE AND FRAMEWORK OF ANALYSIS

Data Source

3.1. The key focus of the research was to scope the availability of software and web services made available to the ethnic minority groups within the UK and to identify the issues that affected the utility of the same. To achieve these objectives, an Internet-based search was conducted using a combination of keywords in various search engines. Information from the web formed the single largest source of information for the research study.

3.2. Queries posted in news groups were another source of information. News groups are a common means of sharing topic-related information on the Internet. Google is the major international news group provider. Queries were posted in Google news groups of all languages requesting members to provide information on software and web services known to them in the respective ethnic minority languages. 26 responses were received, the maximum response being received for Gujarati. Though few relevant links were obtained from the responses, most of them pointed to links that had been already identified by the researchers.

3.3. Electronic mailers were sent to software industry associations and major national community organisations requesting software and web service details used by them or information on providers of such services known to them. Eight community organisations and 12 software associations across the ethnic minority languages were identified for the purpose. Mailers were sent to them. Two associations namely, Turkiye Bilisim Dernegi (Turkish Information Technology Association) and Organisation for Promoting Igbo Language & Culture Abroad (OPILCA) responded. Both these associations, however, had little contribution to make to the research study. A list of software providers obtained from a Vietnamese software association site called www.vietsoftonline.com provided valuable inputs with regard to information on Vietnamese software products and web services. The information provided in the websites of associations and community organisations across ethnic minority languages was outdated resulting in incorrect mail ids being posted.

Eight of the total 20 mails sent bounced and no response was received from the rest.

3.4. Data from the providers of software and web services were directly sought through an electronic survey. The respondents, consisting mainly of the providers and dealers of software, gave information that helped to obtain a clearer perspective on the software and web services in the ethnic minority languages. A total of 1203 electronic mails were sent to software providers and dealers, seeking information and details regarding their application or web service. The mailing exercise received lukewarm response from the providers with a response rate of 11.14 percent. Here again the research team encountered problems of incorrect mail ids and other technical snags such as server problems resulting in around 12 percent of the mails getting bounced. No response was obtained from the rest of the providers. It may be noted that the response has been fairly good where the software providers are actively involved in selling their products. This was true of software providers developing products in more than one ethnic minority language identified for the research work.

Framework of Analysis

3.5. The research was broken down into two distinct phases. Phase I focussed on the identification of software and web services and Phase II provided a more detailed study of short-listed software and web service. The framework of analysis provides the key focus points employed by the researchers to arrive at the research findings.

Spread and depth of ethnic minority languages in the World Wide Web

3.6. Spread and depth of the ethnic minority languages was based on the following parameters:

- The number of links displayed by the search on keywords
- The number of total links
- The number of links profiled by the researcher for the language

UK presence of the ethnic minority languages

3.7. The origin of the software or web service provider was captured during profiling of the web page. Software applications were considered to have UK presence if they met one of the following criteria:

- Software applications where the UK was the origin of the provider
- Software having a distribution or supply network within the UK but the origin was a country other than the UK (i.e. distributors and resellers of the software in the UK)
- Software providing technical support facilities to the residents of the UK.

3.8. For web services, the indicators varied due to their worldwide presence in the public domain. The need for technical support or distribution (as all online web services were available to the users free of charge there is no necessity to have a local presence for billing and collection of fees) is not applicable for web services and hence a UK presence adds no particular value other than making the content or service more appropriate to the UK ethnic minorities. Given the scope of the project, there was no intent to measure the applicability and relevance of the web service (including simple content pages) even if the web service had a UK presence.

The Nature of software or web service made available in the ethnic minority languages

3.9. To identify the types of software and web services provided in the ethnic minority languages, the researcher created a set of categories under software and web services. Initial categorisation was based on an independent study conducted by the researchers to identify the popular software applications and web services provided in the ethnic minority languages. Further categories were subsequently added as and when applications and web services were identified that did not fall into any of the initial set of categories. A separate category called 'Others' was created to incorporate all software and web services that were unique. Software and web services profiled by the researcher were appropriately classified into the categories created.

Table 3.1: Software categories created for the research study

Category	Includes
Accounting Software	Software that caters to the accounting requirements of corporations and individuals
Computer Peripheral Interface	All language-based computer input device drivers and interfaces
Database Tools	Software that helps to maintain databases (records). All Management Information System tools, Customer Relation Management Tools and other such applications
Desktop publishing	Software that enable users to work with patterns, graphics, designs, motifs, figures, etc.
Fonts	A set of printable or displayable text characters in a specific style and size.
Multimedia	All software applications that are enhanced with audio and video features
Office Utilities	Software with features such as Spreadsheets, Presentation tools, scheduler, etc., and add on tools to Microsoft Office
Operating System	The main control program of a computer that schedules tasks, manages storage, and handles communication with peripherals.
Software development Tools	Software that helps to develop applications and programs for any particular minority language.
Translation Software	Software that helps to translate documents from one language to another.
Web based Tools	Software that helps in the development of web applications such as e-mail servers, chat servers and e-commerce applications.
Word Editor	Software for editing documents of a particular format in an ethnic minority language - example of this in English is the HTML editor.
Word Processor	Software for creating and editing documents, e-mail, etc.
Others	Any software, which is unique and peculiar that cannot be classified under any other category

Table 3.2: Web service categories created for the research study

Category	Description
Interactive Web Services	
E-Mail	Services that enable users to send information, files, graphics from one computer to another using the internet or the intranet.
Chat	An online service that provides a venue for communities of users with a common interest to communicate in real time
Discussion Forums	Web based services that allow users to post messages but don't have the capacity for interactive messaging
E-Greetings	Web based services using which people can send greetings
Translation/Interpretation Service	Services that use a computer program to translate input text from one national language to another. Interpretation refers to the spoken language, and translation to the written language.
Non-Interactive Web Services	
Art/Literature	All services pertaining to various forms of art, poetry, novels, etc.
Healthcare	Services that provide information about healthcare
Directory	Web pages that provide listing of similar services as a one-stop reference. For example, a web page providing a list of search engines, books, dictionaries, portals, etc.
News/Magazine	Online newspapers/magazines, articles providing news such as sports news, etc.
Culture/Customs	Information related to culture; customs, religion, etc., of the ethnic minority language
Entertainment	Articles related to music, Internet radio, jokes, movies, etc.
Search Engine	A service that searches the web for documents with specified keywords and returns a list of the documents where the keywords were found.
Others	Associations, Astrological Magazines, Astrology, Books, E-mail Notifications, HTML Writers, Lexicon - Translation, News Letters, Online Shopping, Recipes, Restaurants - UK, Services for the Physically Challenged, and UK Public Service - Employment.

Hardware issues

3.10. To identify the hardware issues that affected the use of the software or web service in practice, a detailed study of 10 software applications and 30 web services from each of the ethnic minority languages was carried out.

3.11. An evaluation report was prepared based on General Evaluation Criteria and Specific Evaluation Criteria set for each category of software application and web service by the researcher. Tables 3.3 and 3.4 provide the specific evaluation criteria set for each category of software application and web service. Evaluation of software and web services based on the set criteria enabled the researchers to spot areas of trouble and issues that could have an impact on the smooth use of these products and services. General evaluation criteria refer to those aspects of the research study that were common to all software or web services and were captured with the aim of obtaining a general understanding of the software/web service available in the ethnic minority language. Specific evaluation criteria are 'a more specific study' of the software product/web service, aimed at capturing the usability and applicability of software/web service short-listed. These vary for each category of software product/web service.

3.12. General Evaluation Criteria – Software:

- System requirements
- Operating system compatibility (Windows 95/98/2K)
- Product support from manufacturers
- UK presence and relevance
- Whether bilingual (English and minority language) or not
- Response to mailers
- Information on products, in the website
- If there is any evaluation version
- Current version and installed client base
- User-friendliness
- Free, buying online or CD
- Printer Compatibility

3.13. General Evaluation Criteria - Web service:

- System requirements
- Font support
- User-friendliness
- Browser compatibility
- Mode of service (free or paid)

Table 3.3: Specific Evaluation Criteria for Software Applications

Specific Evaluating Criteria (SEC)	Why we propose these SEC?
1) Accounting Software • Export and import of data into globally accepted file formats • Feature for date wise viewing of transaction • Invoice generation • The capacity of the software to deliver reports in popular office applications like any spreadsheet • Ability of the software to keep accounts for multiple companies	• Additional processing facilitated. • Important for auditing purposes and error corrections. • Needed for small businesses • To share reports with others who may not have the same software • One application installed in a PC can be shared by multiple businesses
2) Database Tools • Support of Databases (example Oracle, MS access, SQL) • Software languages and components on which the tool is built • Security settings and integrity issues • Database size limits • Interoperability with other applications	• Target user who would benefit • Support availability • Crucial features of a database • For long term usage • Helps integration needs at a later date
3) Office Utilities • File formats supported • Fonts supported • Interoperability with other applications	• For receiving and sending files to others • For printing and on-screen legibility • Coexist with normal usage of PC
4) Translation Software • 2-way translation (example English - Hindi - English) • Relevance of content upon translation • Font support • Multiple input and output formats (input as a file and supported formats) • Number of words and phrases covered	• Important feature for conversion into English by typing own language • Subjective criteria • Useful information
5) Word Processor/Word Editor/ Desktop publishing • User-friendliness • Unique features like spell check and thesaurus • Font support • Support for any popular e-mail client • Interoperability with other applications (for example. importing of pictures from other applications)	• Specific instances would be highlighted

Table 3.4: Specific Evaluation Criteria for web service categories

Web service	Specific Evaluation Criteria
Chat	• Customisation of chat rooms • Conferencing facility (video/audio) • Save options
Discussion forum	• Number of topics covered • Moderated / Non moderated • Options to add topics
E-mail	• Mail box space • Additional features (Attachments, address books) • Secured socket layer support (security check) • Session availability (security check) • Third party mail client support • Formatted Text support • Secured password encryption • Virus protection
E-Greetings	• Additional features (animated effects)
Translation services	• Dialects supported • Phonetic translation • Key board support • Online or offline service
Art/Literature **Culture/Customs** **Education** **Entertainment** **Healthcare** **News/Magazine**	• Accessibility options (features for physically challenged) • UK presence and relevance • Dynamism (frequency of updates).

Impact of software and web services in issues of disability

3.14. To perceive the impact of software and web services in issues of disability, information on software or web services catering to specific requirements of people with disability were studied. The software developed primarily to better their experience while working on computers is either provided as an additional feature with other software or made available as tools for the specific purpose, e.g. the provision of audio features for the visually disabled. Though these features were not widely observed, and not separately categorised, the researchers have noted whenever such applications were made available as an additional feature enabling the use of the software for the disabled.

4. RESEARCH ANALYSIS - PHASE I

Identifying Software and Web Services

4.1. Websites were identified based on the Internet search results as shown by popular search engines. All Top Level Domains (TLD) and the Country Level Domains (CLD) were taken up for analysing and classifying unique websites. In addition to this, all the sub links within the main URL were also included for the above purpose. In other words, even when the link was pointing to a new site or domain or to different pages, all individual pages, as displayed in the search result, were considered as unique links and processed. The validity of the search result could be decided only after opening the page and going through the content. However, the same page was not processed more than once, even if it was displayed many times by the search engines. The search engines used in the research are listed in Table 4.1.A.

Table 4.1.A: List of Search Engines

AltaVista	http://www.altavista.com/
AOL Search	http://search.aol.com/
Ask Jeeves	http://www.askjeeves.com/
Google	http://www.google.com/
GoTo	http://www.goto.com/
HotBot	http://www.hotbot.com
Lycos	http://www.lycos.com
MSN Search	http://search.msn.com/
WebCrawler	http://www.webcrawler.com
Open Directory	http://dmoz.org/
Language-specific Search Engines	
For Akan, Igbo and Swahili	
Africa Online	http://www.africaonline.com/
Ananzi South Africa	http://www.ananzi.co.za/
Siftthru.com	http://www.siftthru.com/
Zebra	http://www.zebra.co.za/
WoYaa	http://www.woyaa.com/

For Arabic	
Ayna	http://www.ayna.com/
Naseej	http://www.naseej.com/
Ajeeb	http://arabic.ajeeb.com/
Fares	http://dir.fares.net/
Pluckie	http://www.pluckie.com/Top/World/Arabic
For Hindi	
Webdunia	http://www.webdunia.com/
For Tamil	
TamilSearch	http://www.tamilsearch.net/

4.2. Table 4.1.B represents the total number of links and the number of relevant links (web-pages) identified for each of the ethnic minority languages. Total links are the number of web pages identified by the researcher as a result of a series of search queries provided in the various search engines. Several keywords and combinations of keywords were adopted to obtain as many relevant search results as possible. In all, 12468 links were perused by the researchers to arrive at 3757 relevant links, which where further classified as 2878 web services and 879 software applications. The number of links identified for each of the languages is not a proportionate representation of the spread of ethnic minority languages in the web. But it can be taken as an indicator to gauge the presence and spread of the language on the web. Thus, we could assume that languages showing good numbers of relevant links such as Chinese, Arabic, Hindi, and Tamil have a web presence that is noticeably higher than languages such as Akan, Igbo and Swahili.

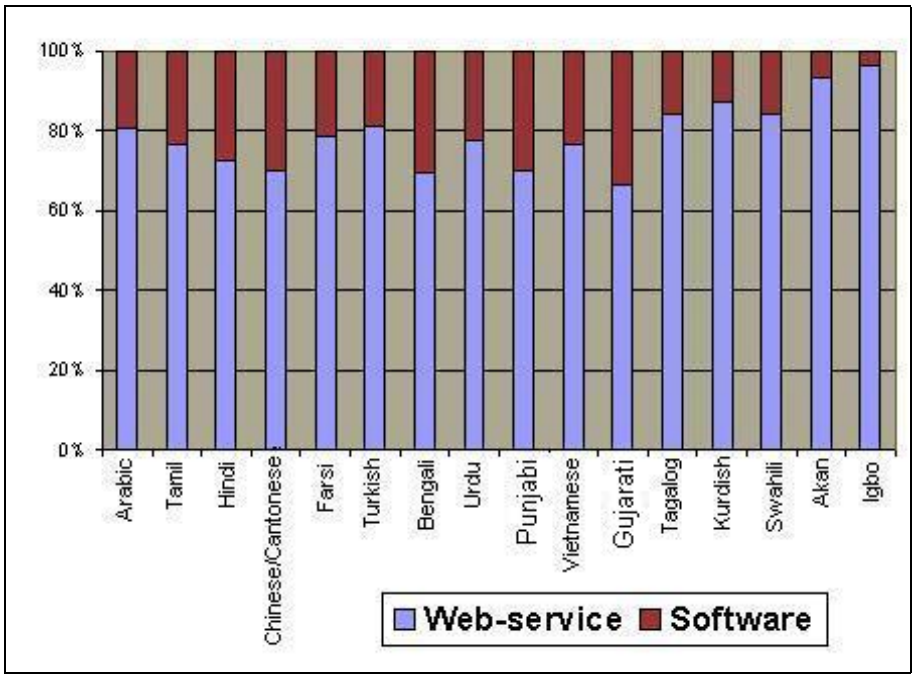
4.3. 30% of the total links (web-pages) identified were found to be relevant links falling within the scope of the research. The other 70%, being irrelevant to the study, were not further processed. Of the 3757 relevant links, 76.6% were classified as web services and 23.4% as software in accordance with the definition agreed upon for the research. The percentage distribution of software and web services indicates a distinct domination of web services over software in the web across ethnic minority languages.

Table 4.1.B: Links Identified

Languages	Total	Relevant	Irrelevant	Web service	Software
Akan (Ashanti)	136	61	75	57	4
Arabic	1047	431	616	347	84
Bengali	817	264	553	184	80
Chinese/ Cantonese	1164	356	808	249	107
Farsi (Persian)	939	302	637	238	64
Gujarati	935	209	726	139	70
Hindi	1040	357	683	259	98
Igbo (Nigeria)	305	54	251	52	2
Kurdish	679	147	532	128	19
Punjabi	975	217	758	152	65
Swahili	221	77	144	65	12
Tagalog (Filipino)	625	152	473	128	24
Tamil (India - Sri Lanka)	1127	395	732	302	93
Turkish	661	275	386	223	52
Urdu	921	245	676	190	55
Vietnamese	876	215	661	165	50
Total	**12468**	**3757**	**8711**	**2878**	**879**

4.4. Figure 4.1 reveals the differences in the number of web services and software identified in each of the ethnic minority languages. In all cases there were more links identified as web services than software applications in the language.

Figure 4.1: Percentage of software and web service links identified in the ethnic minority languages



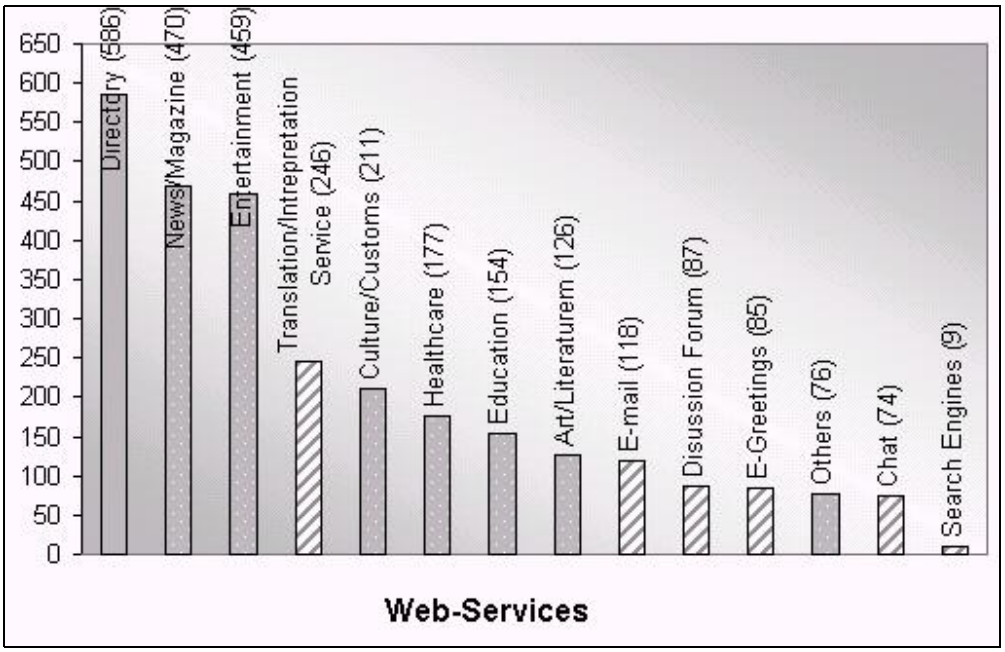
Type and nature of Web services Identified

4.5. Table 4.2 shows the web services identified across ethnic minority languages broken down by language and category. As with the total relevant links, the number of web services is greatest for Chinese, Arabic and the languages of the Asian sub-continent. The ethnic minority languages of Akan, Swahili and Igbo were observed to have poor resources in the web throughout the research. Figure 4.2 represents the breakdown of web services identified by category across ethnic minority languages.

Table 4.2: Breakdown of web services identified by language and category

Category	Bengali	Punjabi	Gujarati	Arabic	Akan	Tamil	Farsi	Igbo	Hindi	Urdu	Vietnamese	Chinese	Turkish	Tagalog	Swahili	Kurdish	Total
Non-Interactive Services																	
Directory	21	34	30	58	2	66	39	1	66	44	31	66	54	21	16	37	**586**
News/ Magazine	40	13	11	114	0	58	52	0	30	49	26	27	25	10	5	10	**470**
Entertainment	31	29	26	32	1	87	50	0	55	17	32	13	21	21	5	39	**459**
Culture/ Customs	10	7	6	25	39	14	4	25	12	5	5	12	17	15	8	7	**211**
Healthcare	19	20	21	15	0	8	4	5	26	18	6	14	9	2	4	6	**177**
Education	3	2	4	17	3	5	17	10	8	4	6	27	13	16	10	9	**154**
Art/Literature	10	4	4	6	7	21	10	9	8	17	11	4	2	7	3	3	**126**
Interactive Services																	
Translation/ Interpretation	18	23	15	27	4	11	16	2	23	15	14	24	24	13	8	9	**246**
E-mail	12	6	9	15	0	11	16	0	12	2	3	13	14	3	0	2	**118**
Discussion Forum	0	0	0	12	0	4	6	0	2	0	16	21	14	5	4	3	**87**
E-Greetings	11	8	7	10	0	6	7	0	5	8	4	8	10	1	0	0	**85**
Chat	3	2	2	8	0	5	7	0	4	1	6	12	17	6	0	1	**74**
Search Engine	0	0	0	3	0	0	1	0	2	0	0	2	1	0	0	0	**9**
Others																	
Others	6	4	4	5	1	6	9	0	6	10	5	6	2	8	2	2	**76**
Total	**184**	**152**	**139**	**347**	**57**	**302**	**238**	**52**	**259**	**190**	**165**	**249**	**223**	**128**	**65**	**128**	**2878**

Figure 4.2: Breakdown of web service by category



[1] Bars shaded in grey represent non-interactive web services and stripes represent interactive web services.

4.6. Of the 2878 total web services identified, 20% were interactive web services and 80% non-interactive services. Non-interactive web services consist of web pages that provide information and do not require the participation of the user.

4.7. The most popular category of web services (inclusive of both interactive and non-interactive) offered across the ethnic minority languages is 'Directory'. These Directories accounted for 20.4% of the total web services identified, followed by, News and Magazines (16.3%), and Entertainment (15.9%) in that order. All three of these are non-interactive services and together comprise 52.6% of the web-based services identified. Translation and interpretation services form the next most popular service across ethnic minority languages as well as being the most widely offered interactive web service.

4.8. Interactive Web services require interaction from users. The number of such services existing in the web cannot be directly linked with the number of users of such services. As the number of services provided to some extent will reflect the activity and dynamism of these services in the web, it seems plausible to

suggest that the services made available on the web would increase in direct proportion to the increase in users. Translation services were identified as the most available interactive web service, followed by Email, Discussion forum, E-greetings and Chat.

Type and nature of software applications identified

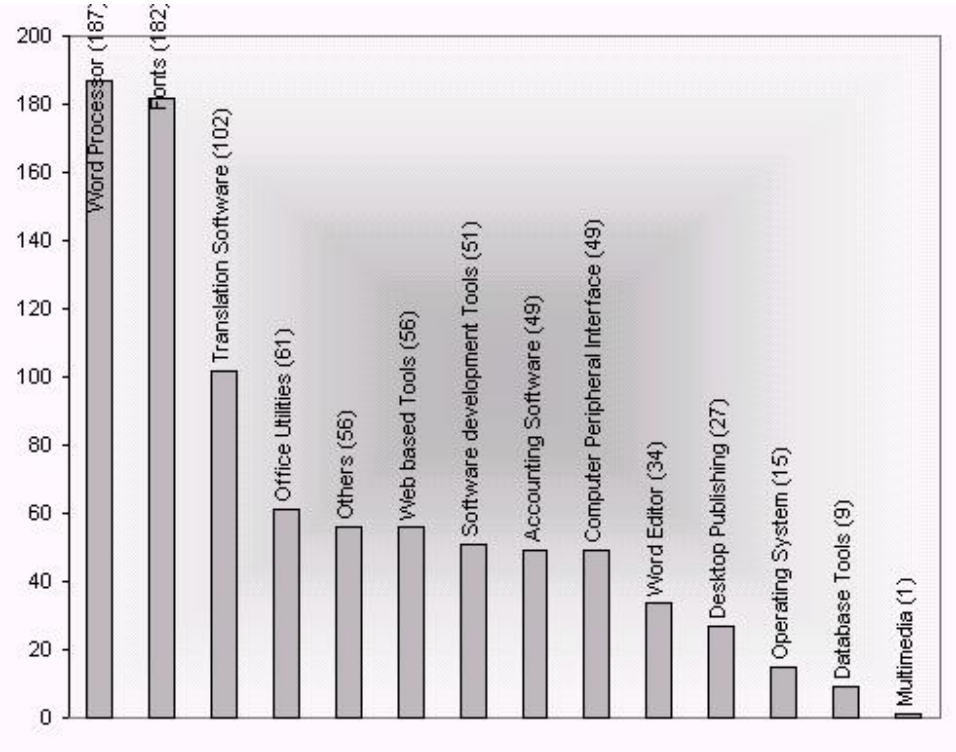
4.9. During the research study 879 software applications were identified, which accounted for approximately 24% of the total relevant links. The software applications were categorised according to the nature and functionality they provided. A breakdown of software applications identified by language and category is shown in Table 4.3.

Table 4.3: Breakdown of software identified by language and category

Category	Bengali	Punjabi	Gujarati	Arabic	Akan	Tamil	Farsi	Igbo	Hindi	Urdu	Vietnamese	Chinese	Turkish	Kurdish	Swahili	Tagalog	Total
Accounting Software	4	4	6	9	0	7	3	0	9	0	1	4	2	0	0	0	**49**
Computer Peripheral Interface	4	2	3	4	0	7	0	0	7	1	5	9	5	2	0	0	**49**
Database Tools	1	1	1	2	0	1	3	0	0	0	0	0	0	0	0	0	**9**
Desktop Publishing	3	2	2	3	0	2	0	0	2	4	0	9	0	0	0	0	**27**
Fonts	16	16	11	15	2	22	14	2	21	8	19	14	6	6	2	8	**182**
Multimedia	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**
Office Utilities	4	4	4	4	0	9	2	0	5	6	3	12	4	2	2	0	**61**
Operating System	0	0	0	4	1	0	4	0	0	1	0	1	4	0	0	0	**15**
Others	4	2	3	8	0	3	2	0	5	0	1	15	6	2	3	2	**56**
Software development Tools	10	8	9	0	0	10	0	0	10	1	1	2	0	0	0	0	**51**
Translation Software	3	0	1	15	0	5	9	0	10	1	12	16	15	1	3	11	**102**
Web based Tools	4	4	3	2	0	6	5	0	5	8	2	13	2	0	1	1	**56**
Word Editor	6	2	4	1	0	4	5	0	5	4	2	1	0	0	0	0	**34**
Word Processor	21	20	23	17	1	17	17	0	19	21	4	10	8	6	1	2	**187**
Total	**80**	**65**	**70**	**84**	**4**	**93**	**64**	**2**	**98**	**55**	**50**	**107**	**52**	**19**	**12**	**24**	**879**

4.10. The number of software applications identified in each of the categories is shown in Figure 4.3. 'Word processor' is the largest category followed by fonts and translation software. These three categories together accounted for 53.6% of total software identified.

Figure 4.3: Breakdown of software by category



Software format

4.11. To establish the ease of procuring and installing the software, information on the following topics was captured.

Four major classifications were made for the purpose:

- Software that can be freely downloaded and installed by the user directly from the site.
- Software that can be downloaded on payment. This may include fully functional versions of the software or evaluation versions provided on trial basis.

- Software that is not downloadable (available offline) but can be purchased online.
- Software that is not downloadable (available offline) and needs to be purchased offline.

A breakdown by language of software made available online is shown in Table 4.4.A and graphically represented in Figure 4.4.

4.12. 28.2% of the software identified can be freely downloaded to the user's local PC. The software in this case may be a fully functional version, a curtailed version or an evaluation version offered to the user for a fixed period of time. These software applications are provided free of cost and not commercially marketed.

4.13. 11.2% of the sites provide software that can be downloaded upon payment. The software version provided in these sites may be the fully functional version or the evaluation version. The user in this case needs to contact the provider either through email or submit the form provided in the site for this purpose. Evaluation copies may be procured either as CD-ROM, downloadable links, or through File Transfer Protocol (FTP)—used in the Internet for sending files, from one device to another.

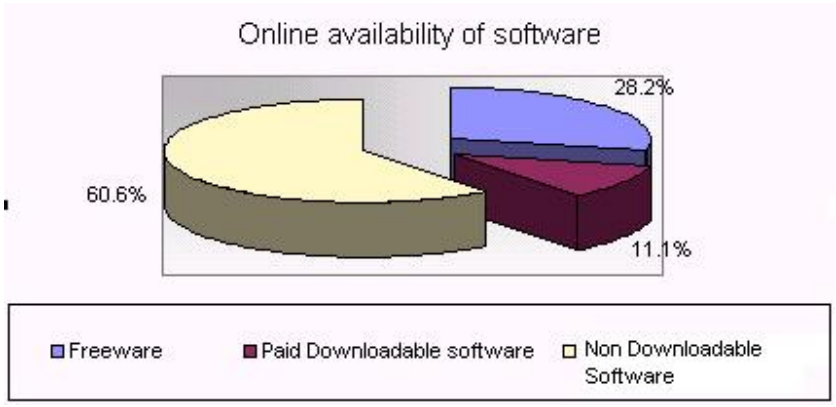
4.14. 60.6% of software identified in the first phase of the study had no downloadable option. The software applications in this case were to be procured either on a CD-ROM or a floppy disk or in any other format agreed upon by the two parties. Of the non-downloadable software applications, 29% had an online purchase option enabling the customer to make online payment.

4.15. 31.6% of the software applications could neither be downloaded nor had the option of online purchase, requiring the customer to contact the provider for the software. The transactions between the provider and the customer are to be carried out offline and the web is used only as a source of providing information on the software.

Table 4.4.A: Online availability of software identified in the 16 ethnic minority languages (downloadable as against non-downloadable)

Language	Downloadable			Non-Downloadable		
	Free ware	Paid Software	Total	Online sales	Offline sales	Total
Akan (Ashanti)	0	0	0	0	4	4
Arabic	17	10	27	32	25	57
Bengali	27	9	36	16	28	44
Chinese/ Cantonese	26	11	37	49	21	70
Farsi (Persian)	21	2	23	25	16	41
Gujarati	13	13	26	17	27	44
Hindi	37	13	50	18	30	48
Igbo (Nigeria)	0	0	0	1	1	2
Kurdish	7	2	9	9	1	10
Punjabi	16	7	23	15	27	42
Swahili	0	2	2	8	2	10
Tagalog (Filipino)	6	1	7	13	4	17
Tamil (India - Sri Lanka)	27	12	39	12	42	54
Turkish	12	10	22	22	8	30
Urdu	19	2	21	22	12	34
Vietnamese	20	4	24	19	7	26
Total	248	98	**346**	278	255	**533**

Figure 4.4: Percentage distribution of software made available online



4.16. Table 4.4.B represents the breakdown of software made available online by category. Noticeable is the number of software applications that are freely downloadable in the category of 'Word editor' and 'Fonts'. Of the 34 word editors and 182 fonts identified, 73% of word editors and 55% of fonts can be freely downloaded from the site. However, Database tools, Desktop publishing and Software Development tools have negligible percentages (0%, 7.4% and 9.8% respectively) of freely downloadable software.

Table 4.4.B: Breakdown of downloadable software applications identified across the ethnic minority languages by category

Category	Software Identified	Downloadable	Percentage Downloadable
Accounting Software	49	17	34.7
Computer Peripheral Interface	49	16	32.7
Database Tools	9	0	0.0
Desktop Publishing	27	2	7.4
Fonts	182	100	54.9
Multimedia	1	1	100.0
Office Utilities	61	9	14.8
Operating System	15	3	20.0
Others	56	26	46.4
Software development Tools	51	5	9.8
Translation Software	102	33	32.4
Web based Tools	56	28	50.0
Word Editor	34	25	73.5
Word Processor	187	81	43.3
Total	879	346	39.4

UK presence of software

4.17. To establish the availability of software within the UK for ethnic minority languages, a study based on the origin of the software was carried out. The aim was to obtain an understanding of the support that would be available for the ethnic minority language for the ICT applications identified. The basis upon which software is said to have a UK presence is described in paragraph 3.7 under 'Framework of Analysis'.

4.18. Of the 879 total software links identified, 117 were found to have UK presence. Breakdown of the UK presence of software by language is shown in Table 4.5. A cross-sectional view across the ethnic minority languages reveals that Vietnamese provides UK support for 10 of its 55 software applications identified in the web, making it the ethnic minority language providing the maximum UK support, followed by Punjabi, Urdu, Gujarati and Hindi. Though Chinese was found to have the maximum number of identified software applications, only 5% of it had UK presence.

4.19. Web services have the inherent advantage of being accessible almost anywhere at all times. Presence of these services in the public domain does away with the requirement of setting up offices and dealerships or support teams across countries. Hence, we have not evaluated the UK presence, as it was found to add no value to the research.

Table 4.5: UK presence of software identified

Languages	Software with UK presence	Total software applications identified
Akan	0	4
Arabic	10	84
Bengali	12	80
Chinese/ Cantonese	6	107
Farsi (Persian)	5	64
Gujarati	12	70
Hindi	16	98
Igbo (Nigeria)	0	2
Kurdish	2	19
Punjabi	12	65
Swahili	3	12
Tagalog (Filipino)	4	24
Tamil (India - Sri Lanka)	6	93
Turkish	9	52
Urdu	10	55
Vietnamese	10	50
Total	**117**	**879**

5. RESEARCH ANALYSIS - PHASE II

5.1. The central tasks in Phase II of the analysis of software and web service were to identify grey areas in the use of software and web services, and to identify gaps in provision. To achieve these purposes, a sample of ten software applications and thirty web services in each of the ethnic minority languages was short-listed and evaluated. Breakdown by category of software and web services evaluated in the ethnic minority languages is shown in Tables 5.1.A and 5.1.B respectively. Detailed study of the short-listed software enabled us to spot trouble areas and common hitches that a user may face on installation of the software. We also analysed patterns of availability of software and issues affecting the download and installation of software and web service in practice.

5.2. Issues affecting the smooth use of the software are discussed in this chapter under the following headings:

- Operating System
- Issues affecting use of software and web service
- Issues affecting download and installation of software and web service
- General Analysis
- Accessibility options

Table 5.1.A: Breakdown by category of software evaluated across ethnic minority languages

Category	Arabic	Bengali	Chinese	Farsi	Gujarati	Hindi	Kurdish	Punjabi	Tamil	Turkish	Urdu	Vietnamese	Total
Accounting	1				2	1							**4**
Computer Peripherals	2	2	2		3	5	1	1	2	1		3	**22**
Desk Top Publishing											1		**1**
Fonts	2	1		1	2	3	2	2	3	1	1		**18**
Office Utilities				1	1			2	2				**6**
Others	1		2			1		1	2			1	**8**
Translation				1					1				**2**
Web based Tools								1			2		**3**
Word Editor				3		1			2		1	1	**8**
Word Processor	2	8	2	4	5	4	2	4	5	3	4		**43**
Total	**8**	**11**	**6**	**10**	**13**	**15**	**5**	**11**	**17**	**5**	**9**	**5**	**115**

Table 5.1.B: Breakdown by category of web services evaluated across ethnic minority languages

Category	Arabic	Bengali	Chinese	Farsi	Gujarati	Hindi	Kurdish	Punjabi	Swahili	Tagalog	Tamil	Turkish	Urdu	Vietnamese	Total
Chat	2	1	1	1	2	2	1	2		3		2	1	1	**19**
Culture and Customs	3	1	2			2	3	1		2	2		1	1	**18**
Discussion forum	2			3		2	2		1	6	2	1		5	**24**
Education	3	1	1	1	1	1		1			2		1		**12**
E-greeting	5	1	5	2	3	2	1	5		1	4	4	1	3	**37**
Email	5	7	2	5	5	4	2	4		2	3	2	3	2	**46**
Entertainment	2	3	2	5	4	5	5	3		1	5	2		5	**42**
Healthcare	3	2	5	1	2	5	1	1			4	2	4	3	**33**
Literature	1	5	2	3	3	3	2	6		3	6	1	6	1	**42**
Magazine		4		2				3		1	2		1		**13**
News	6	4	6	7	6	6	3	3	1	2	7	7	9	5	**72**
Portal		1	4		5	1	1	2		4	1	4	4	4	**31**
Search Engine	2					1									**3**
Total	**34**	**30**	**30**	**30**	**31**	**34**	**21**	**31**	**2**	**25**	**38**	**25**	**31**	**30**	**392**

Operating System

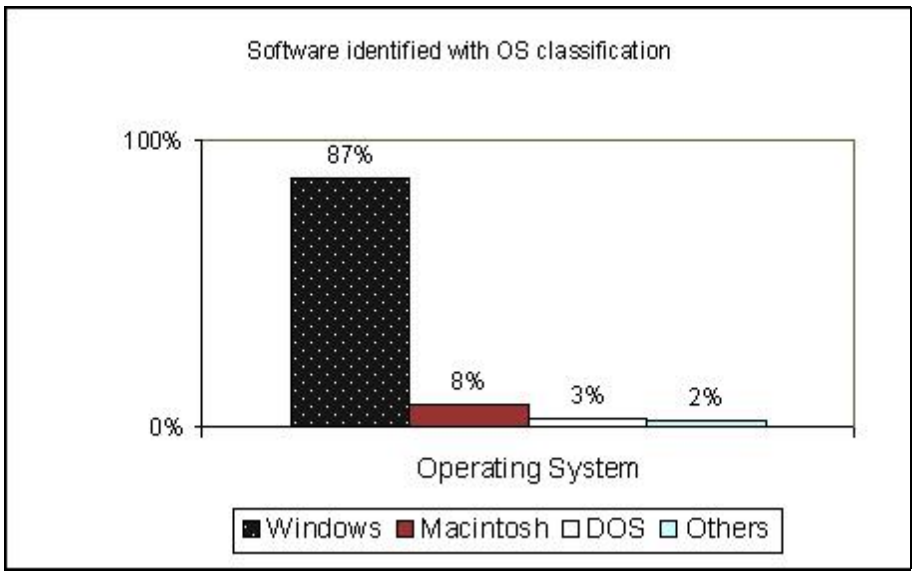
5.3. To identify the patterns of availability of software with regard to technical specification in ethnic minority languages, it was classified according to the operating system that supported the software. 812 software applications (87%) supported the Windows operating system. 74 (8%) supported the Macintosh OS, 31(3.3%) MS DOS, 9 (0.09%) Unix and 11 (1.1%) other operating systems. Table 5.2.A breaks down the software applications by language and operating system. Some software applications were found to be compatible with more than one operating system.

5.4. A clear indication of the domination of Windows-based software in the ethnic minority languages over other operating systems is shown in Figure 5.1. The strong network of technical support established across the world may be considered as one of the reasons for the dominance of Windows as an operating system.

Table 5.2.A – Software breakdown by operating system

Ethnic minority language	Number of software	Windows	Macintosh	DOS	Unix	Others	Total
Akan	4	4	1	0	0	0	5
Arabic	84	77	9	2	0	1	89
Bengali	80	77	4	4	2	0	87
Chinese	107	102	4	2	0	1	109
Farsi	64	59	7	1	0	0	67
Gujarati	70	68	7	3	1	0	79
Hindi	98	86	10	4	1	1	102
Igbo	2	2	0	1	0	0	3
Kurdish	19	19	1	5	0	0	25
Punjabi	65	59	6	1	0	0	66
Swahili	12	11	2	0	0	0	13
Tagalog	24	21	4	1	0	1	27
Tamil	93	89	8	3	3	0	103
Turkish	52	42	5	2	2	5	56
Urdu	55	52	2	1	0	0	55
Vietnamese	50	44	4	1	0	2	51
Total	879	812	74	31	9	11	

Figure 5.1: Percentage distribution of software identified by operating system



5.5. System Requirements: Windows is the most commonly used platform for software applications across ethnic minority languages. So the most commonly used versions of Windows were further analysed. The system requirement of the software was captured only in cases where it was categorically displayed in the site. 479 software applications had no information about the system requirement in their web sites. Among other software applications, Windows 95 was found to be the most popular version followed by Windows 98 and NT versions. Very little software works in Windows 3.1 version—the oldest version of Windows, and in XP—the latest version of Windows. Processor requirements of the software in the ethnic minority languages were studied during the evaluation phase where the system requirement information was made available in greater detail. More than 50% of the evaluated software applications used Pentium processors. Breakdown of software by version of Windows OS is shown in Table 5.2.B.

5.6. System requirements in the case of web services offered across ethnic minority languages focussed on browser compatibility. The picture here portrays a wide usage of Internet Explorer - the browser from the Microsoft stable. Services requiring Java enabled browsers or Netscape Navigator for efficient navigation were very limited in number, accounting for not more than 5% of the total web services identified.

Table 5.2.B: Breakdown of software by version of Windows OS

Language	Windows	Windows 3.1	Windows 95	Windows 98	Windows 2000	Windows Me	Windows XP	Windows NT	Information not Provided
Akan (Ashanti)	1	0	0	0	0	0	0	0	2
Arabic	2	6	24	22	7	2	2	14	48
Bengali	2	8	24	22	8	4	1	14	47
Chinese	6	9	42	42	22	21	11	23	49
Farsi (Persian)	0	7	19	18	5	1	1	10	38
Gujarati	3	5	21	19	6	6		12	39
Hindi	3	7	25	24	9	5	2	13	59
Igbo (Nigeria)	0	0	0	0	0	0	0	0	1
Kurdish	1	1	9	8	3	2	3	3	9
Punjabi	1	4	14	14	4	3		8	40
Swahili	0	1	8	8	3	0	1	3	2
Tagalog (Filipino)	1	3	6	6	3	0	1	5	11
Tamil (India - Sri Lanka)	4	6	21	18	6	4	0	11	60
Turkish	0	6	23	21	10	4	7	14	13
Urdu	2	4	15	13	5	3	2	5	31
Vietnamese	0	5	12	11	6	55	3	7	30
Total	26	72	263	246	97	110	34	142	479

Issues affecting installation and use of software in ethnic minority languages

5.7. Issues highlighted in the following paragraphs are those faced by the researchers during the evaluation process. As the evaluation had been restricted to 115 software applications and 392 web services, out of the total 879 applications and 2575 web services identified, the issues covered are not exhaustive. Given the range of users and context of use, it is likely that similar issues will be faced by the users. We have attempted to offer an outline of the major issues that are likely to be encountered during attempts to download and install software or use web services.

5.8. The reader should note that the percentages given here are based on the sample software and web service evaluated and may not match the trend in the World Wide Web.

5.9. Ten software applications and thirty web services in each ethnic minority languages were studied in detail for problems (Akan, Igbo and Swahili offered insufficient resources). General Evaluation Criteria and Specific Evaluation Criteria were set as guidelines to direct the evaluation process. The focus was on key factors such as user-friendliness, accessibility options and product support.

5.10. The issues were categorised under two main headings, namely, Pre-installation issues (download issues) and Post-installation issues (evaluation issues). Download issues are trouble areas that are likely to be faced by the users while attempting to download and set up the software in their system. Evaluation issues are those which affect the smooth running of the software after having been successfully installed.

5.11. Of the 134 software applications filtered for detailed study, 115 were successfully downloaded and 105 were successfully evaluated based on the general and specific evaluation criteria. A few short-listed software items were subsequently eliminated because of incompatibility with Windows. The following paragraphs describe the types and probable cause of errors. In cases where the cause of error is not definite, the evaluators have suggested the most likely cause(s) for the same.

Figures 5.2 and 5.3 represent the percentage of successful evaluation as against the evaluation failures logged and the type of error.

Figure 5.2: Percentage proportion of successful evaluation as against evaluation failure due to pre and post installation errors.

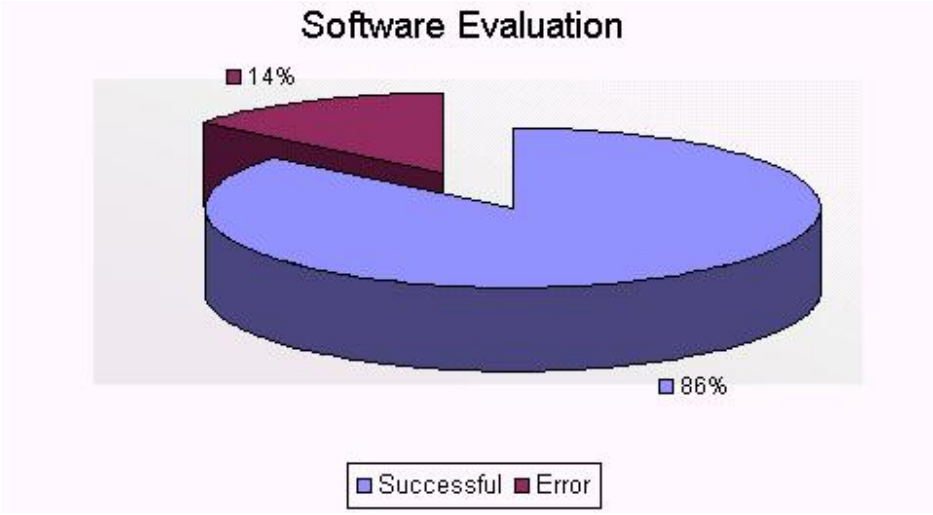
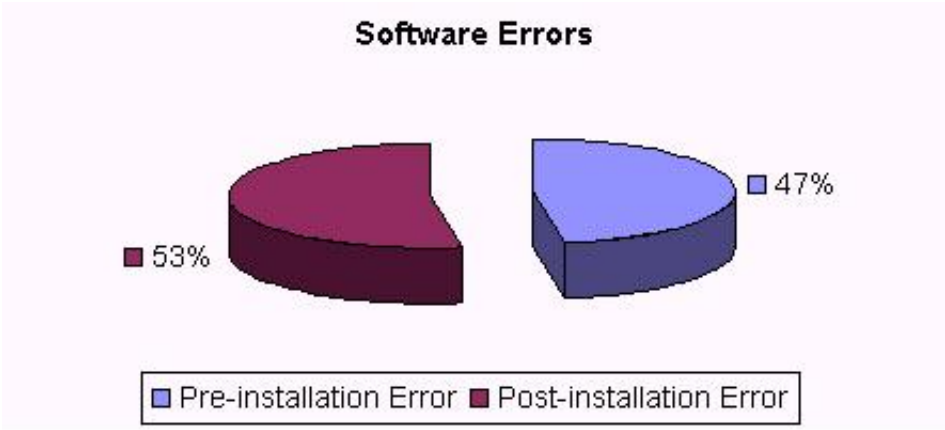


Figure 5.3: Percentage distribution of the type of errors identified



Issues affecting download or installation of software applications and web services in ethnic minority languages

5.12. Upon downloading the software, applications generated 47% of the errors. These were accordingly classified as Pre-installation issues.

5.13. Many errors occurred due to the dynamic nature of the web. Web sites providing software download links captured during the identification phase of the research no longer existed when revisited during the evaluation phase. The web links in such cases were missing or had moved to another location, resulting in messages such as 'page not found' and 'file not found'. The links were also found to be replaced with fresh ones in cases where the software was listed in the site not by the provider but by the dealer or retailer. These software applications are hosted for a period as agreed between the site manager and the provider, after which time the link may or may not continue.

5.14. 'Time out' errors were another commonly faced message while downloading the software. These errors occur mostly when the Internet traffic is high resulting in slow connectivity or when the file size is huge. Though this error is not within the providers' control and is an external variable, it is nevertheless a problem users may face. Software applications giving these errors were subsequently downloaded after repeated attempts.

Issues affecting use of software or web service in ethnic minority languages - Post-installation issues

5.15. Issues affecting the smooth evaluation process of the software upon download have been classified under this category. Troubleshooting in certain instances enabled evaluators to rectify some of these errors and in other cases clarification was sought from the providers. 53% of the errors logged were of this nature. 10 out of 115 downloaded software applications were disqualified from the list of evaluated software as a result of issues faced by the researchers.

5.16. Key evaluation issues were ambiguous or absent instruction manuals, non-existence of help manuals and the lack of supporting files. All these were classified as Product Support issues. Other issues were Font Support,

Interoperability of software, presence of salient features such as provision of interface in the ethnic minority language, 'soft keyboard' etc., and restrictions in the evaluation copy of the software.

Product Support

5.17. Software procured and installed by the user requires support material especially for a first-time user with moderate skills in information technologies. Product support was incorporated in the evaluation as a key feature to establish the level of support, gauged in terms of help manuals, instruction documents, FAQs and other such material offered by the provider. Product support was found to be an important issue. This feature has been discussed with respect to 88 software applications evaluated, discounting the software category of 'fonts', which do not require detailed product support. Product support for web services is limited to interactive web services such as chat and e-mail services.

5.18. Product support for the software evaluated has been ranked, based on the following three categories:

- Good Product support - Applications were considered to have good product support where FAQs, help manuals, instruction manuals, etc were provided in English as well as in the ethnic minority language.
- Average product Support - Where the instruction manuals were made available only in one language (English or the ethnic minority language)
- No product support - no support documents were provided or they were made available in a language other than the ethnic minority language or English.

The researchers used their discretion in cases where the support documents were provided but were ambiguous and lacked clarity.

5.19. It was observed that of all software evaluated, none provided good product support in terms of making available the FAQs, help manuals and other support materials in both English and the ethnic minority language. The support materials were found to exist in only one of the languages.

5.20. Most of the software is accompanied by support documents in either English or the ethnic minority language, English being the more popular language used for the purpose. Of the 88 software applications evaluated (discounting software

such as 'fonts'), 73 were found to have help files in English and 8 in the ethnic minority language.

5.21. Most support documents were made available in software to guide the user through its functions. However, a small percentage of software applications lacked support in the form of help documents. A few instances where help manuals were provided in languages other than English or the ethnic minority language, were also classified as lacking support. The rationale here was that, it is unlikely for a user residing in the UK to benefit from help manuals provided in a third language for a service or application in an ethnic minority language. Such instances occur when the provider is not in an English-speaking country or a country where the ethnic minority language is widely spoken. For example, support documents in French were found to exist for software in ethnic minority languages developed in France. Seven software applications were found to have no product support.

5.22. Product support for web services was only relevant for interactive ones such as E-mail, Chat, Discussion forums and E-greetings. This support was more prevalent for E-mails and Chat interactive services that required higher technical understanding of the service compared to other services.

5.23. Support for Fonts facilitates the process of operating the application in the ethnic minority language. Though font support was found commonly in all software, its presence in web services was more restricted. This issue has hence been raised only in the case of web services where the user had to utilise the service in the ethnic minority language.

5.24. Support in web services was found to exist in the following forms:

- Font support built into the application or service
- Fonts provided as a freely downloadable option.
- Scanned images of text files presented in gif or PDF format.

5.25. 81 web services evaluated provided inbuilt font support, most commonly found in interactive services such as E-greetings, Chat, E-mail and Discussion forums.

5.26. Providing downloadable fonts was found to be a popular means of support for the non-interactive services, particularly 'Art/Literature', 'News' and 'Entertainment'. 109 web services evaluated had downloadable fonts.

5.27. An alternative mode of providing font support for non-interactive services was by scanning the text and presenting it in the form of images (gif format) or as PDF files. This was widely used for News and Magazine services, and in other non-interactive services, where the main aim of the provider was merely to present information in the ethnic minority language.

5.28. Providers of web services also used separate software components to enable font support for the page. 26 of the 392 evaluated web services were found to have this option. In very few cases (15 web services) font support was not provided in the site, requiring the evaluators to use their own font resources to view the page. However, in the case of the Tagalog language, English fonts are widely used in its electronic versions as with a few non-Arabic Turkish and Kurdish sites. These sites did not have any need for special font support as they used English fonts.

Interoperability of software

5.29. Interoperability of the software is seen as important for “future-proofing” as the inter-dependency of applications increases. With an increasing number of applications being developed, the ease with which one application can be connected to others may form the deciding factor for its success. It is impossible to test the interoperability of software within all permutations of software environments. So the researchers examined interoperability only with respect to popular Microsoft applications.

5.30. More than three quarters of the software evaluated was found to be lacking interoperability in relation to Microsoft applications and those which had interoperability, achieved it by use of the Rich Text Format (RTF), a global information standard, and not by virtue of developments in the applications themselves.

Salient features – Software

5.31. The software and web services studied were evaluated on specific salient features offered by the provider. The three key features were: presence of interface made available in the ethnic minority languages, phonetic keyboard layouts and soft keyboards.

5.32. Interface in the ethnic minority languages: the evaluation process revealed that most software in the ethnic minority languages had an interface in English or a mix of the ethnic minority language with English. Only 9 software applications and 44 web services were found to have a user interface developed solely in the ethnic minority languages. In all other instances the user required a basic knowledge of English to use the interface and the application.

5.33. Phonetic Keyboard layout: a phonetic feature within software is of great use to users who are proficient in English as well as their ethnic minority language. Such a keyboard eases the text typing in the ethnic minority language by clicking the equivalent alphabet in English. This feature was present in 70 of the software applications and web services combined. Without a phonetic feature, the application needs a keyboard layout of the ethnic minority language or a soft-keyboard to enable the input of text by the user.

5.34. Soft-Keyboard: a feature wherein the keyboard layout in the ethnic minority language is provided on the application's screen. This is an ideal substitute for the normal keyboard where the application does not support phonetics. . 13.3% of the applications and 4.3% of the web services provided this feature.

Restrictions in Evaluation Copy – Software

5.35. The study reveals two forms of restriction imposed by providers of the software made available in the web, namely, limiting the number of days of usage and limiting the features in the evaluation copy. Where most of the software evaluated was freely downloadable and had no restrictions imposed, the more popular practice was to provide an evaluation copy with a 30-day trial period. This may be a fully functional version or a curtailed version where the user is denied access to a few of its features. Users were expected to purchase the software upon satisfactory evaluation of the restricted copy.

Registration - Web service

5.36. Although most of the web services in the ethnic minority languages did not require the user to register, registration was required for some specialised web services that sought networking among community groups. Services evaluated under E-mail and Discussion forums required users to register themselves for the service. An interesting observation made during the study was the medium of language used for registration. Among the 73 web services that required registration, 59 used English as the medium for registration; only 7 used the ethnic minority languages. Another 7 applications provided options for both English and the ethnic minority language as the medium for registration.

Accessibility options

5.37. Analysis of accessibility focussed on two prominent features, namely, Audio and Video features. Audio features in web services can be particularly useful to visually impaired users who would otherwise not be able to read the text. Audio functions were most often observed in the News and Magazines category, where the site enabled News to be heard online. Video support (animated clippings, etc.) for web services was limited to a few selected sites, again most frequent in the News and Magazines category.

5.38. However, no accessibility options were provided in the software and web services to cater to the specific requirements of the handicapped or the elderly. Features such as text zoom; feather touch keyboards etc., were more or less non-existent. Audio features existed in a few services that were classified as News and Magazines but more as an additional feature of the site for the general public than for the visually impaired. The absence of accessibility options in the software and web services may be attributed to the lack of technological advancements in this sector in the ethnic minority languages. In addition to this, although various guidelines are available, the industry has no prescribed standards for providing these features to the handicapped based on which an assessment could be made. This option has hence not been analysed in depth.

6. DATA ISSUES AND RESEARCH LIMITATIONS

From the Research Desk:

6.1. An effective search process involves the researchers providing the right keyword to extract the best match for the required information. Despite providing the most effective keyword, the vastness and depth of information that resides in the web makes it almost impossible to come up with just the right matches. A large number of redundant links that have no pertinence to the scope of the study may be displayed, requiring considerable research time to exclude.

6.2. In the World Wide Web it is not uncommon to come across the same information in different sites. Duplication of information required the researchers to ensure that the repeating sites were eliminated and not added to the database. We frequently found that a software product listed in more than one site was pulled out during the search process in all those sites, representing more than one website for the same product. The number of links in such cases then became misleading. The researcher had to go through the arduous process of ensuring the non-duplication of information.

6.3. For example both the sites below pointed to the information on a bilingual application called 'Vidyarthi' that manages the student information for educational institutes. It supports English and one regional language.

http://www.modular-infotech.com/html/vidyarthi.html
http://www.indian-languages.org/misc_vidyarthi.htm

In this case, the researchers had to ensure that only one of the above-mentioned sites was added to the database.

6.4. Absence of information pertaining to the product was another problem faced by the researchers while profiling software in web directories. In such cases, the researchers either had to obtain the information by checking through the domain name (that reveals the country of origin and contact information), or

carry out a search, based on the product name to seek the provider information.

6.5. Another limitation of the Web was the dynamic nature of the web pages. Dynamic web pages are designed in a fashion that allows the web page to continuously change. Dynamic information made it difficult for the researcher to refer to the page when revisiting it.

6.6. Another common problem faced by both researchers and users of the data was the problem of not finding the page. Messages such as ‘Page not found’ or ‘Page moved’, etc., appeared on revisiting these pages.

6.7. An interesting feature of the research process was the presence of a few words in different languages misleading the researcher during the search phase. For example, the word “Akan” in the Indonesian Bahasa language is equivalent to the verb 'will' in English. “Akan” also happens to be one of the ethnic minority languages within the scope of the research. Researchers had to eliminate links that contained the CLD (country level domain) of Indonesia on the assumption that the information provided therein is pertinent only to the Indonesian community.

6.8. A search process in the net involves the keyword given by the researchers being matched with the web sites indexed by the search engine. All web pages matching the keyword(s) are displayed in the search results page. In this process if the web page containing the relevant materials was not indexed by the search engine, it would not be displayed in the search results page as well. Though most of the web sites are indexed by one or the other of the popular search engines, there are good chances of some relevant links being missed. Content added after the searches may also not find a place in the search results. So, despite the comprehensive study, a few links may have been overlooked. Researchers posted threads in news groups and discussion forums to acquire information on possible websites that might have been missed in this way.

6.9. One constraint on the research phase was the lack of resources for some languages, such as Akan and Igbo, which were consequently eliminated from the study.

From the Project Management Desk:

6.10. Data accuracy is another limiting factor in Internet-based desk research, as information in the public domain is not scrutinised for accuracy or correctness. Hence the presence of outdated and incorrect data in the web cannot be completely ruled out.

6.11. The mailing exercise carried out to obtain information from the providers had a response rate of only 11.14%. Hence the bulk of the research is based on the information collected and collated from the web. We assumed the low response rate was due to the number of similar surveys.

6.12. The detailed study was conducted only for Windows compatible software and for free evaluation versions of software as agreed with the Department.

ANNEXURE A: RESEARCH METHODOLOGY

Introduction

A.1 The central task in carrying out the research was to obtain sizeable information on the software and web services made available in the sixteen ethnic minority languages. The system of data collection and consolidation was structured so that no relevant information was lost and no time spent on further processing of irrelevant links. Information gathered was incorporated into the database enabling the administrator to recall it. The research methodology followed is elucidated in this annexure.

Data Collection

A.2 The methodology employed for data collection combined Internet-based desk research and electronic survey. The Internet research involved use of various combinations of keywords in search engines to obtain relevant links for the study. The search results were filtered to obtain an average of 779 relevant links for each of the ethnic minority languages. The irrelevant links were eliminated at this stage. Apart from carrying out the search to identify relevant links, researchers also posted queries in newsgroups of the respective languages for their members to post details of software and web services known to them.

A.3 Electronic mailers were sent to software industry associations in various countries, where the ethnic minority languages are widely spoken, to get the list of software developers, and to major national minority community organizations serving minority ethnic communities in the UK to enquire about software applications and web services developed or used by them.

A.4 An electronic survey was also carried out. This was designed to survey 1203 respondents who were either developers or dealers of software applications/web services in the ethnic minority languages. The purpose of this survey was to obtain information not available on the provider's site as well as additional information. The list of providers was sourced from the public domain.

Internet Research

A.5 The Internet research was carried out in the following three stages:

i. Search and Identification of web services and software applications

ii. Classification of relevant/irrelevant web services and software applications

iii. Profiling of information obtained from the web services and software applications

A.5.i. Search and Identification of web sites/software applications

The search and identification of web services and software applications for the ethnic minority languages involved formation of keywords for basic search and use of combinations of such keywords for advanced search. As well as popular search engines such as Google and Alta-Vista, regional and language specific search engines were also used for more comprehensive search.

A.5.ii. Classification as relevant and irrelevant web sites/software applications

- The software applications and websites visited during the search process were classified as “relevant” or “irrelevant”. This was carried out by opening each link displayed in a search results page and deciding the relevance based on the guidelines set for the same.
- Software and web services that cater to the area of health care, entertainment, education or vocational learning etc., and those with the capacity for community participation, cultural activity, sports etc., were classified as relevant. However, software or web services that aimed to teach ethnic minority languages to people whose first language is English were classified as irrelevant. Irrelevant sites were also logged into the database for record purposes.

A.5.iii. Profiling of information obtained from the web sites and software applications

- The links classified as relevant were profiled by recording all relevant information on the software and web service on the web page. Classification of software or web service category types was also carried out at this stage.
- Information such as the URL, a brief outline of the content, the UK presence, hardware requirements, price, target audience, etc., were recorded for each link profiled at this stage and subsequently added to the database.

Guidelines used to capture information on web services

Sections	Description
URL	The address of the website
Title	The heading or title of the processed website page
Classification	Whether the site provides "Web service" or "Software"
Category	Type of software or web service (example: email, health care, e-book)
Provider	The name of the "web service" or "software" provider
Origin	The name of the country where the service originates
Content	A brief description of the service or software
Skills/learning acquired	Skills the user is supposed to acquire through the web service
UK Presence	If the provider has UK presence or not.
Contact Info	Email, Phone, Fax, Address of the Provider as found in the websites
Technical details	Any software, hardware or other technical specification for the software as given in the website.
Downloadable	Whether a download or evaluation version is available in the website
Price	The price of the software
Online sales	Whether online sales are available

A 6 Training of researchers

A.6.1 Exploring the web, and identifying and capturing the relevant information required specific research skills. Skills needed for effective navigation and selection of required information were imparted to the researchers in the training provided early in the project. The training aimed to equip the researchers with the pertinent skills to mine the web in a fashion that resulted in obtaining maximum relevant links in the fixed time allotted for each language.

A.6.2 Every researcher was trained in the collection, collation, analysis and maintenance of data for the research. Training focused on three main aspects of the workflow namely Search, Identification and Classification of web sites, profiling the information obtained from these web sites and evaluation of software and web services.

A.6.3 Particular attention was paid to equip the researchers with the necessary and sufficient technical skills for efficient and adept search of web sites. The process involved familiarising the researchers with keywords and use of their combinations to provide superior search results. The training also covered methodologies and guidelines that need to be adopted to classify these selected web sites for their relevance to the research. Guidelines based on specifications provided were discussed at length with the researchers to ensure clarity and understanding in the workflow process.

A.6.4 Extensive training was imparted for the profiling of information as this process formed the core of the research study. Sample profiling was demonstrated to ensure that all information added to the database was accurate, reliable and valid. Researchers were given time to familiarise themselves with the interface that was used as a medium to input data into the database. Rigorous checks were conducted by the project manager during the training period to monitor the quality and correctness of the process followed. Discussions were conducted with researchers to share their experiences of profiling and also to clarify unclear information.

A.6.5 General guidelines set upon discussion with the Department were circulated amongst the evaluators who were assigned the task of testing and evaluating software applications and web services. Specific attention was paid to ‘key focus areas’ as defined in the general and specific evaluation criteria for each category of software and web services (refer Chapter 3, paragraph 3.11)

A.7. Electronic Survey

Introduction

A.7.1 The Electronic survey forms were sent to the providers of software or web services identified in the respective ethnic minority languages. The purpose of the exercise was to obtain first hand information on the products or service offered, directly from the provider. The information obtained was useful in deciding the applicability of the software to the research study and enabled the researchers to shortlist software for the detailed study.

A.7.2 The electronic survey forms were sent to 1203 respondents consisting of software or web service providers obtained from searches conducted on the web. Also included were a letter from the DfES to introduce the survey, and an introductory mailer that explained the nature and purpose of the survey. The respondents were provided with reasonable time (around three weeks) to respond, after which a reminder email was sent to all those from whom no responses were received. The survey was emailed from research@global-consulting.com created for the sole purpose of the research work.

A.7.3 At the preliminary level, the survey forms were sent to all software or web service providers found through the web search. Based on the response received from the providers, the relevancy of the software and web service was determined. The responses from the providers gave us a clearer perspective of the usage and applicability of the software application or web services to the ethnic minority within the UK.

Introductory Letter

A.7.4 The introductory letter included the structured questionnaire, a brief background of the research, the necessary assurances of confidentiality and the authentication that Global Consulting was carrying out the survey on behalf of the DfES.

Questionnaire

A.7.5 The questionnaire comprised of selected key questions seeking information regarding the software or web service and the provider. Open-ended questions were incorporated.

Processing the Electronic survey

A.7.6 A support team was engaged to digitise the results of the survey from Word format with a software tool to grab content and push it into the appropriate cells in the database. Wherever respondents came back requesting an electronic version of the questionnaire, links to the online survey form made available in http://www.global-consulting.com/questionnaire.asp were provided. Of the survey forms sent, those that bounced the first time were resent as a means of double-checking the flaw that could be due to temporary technical snags. However, email ids that bounced the second time were eliminated from further analysis.

Response Status

A.7.7 Of the 1203 questionnaires originally sent out, a total of 134 responses were received representing a response rate of 11.14 per cent. Analysis of the survey is provided below.

Mailing Statistics

A.7.8 Total Mails sent across all ethnic minority languages	: 1203	: 100%
Total number of mails bounced	: 153	: 12.72%
Total number of mails for which no responses were obtained	: 916	: 76.14%
Total number of responses received	: 134	: 11.14%

A.7.9 *Mails Bounced* represents the number of mails that did not reach the intended provider due to reasons such as incorrect email ids, server problems, mail quota of the recipient exceeding limit and other similar technical snags. 12.72% of the total emails sent fell into this category. Emails were resent to all 153 providers of this category to ensure that the bouncing of the first email was not due to a temporary technical snag. Those websites for which the emails bounced the second time were eliminated from further analysis.

A.7.10 Numbers in *No Response* represents those providers from whom we received no response. There was no response from 76.14% of the providers to whom the mailers were sent. The lukewarm response persisted in-spite of the efforts taken by the researchers to send reminder emails to all providers in this category.

A.7.11 The number in the *Mails Received* category is the number of providers who responded to the researchers' email. The category includes responses in the form of a filled questionnaire, negative responses and any other form of correspondence from the respondent, which resulted in obtaining some kind of information relevant to the research study. It also includes responses stating that the software is out of production or is targeted to groups outside the purview of the project. The total percentage in this category is 11.14%. It is to be noted that automated acknowledgement emails and other forms of acknowledgement emails received were not classified under this category.

A.7.12 A typical response received from one respondent was: *"our software is specifically targeted at Arab countries and only supports the billing and charging methods of the telecommunications authorities in these countries"*. In such cases, the software was eliminated from the list and no longer processed.

A.7.13 It appears from the exercise that the providers who replied were those who were enthusiastic about the research work or actively selling their software. An evident supporting fact is the observation made in case of Multilingual software (MLS) providers catering to one or more of the ethnic minority languages. Of the 60 MLS providers contacted for the purpose, 22 responded to the survey (36.6%) and the non-respondents were only 43%, a sharp contrast with the overall ratio.

A.7.14 Although the number of replies was low we think that the survey was a useful indicator of the seriousness of the provider. As expected, the software providers who were selling their software more readily responded.

A.8 Posting Queries in News Groups

A.8.1 To ensure maximum coverage in the web, threads were posted in News groups pertaining to the respective ethnic minority languages.

A.8.2 Queries requesting information on web services and software in ethnic minority languages were widely posted in Google Newsgroups. Google groups proved to be a one-stop reference forum spreading across all the languages, which are traversed by millions of people. In total, seventeen threads were posted across the ethnic minority languages.

A.8.3 Information received by way of threads posted by the members of the group was checked for relevance to the study and accordingly proceeded with. Links or contact details of the providers of software applications and web services in the ethnic minority language were passed on to the researchers. These links were either profiled if found relevant and subsequently added to the database, or classified as irrelevant and no further process was carried out. Providers were contacted directly through electronic mail for additional information on the product.

A.8.4 For the 17 postings made, 26 responses were received, the maximum responses being received for the Gujarati language. 16 links were identified in all, solely from responses received from Google postings rather than Internet search.

ANNEXURE B: RESEARCH TOOLS

B.1 *Hardware/Software Package*: As the research involved mining the web for the information, every researcher was equipped with a 64 + MB RAM system with Windows OS and an Internet connection. MS Office tools were installed for further analysis of information obtained and for the preparation of interim reports.

B.2 *Database*: MS Access served as the single point data repository for the information gathered during the research study. MS Access is easy to handle and enables the database administrator to store, maintain and retrieve data with comparative ease.

B.3 *Interface*: A Graphical User Interface in Visual Basic was developed and deployed to serve as the medium for the researchers to interact with the database. The interface was developed after giving much thought to the information that needed to be captured for the study. The fields captured were decided using the research requirements and the feedback obtained thereafter from the members of the steering group.

B.4 *Search Engines*: Researchers used "Google" as the main search engine to identify and obtain relevant links in the sixteen ethnic minority languages. Google was chosen as the prime search engine for the superior quality and quantity of search results obtained in comparison with other search engines. The Google search engine has been ranked one among the top search engines for its efficiency and effectiveness in web mining. However, to ensure that no relevant site was overlooked, other search engines such as Alta Vista, Lycos, Ask Jeeves, etc., were also used as well as language and region-specific search engines, making the search process an extensive one. An example of a regional search engine is Africaonline.com for Igbo and Akan. (Refer Table 4.1.A, for a list of search engines used in the research)

B.5 Searchable Database: The wealth of information gathered during the research has been saved and stored in a database that enables the user to retrieve the information anytime in the format prescribed by the user. The relational searchable database is designed to enable users to select specific information using a dropdown list. Any combination of criteria may be selected to view results matching the chosen fields. For example, the user can select 'software applications' in 'Chinese' from the

dropdown list provided to view a list of software applications that have been identified during the research in that ethnic minority language. The interface is user-friendly, and powerful.

List of Search Terms (Keywords) used for identifying software applications and web services across ethnic minority languages

AKAN		
Akan language	Akan + stories	Akan (AND) "web services"
Akan sites (OR) portals	Dictionary Akan	Health information + Akan
Akan software	Education (OR) entertainment + Akan	Akan + culture
List of Akan web sites	Magazines + Akan	Akan + Proverbs
Translation software + Akan	Books + Akan	Akan + language + Ghana
Script processor + Akan	Word processor + Akan	Accounting software + Akan
ARABIC		
"Arabic websites"	"Arabic dictionary"	"Arabic" + "word processor"
"Arabic" portals	"Arabic search engines"	"Arabic" + "script processor"
"Arabic fonts"	"Arabic software"	"Arabic entertainment"
"Arabic" + newspaper + magazines	Arabic + "translation software"	"Arabic" + accounting software
BENGALI		
Bengali (and) "web services"	Bengali accounting software	Bengali chat
news articles in bengali	Bengali dictionary	Bengali discussion forum
Bengali translation software	Bengali + software	Bengali word processor
News papers in bengali	Newsletters + bengali	Bengali script processor
Healthcare information+ bengali	Bengali + bangla + "web services"	Bengali + news papers + magazines

Bengali +poetry		
CHINESE/CANTONESE		
Chinese websites	"Chinese newspaper"	Chinese word processor
"Chinese fonts"	Chinese entertainment	Chinese dictionary
Chinese music	Chinese literature	Chinese software
Chinese education		
FARSI		
“Farsi" + "websites"	"Farsi portals"	Farsi + "translation software"
Farsi fonts	Farsi + "search engines"	Farsi entertainment
Farsi + newspaper + magazines	Farsi software	Farsi + "healthcare"
Farsi + "word processor"	Farsi + "accounting software"	Farsi dictionary
GUJARATI		
Gujarati websites	Gujarati +newspaper	Gujarati +dictionary
Gujarati portals	Gujarati + "word processor"	"Gujarati software"
Gujarati fonts	Gujarati +"accounting software"	Gujarati +entertainment
Gujarati +literature		
HINDI		
Hindi websites (or) Portals	Hindi + software	Hindi word processor
Hindi Translation Software	Hindi (AND) "web services"	Hindi Script Processor
Hindi Accounting Software	E-books+ Hindi	News papers in Hindi
Hindi Dictionary	Newsletters + Hindi	Hindi Magazines
Hindi Discussion Forum	Hindi Chat	Healthcare information+ Hindi
Hindi +poetry		

IGBO		
Igbo language	Igbo (AND) "web services"	Igbo sites (OR) portals
Igbo stories	Igbo culture	List of "Igbo" web sites
Igbo books	Igbo Dictionary	Health information & "Igbo"
Discussion forum + Igbo"	("Education" (OR) "entertainment") & "Igbo"	
KURDISH		
Kurdish websites	Kurdish +"accounting software"	Kurdish +entertainment
Kurdish portals	Kurdish +dictionary	Kurdish +literature
Kurdish +newspaper	Kurdish software	Kurdish music
Kurdish + "word processor"	Kurdish +healthcare	
PUNJABI		
Punjabi + websites"	Punjabi fonts	Punjabi dictionary
Punjabi + "portals"	Punjabi+ "word processor"	Punjabi software
Punjabi+"Email" (OR) "E-greetings"	Punjabi + newspaper + magazines	Punjabi + "Accounting software"
Punjabi + "music"	Punjabi + "translation software"	
SWAHILI		
Swahili websites	Swahili +accounting software	Swahili literature
Swahili +portals	Swahili dictionary	Swahili music
Swahili fonts	Swahili software	Swahili education
Swahili newspaper	Swahili entertainment	Swahili +healthcare
Swahili word processor		

TAGALOG		
Tagalog websites	Tagalog +literature	Tagalog + "word processor"
Tagalog portals	Tagalog +music	Tagalog +"accounting software"
Tagalog +fonts	Tagalog education	Tagalog +dictionary
Tagalog +newspaper	Tagalog +healthcare	Tagalog software
Tagalog +entertainment		
TAMIL		
Tamil sites (OR) portals	Tamil + libraries + UK	Word processor + Tamil
Tamil software	Tamil + literature	Accounting software + Tamil
Tamil (AND) web sites	Dictionary + Tamil	Translation software + Tamil
Tamil (AND) "web services"	Education (OR) entertainment +Tamil	Script processor + Tamil
Health information +Tamil	Magazine + Tamil	Discussion forum + Tamil
Books + Tamil		
TURKISH		
Turkish websites	Turkish + healthcare	Turkish software
Turkish portals	Turkish + "word processor"	Turkish + entertainment
Turkish + fonts	Turkish +"accounting software"	Turkish + literature
Turkish + newspaper	Turkish + dictionary	Turkish + music
Turkish education		
URDU		
"Urdu" + "websites"	Urdu + "accounting software"	Urdu + newspaper + magazines
"Urdu + "portals"	"Urdu dictionary"	Urdu + "word processor"
"Urdu fonts"	Urdu + "search engines"	"Urdu software"

Urdu + "translation software"	Urdu entertainment	Urdu + "healthcare"
VIETNAMESE		
"Vietnamese websites"	Vietnamese +accounting software	"Vietnamese music"
Vietnamese +portals	"Vietnamese dictionary"	"Vietnamese education"
"Vietnamese fonts"	"Vietnamese software"	Vietnamese +healthcare
"Vietnamese newspaper"	"Vietnamese entertainment"	"Vietnamese literature"
"Vietnamese word processor"		

ANNEXURE C: BRIEF SYNOPSIS ON THE ETHNIC MINORITY LANGUAGES

PUNJABI

C.1 Punjabi, also spelt as 'Panjabi', is spoken in Punjab - the historic region now divided between India and Pakistan. In Pakistan, though Urdu is the official language of the country, it is the daily language of about two-thirds of the population. In India it is the official language of Punjab State, and is also spoken in the neighbouring States of Haryana and Hibachi Pradesh. Punjabi belongs to the Indo-Aryan family, though very ancient, turned literary around the 15th Century. From the 19th Century, Punjabi showed vigorous development in all branches of literature. It is written in Gurmukhi script, created by the Sikh Guru, Angad. There are approximately 60 million speakers in Pakistan and about 15 million in India. Punjabi Speakers, especially Sikhs are in United Kingdom, United Arab Emirates, France, Bangladesh, Nepal, Bhutan, Singapore, United States, and Canada. About 70 percent of the world Sikh population lives in Punjab.

GUJARATI

C.2 Gujarati is an Indic language spoken by approximately 44,000,000 people, primarily in the state of Gujarat on the western coast of India but also by sizeable communities elsewhere in South Asia and worldwide. Gujarati speakers also reside in many other countries, principally Pakistan, Singapore, Fiji, South Africa, the United Kingdom, the United States and Canada.

BENGALI

C.3 Bengali is spoken in the region known as Bengal, lying both in India and in the new nation of Bangladesh. In the latter, it is spoken by virtually the entire population of 120 million; in India it is spoken by about 70 million people in the province known as West Bengal. Only five other languages in the world can claim as many as 190 million speakers.

ARABIC

C.4 Arabic is one of the world's major languages, spoken in a broad belt extending from the Arabian Peninsula across the Fertile Crescent and on to the Atlantic Ocean. It is the official language of Saudi Arabia, Yemen, United Arab Emirates, Oman, Kuwait, Bahrain, Qatar, Iraq, Syria, Jordan, Lebanon, Egypt, Sudan, Libya, Tunisia, Algeria, and Morocco, making it the mother tongue of about 215 million people. In addition, many millions of Moslems in other countries have some knowledge of Arabic, it being the language of the Moslem religion and of the sacred Koran. In 1974, Arabic was made the sixth official language of the United Nations.

Arabic Speakers	280 millions
Usage	African and Asian countries.
Official Language	Algeria, Bahrain, Chad, Djibouti, Egypt, Gaza Strip, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen.
Home Speakers	Ethiopia, Mali, Niger, Nigeria, and Turkey. In France it is one of the important immigrant languages

URDU

C.5 'Urdu' is a Turkish word, which means 'foreign' or 'horde'. Urdu was recognised as a distinct language since it was developed in the broad region of Punjab thousand years ago. It was evolved with the interaction of foreign army, merchants and immigrants to India. Today, it is the national language of Pakistan. Urdu involves numerous elements of Arabic as well as Persian. Though not a very old language, Urdu is a language full of charm and elegance, a language that holds literature so courtly. Even today when this ethnic minority language has almost lost its importance in the country (Pakistan), the ones with a slight poetic and aesthetic sense prefer to express only in Urdu, as the language adds charm to prose and poetry. Urdu speakers are present in Pakistan, Afghanistan, Mauritius, South Africa, United Arab Emirates, Thailand, United Kingdom, India, Bahrain, Qatar, Fiji, Germany, Oman, and Thailand.

HINDI

C.6 Hindi is the most widely spoken language of India, centred principally in the States of Uttar Pradesh and Madhya Pradesh in the north-central part of the country. Its 275 million speakers rank it as one of the leading languages of the world, but it is, nevertheless, understood by only about one-third of India's population. When independence was achieved in 1947, Hindi was chosen as India's national language, but it failed to win acceptance among speakers of other languages and shared the title of official language with English. In countries such as Mauritius and Fiji, it is spoken by about a third of the population. There are also sizable bodies of speakers in Trinidad, Guyana, and Surinam. Like most of the languages of northern India, Hindi descended from Sanskrit. Hindi and Urdu are virtually the same. Pure Hindi derives most of its vocabulary from Sanskrit, while Urdu contains many words from Persian and Arabic. The basis of both languages is actually Hindustani, the colloquial form of speech that served as the lingua franca of much of India for four centuries.

FARSI

C.7 Persian is one of the world's oldest languages, a standard and well-recognised tongue as early as the 6th century B.C. It is one of the Iranian languages - a branch of the Indo-European family. To native speakers Persian is known as Farsi. Old Persian was the language of the great Persian Empire, which at one time extended from the Mediterranean to the Indus River in India. The language was written in Cuneiform, the wedge-shaped characters used throughout much of the ancient world. In the 2nd century B.C. the Persians created their own alphabet, known as Pahlavi, which remained in use until the Islamic conquest of the 7th century. Since that time, Persian has been written in the Arabic script with a number of additional characters to accommodate special sounds. Modern Persian is spoken by over 40 million people in Iran and another 5 million in Afghanistan. In Iran, it is generally referred to as Farsi, in Afghanistan as Dari. A variety of Persian called Tajik is spoken in the Tajikistan, but there it is written in the Cyrillic alphabet.

TAMIL

C.8 Tamil is one of the major languages of southern India. It is spoken principally in the State of Tamil Nadu (formerly Madras), located on the eastern coast and extending down to the southernmost tip of the Indian subcontinent. There are about 60 million

Tamil speakers in India. In addition it is spoken by about 4 million people in northeastern Sri Lanka, about one million in Malaysia, and in smaller colonies in Singapore, Fiji, Mauritius, Trinidad, Guyana, Zanzibar, and parts of East Africa. Tamil is the oldest and most richly developed of the Dravidian languages. The origin of the alphabet is uncertain, though it is believed to be about 1,500 years old.

AKAN

C.9 Akan, often called Twi, is one of the Kwa groups of Niger-Congo Languages. It was the ruling language of the Ashanti Empire and is now the most important language of Ghana. Even among some who use other languages in daily life, Akan is the language of the priesthood and of liturgical texts in the Ashanti religion, still widely practised. There are three standard forms of Akan, all mutually intelligible: Twi or Asante, Fante and Akuapem. Researchers could not establish the approximate number of the Akan speaking population; however, information gathered from the net suggests that this population is limited to specific regions in Africa. The resource for Akan in the web was limited. Researchers were not able to filter more than 136 sites in the first level search and only 60 links from this were found to be relevant.

IGBO

C.10 Igbo is one of the more popular languages in Africa, which traces its anonymous ancient origin, possibly either from West Asia or the Dark Continent itself. The tradition and culture of Igbo is very rich and its history, bountiful. Igbo, or Ibo, is one of the largest ethnic groups in Nigeria. The Igbo population is estimated at about 30 million. The Igbo inhabit the south-eastern section of Nigeria, a region of tropical rain forests near the Atlantic coast. The term Igbo also refers to the group's territory and to their language. The number of Igbo speaking population in the UK is still very indefinite due to the lack of records or resources such as surveys providing the information.

VIETNAMESE

C.11 Vietnamese is the official language of Vietnam. Vietnamese, also known as Annamese, is spoken in both North and South Vietnam by about 65 million people. Its linguistic affiliation is uncertain, and though it is sometimes thought to be distantly related to Chinese, this remains to be proven. Like Chinese, Vietnamese is a tonal language and it has borrowed nearly half of its vocabulary from the Chinese. As a result

of economic and cultural development, particularly in the north, Vietnamese is also widely used as a second language by many of the mountain-dwelling ethnic minorities and in neighbouring countries like Laos, Cambodia, and Thailand where a significant Vietnamese population exists. A significant number of Vietnamese speakers live overseas, notably in the United States (600,000) France (10,000), and to a lesser extent in Canada, Australia, Senegal, and Cote d'Ivoire (Grimes 1992).

CHINESE

C.12 Chinese is spoken by more people than any other language in the world. Since estimates of the current population of China are only approximate, figures for the number of speakers of Chinese must likewise be approximate. An educated guess would be about 1.1 billion in the People's Republic of China, to which must be added another 20 million in Taiwan, 5 million in Hong Kong, 4 million in Malaysia, l.75 million in Singapore, 1 million in Vietnam, and lesser numbers in other countries including the United States. Thus Chinese has more than twice the number of speakers of English, though of course it lacks the universality of English. Chinese has been an official language of the United Nations since the founding of the organization in 1945. Though Chinese has many dialects, Mandarin, based on the pronunciation of Peking, is considered the standard and is spoken by about two-thirds of the population. The other major dialects are (I) Wu, spoken by about 50 million people in the Shanghai area and in Chekiang Province to the south, (2) Cantonese, spoken by about 45 million people in the extreme southern provinces of Kwangtung and Kwangsi. In addition, Cantonese is also spoken in Hong Kong and on the Southeast Asia mainland. Nearly all Chinese in the United States speak Cantonese.

C.12.a. Chinese on the Net: A survey by marketing communications consulting company Global Reach, reveals that the languages most heavily represented online (after English) was Chinese. 3.9% of the total web content is made available in Chinese. A total of 28.7 million Chinese-speaking people are online and this number of Chinese-speakers online is continually on the increase.

TAGALOG

C.13 Tagalog, with the stress on the second syllable, is the national language of the Philippines. In 1962, it was made the country's official language and given the new name of Pilipino (also spelled Filipino). Tagalog is the mother tongue of about 15 million people, who mostly live in southern Luzon, in an area that includes Manila. Its study has

been strongly encouraged by the government and it is estimated that over 75 percent of the population at least understands the language. Tagalog is a member of the Malayo-Polynesian family of languages. The three centuries of Spanish rule in the Philippines left a strong imprint on the vocabulary.

SWAHILI

C.14 Swahili, more correctly called Kiswahili, is the most important language of East Africa. It is the official language of both Tanzania and Kenya, and is also spoken in Uganda, Rwanda, Burundi, and Zaire. (In Zaire a separate dialect is spoken, known as Kingwana.) Swahili is the mother tongue of perhaps only a million people, but at least 10 million more speak it fluently as a second language, and many millions more at least understand it to some degree. Swahili is one of the Bantu languages, which form a branch of the Niger-Congo family. Its vocabulary is basically Bantu but many words were borrowed from Arabic. The name Swahili is derived from an Arabic word meaning "coastal," having developed among Arabic speaking settlers of the African coast beginning about the 7th century. During the 19th century it was carried inland by Arab tradesmen, and was later adopted by the Germans as the language of administration in Tanganyika. In modern Tanzania it is the national language, and in 1970 it was proclaimed the official language of Kenya. Swahili is spoken/used in Burundi, Congo (Zaire), Kenya, Rwanda, Tanzania, Uganda and Zaire.

KURDISH

C.15 There are about 10 million speakers of Kurdish, scattered over four countries. There are about 5 million each in Turkey, Iraq, and Iran and about 750,000 in Syria. The general area in which they live is often referred to as Kurdistan. The Kurds are an ancient people who have always had a strong sense of ethnic identity. Their language belongs to the Iranian branch of the Indo-European family. It is generally written in a variation of the Arabic script, though the Cyrillic alphabet has been introduced in the Soviet Union, and a Roman script exists in Iraq and Syria.

TURKISH

C.16 Turkish is the national language of Turkey, and is also spoken by minority groups in Bulgaria, Greece, Cyprus, and other countries. It is the most important member of the Turkic group of languages, which form a branch of the Altaic family. There are about 55 million speakers. Turkish was originally written in the Arabic script, which, though poorly suited to the language, had been in use since the conversion of the Turks to Islam. In 1928, President Mustafa Kemal Ataturk decreed the introduction of a slightly modified version of the Roman alphabet, consisting of twenty-one consonants and eight vowels.

Note

C.17 The size of population speaking ethnic minority languages, as represented in this report, has been sourced from the public domain. The researcher does not claim these numbers to be definitive or the ultimate. These figures are only an approximation, presented to give the readers a clearer background with relevance to the study.

ANNEXURE D: RESEARCH TEAM

D.1 The research to scope the availability of software in ethnic minority language was carried out by Global Consulting UK with the dedicated effort and assistance from a strong team of researchers, the project management team and other supporting staff.

D.2 The process of identifying and scoping software and web services were split amongst a core team and various supporting teams set for the purpose. The core team of researchers constituted those who had strong research background with more than a year's experience in mining the web and preparing reports specific to the client requirement.

D.3 The supporting staff assisted the research process in obtaining data through electronic survey. A dedicated team of supporting staff were involved in sending e-mailers to providers of software applications and web services. Mailers were also sent out to software industry associations and community organisations in countries where the language is widely spoken. All communications and correspondences with the providers were initiated and maintained by this team. The support team also ensured that the reports sent out at various stages of the research were passed through rigorous checks by proof reading the content and formatting the document.

ANNEXURE E: List of Community Organisations and Software Associations

E1: List of Community Organisations

Community Organisation	Contact/Source
SOUTH LONDON TAMIL WELFARE GROUP	South London Tamil Welfare Group 36 High Street, Colliers Wood, London, SW19 2AB Tel: 020 8542 3285, Fax: 020 8542 3289 Email: vairamuthu.kulasingham@sltwg.demon.co.uk http://www.merton.gov.uk/ethnic/tamilwelfaregroup.asp
TURKISH CYPRIOT WOMEN'S PROJECT	6a Hampden Road Hornsey, London, N8 OHX Tel: 020 8340 3300 Fax: 020 8340 3412 Contact: Imren Incipli email: turkcypwom@hotmail.com http://www.beh.nhs.uk/up/commgr.htm
CONSORTIUM OF BENGALI ASSOCIATIONS (THE) CBA	100 Gatesden, Argyle Street, London WC1H 8EB Telephone: 020 7713 8610/8611 E-mail: enquiries@cba-uk.org.uk http://www.londonhealth.co.uk/campaignandsupportgroupsethnicminorities.asp
ARABICA	Nadia Abdelaal PO Box 150, Altrincham, Cheshire WA15 8RR. Tel: 0161 904 8102. E-mail: arabica@breathemail.net. Website: http://www.arabica.org.uk http://www.cilt.org.uk/commlangs/support.htm
CHINESE LANGUAGE TEACHERS' NETWORK	Katharine Carruthers Parkside Community College, Parkside, Cambridge CB1 1EH. Tel: 01223 355 233. Fax: 01223 712 601. E-mail: enquiry@parkside.cambs-schools.net http://www.cilt.org.uk/commlangs/support.htm
MILET PUBLISHING LTD	19 North End Parade, London, W14 0SJ Tel: 020 7603 5477. Fax: 020 7610 5475. E-Mail: info@milet.com Website: http://www.milet.com http://www.cilt.org.uk/commlangs/support.htm
KURDISH AND TURKISH ASSOCIATION	info@daymer.org http://www.refugeesonline.org.uk/daymer/daymer.htm
ORGANISATION FOR PROMOTING IGBO LANGUAGE & CULTURE (OPILCA)	opilca@naijanet.com www.igbo.co.uk

E2: List of Software Associations

Software Association	Contact
PAKISTAN SOFTWARE HOUSES ASSOCIATION (PASHA) COMPUTER SOCIETY OF PAKISTAN (CSP)	Maqsood Ahmed Chaudhry Y-126, Commercial Area, Defence Housing Authority (DHA) Lahore, Cantt, 54792 Ph: 042-111-44-88-00 Ext. 136 Fax: 042-5726740 email: maqsood_chaudhry@netsolpk.com http://12.16.135.174/csp/forms/contact.htm
BANGLADESH COMPUTER SAMITY (BCS)	Bangladesh Computer SamityHouse 8/A, Road No. 14 (new), Dhanmondi, Dhaka 1205, Bangladesh. Tel: 9122847, Fax: 880 2 9122847. E-mail: samity@dhaka.agni.com
TURKISH INFORMATION TECHNOLOGY ASSOCIATION (TURKIYE BILISIM DERNEGI)	levent.berkman@tbd.org.tr, tbd-merkez@tbd.org.tr
INFORMATION INDUSTRY SOUTH AFRICA (IISA)	355 Pretoria Ave, Ferndale, Randburg, 2125 Email:pieto@pieto.com
PSA - PHILIPPINE SOFTWARE ASSOCIATION	22/F Robinson PCIBank TowerADB Ave. Ortigas CentrePasig City. Tel: 635-3737 Email: malou.dawit@softwar eag.com
PHILIPPINE SOFTWARE ASSOCIATION (PSA)	Orient Square, Emerald Ave., Ortigas Centre, 1605 Pasig City , Tel. No./s: (632) 638-2760 , Fax No./s: (632) 638-8796 , Email: iyumol@svi.com.ph , Contact: Mr. Antonio Pio de Roda - President
VIETNAM SOFTWARE INDUSTRY	E-mail: kt01@fpt.vn, hantri@vietsoftonline.com, promotion@vietsoftonline.com
INFORMATION SERVICE INDUSTRY ASSOCIATION OF CHINA, TAIPEI (CISA)	cisa@mail.cisanet.org.tw
TAIPEI COMPUTER ASSOCIATION (TCA)	peggy@mail.tca.org.tw
INSTITUTE FOR INFORMATION INDUSTRY (III)	11F, NO.106, Ho-Ping E. Rd., Sec. 2, Taipei, Taiwan, 106, R.O.C., Tel: G2737-7111 , E-mail:Gmaster@iii.org.tw
UNION OF IRANIAN SOFTWARE EXPORTERS	No.52, Forsat Ave., Enghelab Ave., Tehran, Iran E-mail: info@uiseonline.org