

SYSTEMS FOR MULTILINGUAL INTERACTION

A survey presented to the Utilika Foundation
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Task: Perform a literature review and current-knowledge summarization on proposed and implemented systems, and evaluations of systems, that automatically enable massively translingual human interactions. Interaction types can include email, discussion forums, collaborative publication, social networking, and financial transactions.

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1 Introduction

No project described in this report currently supports “massively translingual” interaction. Except for some of the open-source initiatives, almost all of the projects rely on some type of machine translation. One notable exception is the pictograph communication systems, but even these are quite limited in their language coverage; some, despite their obvious potential, have not even been considered as candidates for translingual communication.

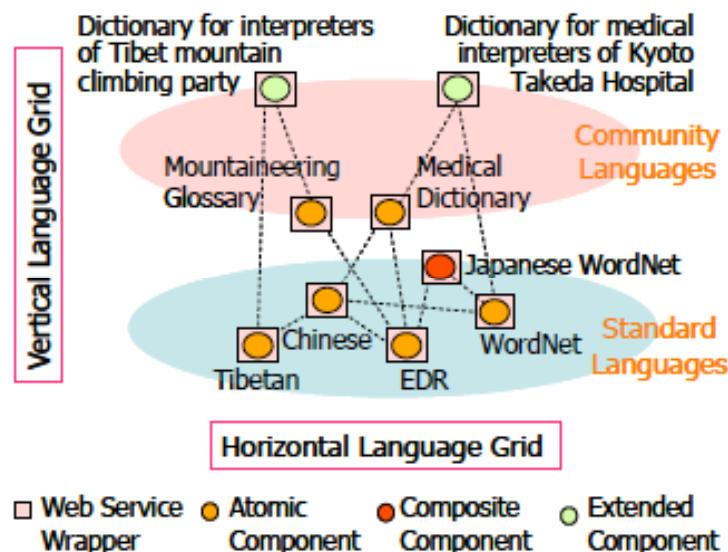
Most of the systems were developed with the hope that they would eventually become much more linguistically diverse. Toward this goal, some of the developers are relying on Semantic Web technology; others pin their hopes on expansion and improvement of machine translation technology. While volunteers are essential to some projects, human collaboration generally isn’t seen as an essential ingredient in developing multilingual tools.

The material reviewed is divided into three sections: (1) academic research reports on translingual communication systems; (2) information about open-source projects and resources; and (3) Web sites offering commercial products. There is some overlap between categories, as when an academically developed service is publicly implemented (e.g., the Pangaea system). And there are probably some categories and many projects that have been omitted entirely. Far from being comprehensive or even wide-ranging, this report is a selective, myopic view of a very broad and constantly evolving area.

2 Academic research

2.1 The Language Grid

The impetus for the Language Grid, a collaborative project sponsored by Japan’s National Institute of Information and Communications Technology, was the fact that Asian people are not taught the languages of neighboring countries. (Nomura, Ishida, Yamashita, Yasuoka, & Funakoshi, 2002) The grid is a conceptual device that can be seen as either vertical or horizontal, as illustrated below. The vertical grid combines language services developed by particular communities (i.e., domains), and the horizontal grid connects the standard languages of nations. (Ishida, 2006)



Somehow the grids make use of Semantic Web technology, as well as the techniques/services WSDL, UDDI, SOAP and BPEL. Projects based on the Language Grid have included a medical interpretation program and a multilingual “blackboard” for use by participants in Kyoto Community Broadcast.

Additional details and study results can be found in Inaba, Murakami, Nadamoto, & Ishida (2007). Trial use of the Language Grid is available for nonprofit activities at <http://langrid.org/operation/en/>.

2.2 CROCODIAL

The CROCODIAL system (Crosslingual Computer-mediated Dialogue) generates natural-language feedback text, drawing on concepts that are in a central ontology. Users view the feedback text and modify the concepts in a language-appropriate interface, with expandable concepts shown as bold “anchors” that can be clicked to reveal options for expansion. This approach to creating discourse is called WYSIWYM (What You See Is What You Meant). (Piwek & Power, 2006)

CROCODIAL has been tested as a game in which speakers of differing languages conduct a simulated transaction. The game environment is like a chat-room except that people have to agree to work on a dialog in a domain for which there are concepts in the knowledge base. In the example below, a Turkish-speaking shopkeeper and an English-speaking customer engage in a food-shopping dialog that uses concepts from a chapter in an English-Turkish phrase book. It took three days for one author to construct the ontology and add the English resources needed for the food-shopping game; an additional two days were needed to add the Turkish language resources. (Piwek, Hardcastle, & Power, 2007).



Piwek & Power (2006) argued that there is currently no competing system that offers both speed and accuracy in translation. “In fact,” they wrote, “we feel that it is misguided to present current speech-based MT as a competitor of the CROCODIAL approach. Firstly, there are many applications in which extreme accuracy is not called for. Secondly, we see potential for hybrid solutions.” One solution they proposed is the use of back translation: “If such a back translation were based on an interlingua, it

would be possible to use our approach to correct the back translation whenever necessary, by means of WYSIWYM editing.” They reported that “users find the WYSIWYM editing operations and feedback to lead to predictable results and follow a logical pattern.” Relying as it does on formal ontologies to map concepts to natural language text, success of the CROCODIAL system depends on development of Semantic Web technologies.

2.3 Pictogram communication

2.3.1 Blissymbols and PCS

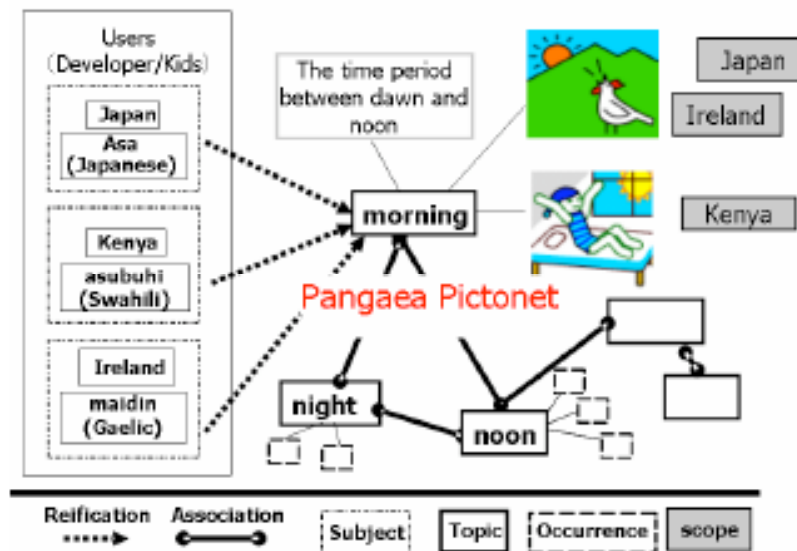
Lin and Biggs (2006) described four systems that are used for conveying meanings through the use of graphic symbols: Blissymbolics, Picture Communication Symbols (PCS), the Elephant’s Memory, and ASCII pictograms. Blissymbolics and PCS are primarily used by people who have difficulty with spoken language. ASCII is used for annotating text, e.g., with emoticons, and the Elephant’s Memory was designed as a research tool for people interested in language development; neither of these systems seems like a potential medium for “massively translingual” interaction. Bliss and PCS, on the other hand, do show promise as methods for people to communicate across languages, but they differ from each other in important ways.

Blissymbols (described in detail in Mini-project 4 report “Graphical Representation of Meaning”) consist of fairly abstract graphics, while PCS uses pictures (often in color) of the concepts being represented. There are about 3,000 Blissymbols versus 10,000 PCS symbols; this difference is partly explained by the fact that many PCS symbols consist of images that are precombined to represent a meaning while Blissymbolics relies on postcoordination to create phrases.

PCS is described as being available in 40 languages; presumably this means that the labels for the different symbols are multilingual. PCS and Blissymbols are both used worldwide by disabled people, and some work has been done to generate bilingual text from the symbols (e.g., Netzer, 2005). In addition, Blissymbols have been tested in a health-care setting in the UK as a means of communicating with Somali patients; the results were generally positive (Somers & Lovel, 2006). However, there doesn’t seem to be any concerted effort to develop either system for wider multilingual use.

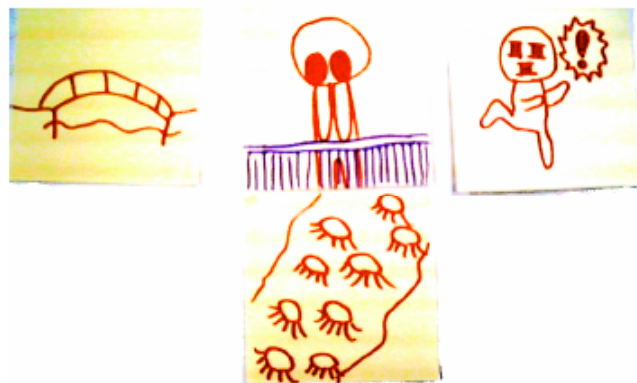
2.3.2 Pangaea

Pangaea, a Japanese nonprofit organization based in Tokyo, has developed a Web site where children from different cultures can interact (<http://www.pangaeaan.org>). The site includes a communication system that uses *pictons* – pictograms developed to represent concepts derived from WordNet. Pictons were chosen with input from children of different language and cultural backgrounds, so that the same concept is represented by culturally appropriate pictons in each language (see figure below). (Takasaki & Mori, 2007)



Communicator, the system used at the Pangaea Web site, is an Adobe Flash application. In an early prototype, the pictons were arranged on one large palette, from which users would drag the selected pictogram into the message field. Later a categorization system was developed; the nine categories were Basic, Feeling, Entertainment, People, Place, Relation, Food, Action, and Encyclopedia.

User testing revealed that children preferred a system that allowed them to compose messages in two dimensions, both horizontally and vertically, so this capability was implemented. The message displayed below means “I was surprised to see smack of jellyfish under a bridge.”



Originally each child created his/her own pictograms, but eventually a standard set was developed by a pictogram-design team. The Web site continues to solicit input from users as to the meaning inferred from specific Pictons. Here are a few examples from a recent survey:



The original Communicator system was developed independently of the Language Grid, but there is now a partnership that involves use of the Language Grid for communication among Pangaea staff; it may in the future include the picton system. “If Pangaea’s pictonet is connected to the language grid, we can easily create a new service, say pictochat between Japanese and Korean kids, by combining Japanese-Korean translation, Korean morphological analysis, and so on.” (Ishida, 2006, p. 4)

2.4 AnnoChat

The AnnoChat system (Shigenobu¹, Fujii, & Yoshino, 2007) it provides a way for users to annotate the content of a message. Annotations are shown as bold links; when the user scrolls over the link with the mouse, the content of the annotation is revealed in an annotation box. Another feature of the system is the use of back-translation to allow users to make corrections to their original messages if the translation appears inadequate..

Three types of annotation are available to users:

1. Dictionary – Offers a definition or description of the term used. These made up about 70 percent of annotations in user studies.
2. Conversation supplementation – Adds details to a word or phrase to help explain it in context. About 20 percent of annotations were in this category.
3. Translation confirmation – Indicates that a particular word or phrase is not understood.

AnnoChat was tested on speakers of Chinese, Japanese, and Korean. Users generally found the system easy to use and the annotations helpful, although one Korean user commented, “Because the translation quality was bad, annotations were useless.” (p. 193) The researchers hope to improve the usability of the annotation feature.

2.5 BuzzTrans IM translator

BuzzTrans (<http://www.rahulnair.net/buzztrans.html>), developed for the “Global Classroom Project” in April 2004 (by Justin Godfrey, Rahul Nair, and Kedar Shiroom of the Georgia Institute of Technology), was based on the Jabber instant messaging technology (www.jabber.org), with an interface based on the TechJab client. Both of these are open-source technologies, but the translation functions rely on Systran. The system supports 30 language pairs, 10 of which do not include English.

BuzzTrans was tested on eight subjects, with an average age of 32. Key findings included the following:

- Users were comfortable with the translation as long as they were explicitly told that it was done by a machine.
- Shared context (e.g., pop culture or school) and knowledge of the other person’s language helped users to compensate for translation errors.
- Users modified their speech to avoid recurring translation errors.
- The researchers found it helpful to add an Escape sequence so that users could indicate sections of a comment that were not to be translated (e.g., names).

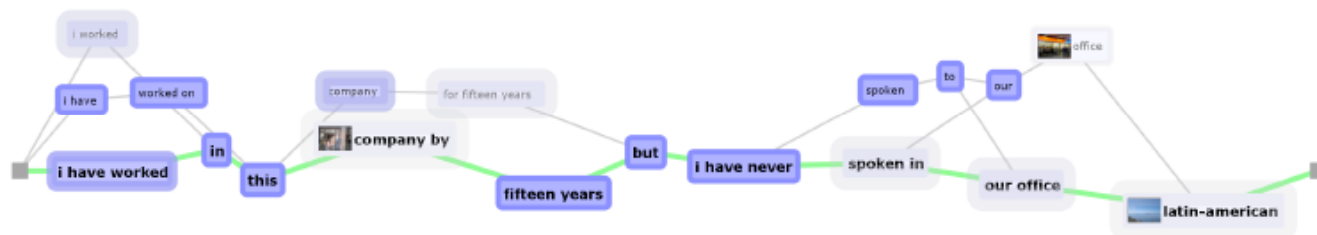
2.6 Multilingual Forum Communities (KOM 2002)

This project's Web site (<http://cmc.dsv.su.se/kom/kom2002.html>) was last revised in 2004, so it's unclear whether anything is still being done on this project, which relies on Systran machine translation. The only Web site to make use of the KOM 2002 multilingual content management system is Web4Health (<http://web4health.info>), a service that provides automatic question answering on topics related to psychological health. The site's "Psychology Free Online Medical Advice" is available in seven languages: German, English, Greek, Italian, Polish, Swedish, and Finnish.

A paper on the project, which describes the features that supposedly make KOM 2002 different from other content management systems, was presented at the TERRENA Networking Conference (Palme, 2006). Its author, Jacob Palme, apparently maintains both the KOM 2002 and the Web4Health Web sites.

2.7 "Leveraging uncertainty" to enhance chat

Collins and Penn (2006) describe a visualization system (see illustration below) in which alternative translations are provided during instant-messaging sessions. "The visualization is designed to reveal uncertainty in the data and support interactive exploration and modification of the translation alternatives while maintaining readability and maximizing screen real estate." The prototype uses only English and Spanish.



2.8 Misconceptions in multilingual communication systems

Yamashita and Ishida (2006) studied the misconceptions that occurred frequently in online, machine-translated conversations. "The proposed method assesses the tendency of each dialogue including misconceptions by calculating the gaps between the regular discussion thread (syntactic thread) and the discussion thread based on lexical cohesion (semantic thread). Verification results show significant positive correlation between actual misconception frequency and gaps between syntactic and semantic threads, which indicate the validity of the method. ... Our next step is to overcome limitations by expanding the proposed method into a system that can alert discussion members to the existence of misconceptions."

Among the more interesting findings:

- Most misconceptions in daily discourse occur when speakers assume that they have shared knowledge or context, i.e., facts are unstated, but the serious gaps in understanding that occur when using machine translation are based on clearly stated comments that are misunderstood.
- People who disagree with each other often preface their messages with polite acknowledgement of the other person's opinions, thus leading the other party to believe that the entire message is one of agreement.
- Long machine-translated sentences are difficult to understand.

3 Open source and collaborative projects

3.1 Content management systems

Several open-source content management systems offer the ability to publish and communicate in multiple languages. The table below compares the multilingual features of six of the most popular systems. All of the systems also offer “Interface Localization”. Complete comparisons of system features can be retrieved from <http://www.cmsmatrix.org/> (a matrix obtained in November 2007 accompanies this report).

	Drupal	Joomla!	Moodle	Plone	TYPO3	WordPress
Web-based Translation Management	Yes	Free Add On	Yes	Yes	Yes	Limited
UTF-8 Support	Yes	Limited	Yes	Yes	Yes	Yes
Supports creation of sites with multilingual content	Yes	Free Add On	Yes	Yes	Yes	Free Add On
Supports multilingual version of each content object	Free Add On	Free Add On	Yes	Yes	Yes	Free Add On

A comparison of the methods used by the various systems is available in a blog posting by Drupal developer Gábor Hojtsy at http://www.developmentseed.org/118n/os_platforms. More detailed information is available in Hojtsy’s *Multilingual Web Applications with Open Source Systems*, <http://hojtsy.hu/files/GaborHojtsyThesis.pdf>.

3.2 Magento

Magento is an open source e-commerce application that promises: “Easily Create Multi-Lingual Versions of Your Store” (<http://www.magentocommerce.com/features/general/multiple-languages>). It offers typical e-commerce features: product comparison, reviews, shopping cart, checkout, etc. The application’s multilinguality seems to depend on volunteers, who are invited to download and translate the various pages that make up the site. A forum post from October 2007 said: “I believe to date we have polish, russian, german and romanian. More are coming every day.”

3.3 One Laptop per Child

The XO laptop that is distributed to children in the developing world was designed for collaborative work and play. Social networking, chat, and multiplayer games are integrated into the operating system. In describing the XO’s mesh network (or “neighborhood”), which is represented as icons on the desktop, one writer explained that “an icon here may represent anything from a few meters to thousands kilometers away.” (Van de Sande, 2007) Presumably children would need to communicate multilingually with at least some of those far-flung “neighbors”; there doesn’t seem to be any effort to make this possible, but one could install a commercial or open-source product on the machines. Currently the only sense in which OLPC is multilingual is in the localization of the devices themselves.

3.4 Worldwide Lexicon

It's unclear what this project is trying to do, but according to a 2002 article at Wired.com, it was originally a distributed-computing application that would take advantage of idle human hours by asking volunteers to translate words and phrases. (Patrizio, 2002) The current Web site (www.worldwidelexicon.org/) says that "you can contribute to WWL by creating and editing translations for content that interests you." It appears to be some sort of collaborative publishing venture and includes a "Website Localization Tool".

Interesting but not very relevant: A history of WWL (presumably written by the project's founder and biggest fan, Brian S. McConnell) describes an early experiment called Disambiguation Markup Language. DML is "a simple way to hide clues inside ordinary web documents" to "help automatic translation systems to understand difficult words or phrases." Examples are "like <!--like~similar--> my aunt's home" and "like <!--like~enjoy--> it". DML does not seem to have progressed much beyond the conceptual phase. (<http://blog.worldwidelexicon.org/2007/04/09/a-history-of-the-wwl-project/>)

3.5 Project Lingua

An adjunct to the Global Voices project (<http://www.globalvoicesonline.org>), Project Lingua uses volunteers to translate English news content. Current languages are Spanish, French, Malagasy, Portuguese, Arabic, Farsi, Bangla, Chinese, and Japanese. Languages chosen "reflect the momentum in their community of speakers." (<http://www.globalvoicesonline.org/lingua>)

4 Commercial Products

4.1 Introduction

A news release in March 1997 announced that a company called Globalink, "a leading provider of language translation software and services", would be developing, with another company called Uni-Verse, the Internet's first translation-enabled chat room. The service was going to use Globalink's Barcelona translation engine and Uni-Verse's chat software. Users in a variety of chatroom, through various interfaces, would get "instant analysis and translation of each new line of text into English, Spanish, French, German, Italian or Portuguese."

Today there is no evidence of this joint venture. Uni-Verse appears to have disappeared, and the translation company called Globalink offers only human translation. Many other companies, however, have seen the same need and are currently trying to fill it. A few companies that specialize in communication technologies are described below. For a more comprehensive view, see Hutchins (2008), a well-researched and frequently updated list of translation products and services.

4.2 Product descriptions

4.2.1 IM Translator

Smart Link Corporation has a product called IM Translator 3.0 (<http://www.paralink.com/ims/>), which "provides instant translation of messages and other texts in major European languages. With IM Translator you can chat with your friends on ICQ, AIM, MSN Messenger, Yahoo! Messenger and other messenger services even if you don't speak each other's language." To use the software, one copies and pastes text between the translator and the instant messaging programs.

Using PROMT technology, IM Translator currently offers the following translation pairs:

- English <-> French
- English <-> German
- English -> Portuguese
- English <-> Russian
- English <-> Spanish
- French <-> Russian
- German <-> Russian
- Italian -> Russian
- Spanish <-> Russian

The system, which is Unicode compatible, supports transliterated Russian in addition to Cyrillic characters. It translates up to 500 characters at a time; messages longer than 500 characters are truncated.

4.2.2 TrIM

The Technology Transfer Office of MITRE offers a product called Translingual Instant Messaging (TrIM). “The MITRE prototype is a communications tool that provides automatic language translation services for instant messaging users. ... Based on the Simple Instant Messaging and Presence service (SIMP) distributed instant messaging architecture and the CyberTrans machine translation framework, both earlier MITRE research projects, TrIM provides a means for instant messaging among users while providing access to machine translation services. The translated messages are displayed quickly enough to sustain natural dialogue.” (http://www.mitre.org/work/tech_transfer/trim.html)

A commercial version of TrIM is available as Transclick, <http://home.transclick.com/>: “Real-time language translation of SMS, email and Instant Messaging in 16 languages to/from English.” Use of Transclick is by subscription, with a 30-day free trial. The software is available for various platforms, including BlackBerry, and as a Firefox plugin.

Transclick is supposedly preferable to ordinary machine translation, because it draws on more than 150 subject domain dictionaries. Translation speed and accuracy are also touted: “400 words per second at 80% to 100% accuracy depending on dictionaries.” Because it is integrated with particular devices and applications, there is no need to cut and paste the translations.

4.2.3 SDL

SDL International is most visible to Web users through its FreeTranslation.com service. It offers many other translation and localization products and services, including something called Enterprise Translation Server, which “integrates real-time translation wherever your company needs cross-language capabilities, including e-mail, instant messaging, intranets, and web sites.” (<http://www.sdl.com/en/products/products-index/sdl-enterprise-translation-system.asp>)

SDLChat Translator is a program that interacts with AOL Instant Messenger to provide translations of incoming and outgoing messages. The program currently works only with AIM and only runs under Windows, although the company’s Web site indicates that additional platforms and operating systems will be available in the future. The chat translator offers most of the languages available through

FreeTranslation.com; exceptions are Russian, Japanese, Chinese and Norwegian. As with Transclick/TrIM, all translation is to or from English.

4.2.4 AmiChat

AmiChat (<http://www.amikai.com/products/portal/amichat.jsp>) is a stand-alone communication tool that does not require the user to install another program or to cut and paste between applications (although another desktop tool, AmiText, does provide translations for use in multiple programs). Another way that AmiChat differs from the instant messaging programs described above is that, by default, it is a multi-user chat system. Users who want to have a one-on-one conversation can select the Private Chat option.

Eight languages are supported, including English, German, Japanese, and Korean; apparently the chat system provides translation between any two languages. The company, Amikai, offers a number of other translation tools, all running on a platform that “combines industry-leading machine translation technologies with proprietary linguistic enhancements to deliver the highest quality software-based translation.” Amikai's products are currently used, says the company, “by over 2 million people to perform translations across 9 languages.” (<http://www.amikai.com/products/portal/amitext.jsp>)

4.2.5 WorldLingo

“Currently, several thousand websites rely on WorldLingo's innovative translation technologies to conduct successful international business each day.” (<http://worldlingo.com/en/company/>) The company offers a multilingual instant messaging product in the form of an applet that works with most applications and operating systems. The languages available are English, French, German, Italian, Spanish, Portuguese, Japanese, Korean, Chinese and Russian—a list that, according to the company's Web site, makes it possible to communicate with 90 percent of Internet users.

WorldLingo estimates that its machine translations are about 70 percent accurate. One of the company's other products is an email translation service, available in both desktop and Web-based formats.

Online demos for both the email and chat products are available. In a recent test, the chat demo gave error messages and no translations. The email demo provided an accurate on-screen translation, but when the email finally arrived, there was no translation at all. Instead there were two copies of the original English text, prefaced by: “Only partial translation available of this email message due to translation timed out error(s), please try again later.” Before the “translation” arrived, the system sent a message welcoming the recipient as a new WorldLingo account holder.

4.2.6 Language Weaver

Language Weaver claims that its statistically based machine translation software is more accurate than rule-based systems, on which it says all other products rely. “This is particularly important for instant messaging translation because there are so many abbreviations that will throw off most translation systems. However, if Language Weaver trains the software on ‘chat’ style data, the software will translate this type of information with even greater accuracy, including all of the abbreviations.” (<http://www.languageweaver.com/page.asp?intNodeID=898&intPageID=868>)

4.2.7 Multicity

“Multicity, Inc® is a leading provider of online communication solutions. Available in up to 17 different languages, Multicity Suite 3.5 is a fully customizable communication & publishing platform featuring tightly integrated Blogs, Chat, Message Boards and Web Polls designed to help clients engage, understand and communicate with customers and constituencies. Applications include Peer Group Collaboration, Customer Care, Consumer Communities, and Organizational Communication.” (<http://www.multicity.com/about/>)

The company is about eight years old, but doesn’t seem to have progressed much since its founding: The latest news article on its Web site is from 2001 (although it has press releases as recent as 2006). The chat component was named “the best chat service on the Internet” by *Yahoo Internet Life* (<http://www.multicity.com/solutions/products/chat/index.html>), a publication that has been defunct since 2002. Multicity clients allegedly include Coca-Cola, the Peace Corps, PBS, and Amnesty International USA.

4.2.8 LinguaNet

The LinguaNet messaging system “provides police units with real time, multi language assisted, electronic, cross-border communication” (<http://www.prolingua.co.uk/Linguanet/index.html>). It was first developed for police and emergency workers at the Channel Tunnel, but is now used in nine countries. Languages currently in use are Danish, Dutch, English, French, German, Italian, Portuguese and Spanish. A paper describing the system (Hansen & Sørensen, 2002) pointed out that “authoring errors proved to be much more counter-productive than insufficiencies of MT” and that “it is preferable to leave it to the recipient of a message to request a machine translation rather than providing it automatically up front.”

5 Concluding comments

A key factor in making the Web more linguistically diverse is the availability of free and open-source applications and platforms. There are thousands of dedicated, innovative programmers who, on a daily basis, take existing technologies and merge them with others to create workable solutions. Projects that encourage this and other types of collaboration (e.g., the open-source content management systems, the Language Grid, and the One Laptop initiative) may have the greatest potential to increase the accessibility of Internet content and communications.

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