

Encyclopedia of Networked and Virtual Organizations

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Localization, Culture, and Global Communication

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INTRODUCTION

The ‘native language’ (the *mother tongue*) is one of the most decisive identity factors of a nation. Besides being of political importance, it carries a high emotional value and is strongly related to culture. Due to technology, particularly the Internet and due to individual ownership of computers people have more opportunities to interact and cooperate with others outside their local community (Nakakoji, 1996). As a consequence, software products must be used in different countries. As early as 1960, the first technological steps were made by IBM (Hensch, 2005) in order to find ways of processing and displaying Japanese characters. Initially, the prime concern was an adequate representation of national characters (including diacritical characters of European languages), typically called *national language support*. In the meantime, an ever increasing number of people are in need of using software products. Technological progress allows communication via pictures and also via colorful, animated displays showing people in their natural surroundings, resulting in software products becoming a part of their daily environment. Computers today execute more complex tasks in closer imitation of human behavior. As a consequence people expect the computer to adapt to their individual culture.

Experience has shown that the transfer of a software product into a geographically (and culturally) different environment implies much more than a simple language translation: we speak of *localization* (Ishida & Miller, 2005), that is *the process of adapting a product to reflect the local standards, culture and language of another market* (GSSI, 2000), or *the infusion of a specific culture into an international product*. It requires a comprehensive rethinking of logic and presentation, sometimes even paradigmatic changes to the offered product (Chroust, 2000; Collins, 2002; Davis, Grimes, & Knoles, 1996; Esselink, 2000; Ishida & Miller, 2005; Kubota, 2003).

In this contribution we identify several layers of localization and concentrate on those layers which

show a high interaction with the cultural environment of the user. *Examples are identified by “□.”*

BACKGROUND

Both the need for more adequate localization and the means to provide it have increased over the last few years. Factors promoting the need for localization are:

- **Technological advances:** Increase in speed and quality of computers especially due to modern displays technology permit high-class near-real-life videos.
- **Increased realistic animations:** The text-oriented computer interfaces and largely culturally neutral applications (ledger, bookkeeping, etc.) of yesterday did not require much localization. As long as communication functions through formalized representations (e.g., UML-diagrams) little cultural context is transmitted. This changes when communicating via language, images or video (Nakakoji, 1996). Improved graphical support enables images and video-clips of real persons in realistic surroundings to be shown. Images and videos carry many subtle cultural messages. This increases the need to localize, especially with respect to social behavior of the actors and their cultural setting according to social conventions. But, these videos are consumed in the familiar cultural environment of their viewer and discrepancies become more evident.
- **User expectations:** More and more people come in contact with software (often in hidden form). An increasing percentage of them are not willing, interested or able to communicate in a foreign language with the system, they expect high-quality communication in their mother tongue (Miller, 2004) compatible with their cultural expectations. In contrast to traveling in a foreign country, access-

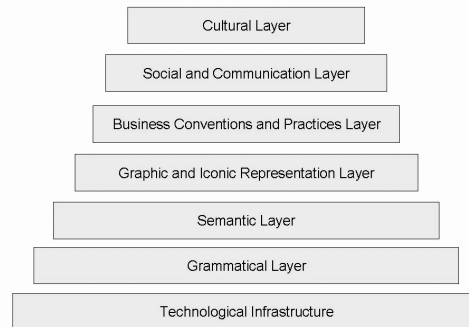
ing systems from one's habitual business or home environment makes deviations from the cultural norm strongly apparent. This is psychologically different from traveling to a foreign country.

- **International cooperation:** Global outsourcing of software production induces localization problems both in the product and the production process (Krishna, Sahay, & Walsham, 2004). International business processes will require products which can even be operated transparently in different languages at the same time. Subtle questions about translation of user inputs and outputs arise.
- **Buyer's market:** Due to the ability of global shopping, there is a surplus in offered software world-wide. Emotional factors play a considerable influence on buying decisions. When trying to attract customers' interest, mother tongue and familiar cultural settings and graphics are the best eye catchers. Customers prefer products that have local branding elements corresponding to their culture. Bad or inadequate localization will diminish the thrust of potential buyers (Lohse & Spiller, 1998). Potential buyers must also be able to understand the usability and functionality of a product quickly (using demos, introductions, examples) otherwise the opportunity is missed. Again cultural compatibility is a must.
- **Increased non-personal interaction:** Communicating by a computer is deprived of many channels (e.g., intonation and body language) used in face-to-face encounters. Cultural mismatches might therefore result more easily in misunderstanding.
- **Return on investment:** Producing software for a (small) local national market is in most cases economically unsuccessful. Software products as international commodities make it necessary to localize on a common base product (a 'product line'). This approach also allows even small, local niche suppliers to compete with their products in the international market.

LAYERS OF LOCALIZATION

Localization has to be performed on different levels of increased comprehensiveness and cultural dependence (Figure 1). Higher levels usually rely on lower-levels of localization.

Figure 1. Layers of localization



Technological Infrastructure Layer

The basis for localization is technical and organizational provisions. They are mostly invisible to the user, mostly providing *internationalization*, that is making a product ready to be localized. Necessary provisions are well understood and will only be sketched below (Barbour & Yeo, 1996; Chroust, 2000).

- **Separation of text and code:** The basic strategy is to separate text and code in order to be able to translate the text without affecting the functionality (the code). For localization only the text-part is replaced. This seemingly simple scheme, however, cannot be fully achieved, see (Chroust, 2000).
- **Storage size for texts:** English is a very compact language. Other languages usually take more space. As a consequence panels and layouts often have to be redesigned to accommodate other languages. □ *IBM reserves 30 percent extra space in order to accommodate languages other than English.*
- **Code pages/Unicode:** For a localized product the correct code page or the appropriate Unicode settings must be provided.
- **Sorting sequence:** Unsophisticated sorting algorithms use the bit representation of the individual characters of the code page. As a consequence national characters (e.g., 'ä') appear out of sequence. The alternative is a more complicated (and therefore slower) sorting algorithm (Mustafa, 1996).
- **Sorting of names:** The position of the 'family name' is different in different cultures. □ *"Franz Liszt" becomes "Liszt Ferenc" in Hungary.*

- **Two-byte languages:** Several Asian languages (Japanese, Chinese, etc.) are word-based and need a dramatically higher number of characters, resulting in a two-byte representation. Characters of these languages are usually larger. This often causes a re-arrangement of lists and formatted text, especially on computer displays. This in turn changes the ‘look and feel’ of the product.
- **Writing and reading direction:** Some language families (e.g., Semitic languages) are written and read from right to left, Asian languages are often written and read top to bottom, runic languages from bottom to top (He, Bustard, & Liu, 2002; Kim, 1999; Trager, 2006). The problem is aggravated by differences in the block progression, that is in which direction the next line will follow: top-to-bottom (Latin), right-to-left (Chinese, Japanese), or left-to-right (traditional Mongolian texts). Special precautions are needed for mixed texts, for example when including original citations (Figure 2).
Representation of diagrams (e.g., flow charts) should also follow the major reading direction, in Arabic countries from right to left. Similarly the placement of the most important element on a Webpage should follow the reading habits of the users (Collins, 2002).
- **Dynamic of language selection:** The point of time as to when the user has to decide which localized version is to be used has to be defined: at delivery of the product, at the start of a session, at any time during the use. Switching between alternative localizations also has to be considered.
- **Product packaging strategies:** A basic marketing decision (including some development implications) is whether one product should be delivered with all localization alternatives or alternatively several, individually localized products should be offered, having implications on pricing and user friendliness (Krishna et al., 2004).

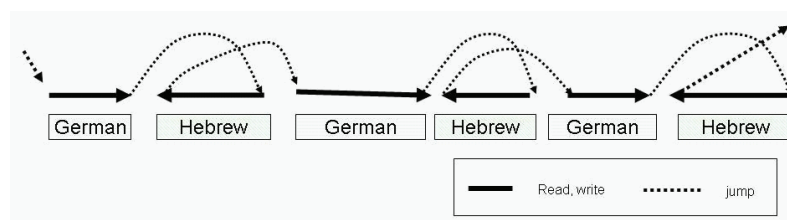
- **Selective localization:** For some parts of a product (e.g., tool drivers) it is cost effective to avoid translation, assuming the relevant persons (e.g., computer specialists) will know the source language (e.g., English).

Grammatical Layer

Text translation is almost as old as writing itself. For translation of computer supported texts some additional considerations are necessary. They mostly result from the fact that the computer requires more formalism than a human reader when interpreting and presenting texts. Also, the generic composition of texts (a necessity in user interfaces is unknown to classical translation situations).

- **Locale:** Locale is a subset of a user’s environment that defines conventions for representations in a specified culture. They include date, currency, time, etc. to be chosen by the user (He et al., 2002; Herden, 2006; Kubota, 2003; Trager, 2006). The necessary translations can usually be done automatically, problems arise if such data are used as part of identifiers or numbering schemes and further processed.
- **Paper sizes:** They differ in different countries. As a consequence texts have to be reformatted, causing changing page breaks, difficulties with placing pictures and often ruining an initially attractive layout.
- **Ligatures:** For aesthetic purposes Latin-type fonts use ligatures (like “ffi” or “œ”). These are usually ignored in computer printout without loss of readability. In Arabic texts, ligatures are an essential part of the appearance and semantics of a text, but it is practically impossible to correctly generate all of them mechanically because of their high context and semantic dependency (Mankai, 1995).

Figure 2. Left-to-right and right-to-left languages



- **Truncation of text fields:** The space in text fields, especially on a screen is limited. Unreflected (automatic) truncation, due to excessive characters, can be unpleasant or even embarrassing. This problem also comes up with keyboard shortcuts (Microsoft Corp, 2006) in which the characters have to be changed due to localization in order to convey the intended meaning. □ *Abbreviating “analysis” to “anal” is not desirable.*
- **Word order:** For the generation of context-dependent messages text fragments must be inserted into predefined message skeletons. A problem arises from the fact that the word order is different in different languages, causing code changes. □ *English “Red Cross” versus French “Croix Rouge.”*

Semantic Layer

- **Technical versus common language:** In translating technical literature - and responding to user input - it is necessary to distinguish whether a word is used as a well-defined technical term or in its common meaning. In contrast to classical prose variations of words are not desirable. □ *In a software engineering tool the word ‘activity’ meant one step in the development process, but it was also needed in its common usage when speaking about the ‘activities’ of the team.*
- **Missing variation of terms in a language:** In technical work often essentially synonymous words are used with different semantics causing problems if the target language does not provide this variability. □ *A software environment used in its German version both ‘Aktivität’ and ‘Tätigkeit’ in different meanings, but unfortunately both map to the single English word ‘activity’.*
- **Expressiveness of languages:** The expressiveness of languages is different (e.g., Asian languages). □ *It is not without reason that German has been the favourite language of philosophers, French the favourite of diplomats and English the favourite for commerce and science.*
- **Abbreviations:** Effective abbreviations (especially for keys and hot-keys) have to provide a certain intuitive association to the word or object they stand for. Translations sometimes cannot accomplish this due to similarities in the target language.

□ *In German one can abbreviate ‘on’ and ‘off’ by ‘E’ and ‘A’ (Ein and Aus). For English 2 characters or some other scheme has to be used.*

Graphic and Iconic Representation Layer

Increasingly software products rely on graphical representations in panels, demos, and animations.

- **Symbols and icons:** Symbols convey habits, customs, and conventions which often cannot be understood by other cultures. Animals are frequently differently associated with properties and values. Similarly not all cultures associate the same model with an object of daily life (Is an item in a trash can recoverable or not? (Nakakoji, 1996))
□ *The American symbol for a mailbox does not correspond to mailboxes used in Central Europe. The same holds for many traffic signs. Similarly in Christian environments the sign for help is a Red Cross, in Islamic countries it is the Red Crescent.*
- **Colors:** The association of moods and feelings with colours differs radically in the various countries (Decker, 2006). □ *A fast-food shop decorated with white tiles was unsuccessful in China since white is the colour of mourning (Collins, 2002).*
- **Sounds:** Besides the type of sound, also the occurrence of a sound (e.g., an ‘error beep’) might be embarrassing to the user of the computer (Collins, 2002).
- **Body language and gestures:** Both gestures and usually unconscious body language are transmitted by pictures and animations, but often vary entirely in different cultures (Morris, 1994). □ *In most of Europe nodding your head means ‘yes’, in Greece it means ‘no.’*
□ *Counting with fingers is different in different countries. Americans start with the index finger, in Austria the thumb comes first.*

Business Conventions and Practices Layer

Business practices show dramatic differences, aptly described by Hampden-Turner & Trompenaars (2000)

and Hofstede & Hofstede (2005) causing misunderstanding, friction, and alienation (Krishna et al., 2004). Especially animations, but even texts, could contain cultural blunders.

- **Leadership approach:** Leadership approach varies in different countries and within organizations (democratic, authoritarian, and participative). Management support tools have to conform in their interfaces and processing. □ *In Spain it is customary to first inform management before disseminating this information to the employees. The BOOTSTRAP Assessment Method had to be modified in order to cater for this.*
- **Organizational structure:** Depending on whether the society is rather egalitarian or hierarchical, both the structure of interfaces, Web sites and obviously pictorial representations must conform (Hofstede & Hofstede, 2005).
- **Navigation in Web sites:** Many of the national preferences (e.g., low versus high context cultures (Hall, 1976), specificity versus diffusion) have to reflect themselves in the design of Web pages.
- **Dates and deadlines:** Commitment to dates and deadlines vary considerably in different cultures, following (Hampden-Turner & Trompenaars, 2000) sequential versus synchronous time. Vague deadlines have to be catered for in project management tools.
□ *In Sri Lanka the author was assured that a deadline is just a non-committals promise for delivery.*
- **Performance measures:** Performance measures vary according to cultural divergence, especially with respect to individualism-communitarianism/collectivism and inner direction-outer direction (Hampden-Turner & Trompenaars, 2000; Hofstede & Hofstede, 2005).
□ *Typically in the USA awards go usually to an individual, in Japan usually to the team in total.*

Social and Communication Layer

Humans expect certain behavior of their partners in communication. They tend to ascribe human qualities to complex sophisticated computer interfaces. As a result they “expect good behaviour, observation of etiquette and politeness, subservience, helpfulness,

and the sensitivity of an intuitive, courteous butler” (Miller, 2004). The more realistic the human/computer interface becomes (from simple text-based to animated interactive displays with software agents (avatars)) the more the computer interface has to obey social conventions.

- **Addressing and greeting the user:** Rules for addressing and greetings persons vary greatly both with respect to the chosen phrases (use of family name, title, etc.) and the accompanying gestures (Herden, 2006). Especially expressing the various degrees of familiarity is very subtle. Pictures and animation must conform to these conventions.
□ *In Japan the suffix ‘-san’ is attached to the family name, to express one’s appreciation, in Austria the title (‘Dr. ‘Director etc.) must be used. In Cambodia the (positional) title is preferred, not the name. □ American manuals address readers directly (e.g., ‘In order to switch panels you press key F10’) which is considered highly impolite and improper in Germany. Here a neutral, non-personal wording is expected: ‘...to switch panels, key F10 is pressed.’*
- **Answering a user:** A ‘polite’ system is expected to conform to the ways of saying ‘no’ in a culturally compatible manner. In many Asian countries a ‘no’ is avoided in favor of no answer or a ‘yes,’ which is to be interpreted as a ‘no’ (Herden, 2006).
- **Communication styles:** Communication styles permeate to interactive Web sites. High-context cultures with their reliance on the context and the nonverbal aspects are to be distinguished from low-context cultures which depend more on explicit, verbally expressed forms of communication (Hall, 1976; Schneider, 2001). This is related to the cultural divergence of specificity-diffusion (Hampden-Turner & Trompenaars, 2000), that is between a detailed versus a holistic view of a situation. This affects design of negotiation support systems, decision making and customer relation management systems.
- **Social classes:** Social class affiliation may play a dominant role in communication (Davidson, 2002; Hampden-Turner & Trompenaars, 2000; Hofstede & Hofstede, 2005; Soh, Kien, & Tay-Yap 2000). Differentiation must be made depending on the users and their individual subculture (class),

including differences with respect to age, education (Marsh & Morris, 1989; Payne, 2006). □ *In English we have to distinguish between 'posh' vs. 'street' English.* □ *In the Khmer-language even such simple words like 'eat' or 'yes' have different stems depending on social status from king to one's younger brother (Herden, 2006).*

- **Social position—age:** The importance and respect for age and the resulting social position varies in different countries. Hampden-Turner & Trompenaars (2000) speak of *ascribed* versus *achieved* status.
□ *In China seniority is expected to go hand in hand with higher positions in management (ascribed status), in contrast to Western management in which hierarchies rely on achieved status.*
- **Social position—gender:** The social position of women varies in different cultures. In western societies it is politically correct to show women in leadership positions. This is not expected in some Arabian countries. □ *Consider a demo showing a Ms. Jones as manager who then has to distribute her work via a work flow system to her male subordinates due to pregnancy. This demo cannot be salvaged for an Arabic country by simply renaming and redrawing Ms. Jones to a Mr. Jones...*
- **Overtime:** The acceptable amount of unpaid overtime work varies and has to be reflected in attendance recording and payroll programs.

Cultural Layer

Cultural divergence has to be reflected in system design due to its high impact on acceptability of a software product. The six cultural dimensions identified in (Hampden-Turner & Trompenaars, 2000) or the similar categories identified in (Hofstede & Hofstede, 2005) have to be observed when localizing software.

- **Taboos:** Taboos are ancient 'good practices' which have changed into religious or social interdiction, often void of meaning today. They are highly culturally dependent, highly sensitive and often not explicitly talked about. *In spring, 2006, Danish caricatures of the prophet Mohammed caused severe riots in Islamic countries*
- **Metaphors, puns, jargon:** Metaphors and puns are especially prone to cultural divergence. Jargon

is usually only used in certain subgroups. Their use easily causes misunderstandings and ineffective communication. Typically, sport metaphors may not come across if the sport is not played in certain countries. They are best avoided in favor of simple, short and direct messages (Lang, 2006).

- **Humor:** Humor very rarely carries over to another culture, being the result of the interplay of representation, meaning, and context (Bourges-Waldegg & Scrivener, 1998). Especially the context-information will often be lost during localization.

FUTURE TRENDS

The importance and pervasiveness of software products is growing globally. Inadequate localization will be increasingly detrimental to the perceived 'quality in use' (cf. ISO/IEC ISO9126) and user acceptance. We will see a diversification into several dimensions:

- **Subcultures:** While at the moment only 'main' cultures (e.g., South East Asia) are considered, at the price of ignoring subtle differences within those areas, more fine-grained subcultures will have to be identified and addressed in the future.
- **Religious differences:** The growing globalization of commerce together with the growing self-consciousness of the Second and Third World countries will have to be considered.
- **Sociological strata:** 'Horizontal strata' within a society will also receive more attention, e.g., young people, elderly people, different economic power, and so forth.
- **Shareable software products:** Growing (synchronous) cooperation via software products requires products *simultaneously* localized for several cultures (Barbour & Yeo, 1996; Bourges-Waldegg & Scrivener, 1998).
- **Testing and certification:** Adequate testing methods (beyond simple check lists and some good advice (Vine, 2006)) and hopefully automatic methods are needed to reduce the risk of inadequate localization. Certification of the localization of software is also under discussion (similar to ISO/IEC 9000).

- **Automation:** Higher levels of localization are becoming more difficult and resource consuming, especially with the growing difference between cultures. The growing demand on human involvement will limit the ambitions with respect to localization. Despite sophisticated programs helping with localization, fully automatic localization will be beyond reach.
- **Learning systems:** A different approach would be learning systems which gradually learn adequate localization by a mixture of tutoring and error recognition during actual work.

CONCLUSION

This chapter provides a systematic analysis of growing demands on localization, providing a hierarchy of layers, showing the dimension and complexity of the problems. Inadequate localization can have adverse business effects by reducing *effectiveness and productivity* due to misunderstood communication, misinterpretation of messages, sign and environment, due to anger and offence. It can be the source of *ridicule, embarrassment, or offence* and in the worst case result in broken personal and economic opportunities. Interpreting inadequate localization as incompetence will *diminish trust* and thus endanger business contacts. Users will experience less *satisfaction* up to rejection of products. It must be accepted that localization is an absolute necessity in the global economy. It is not cheap, but the extra expenses are usually compensated by increased usability of the product and thus by larger marketing revenue.

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KEY TERMS

Code Page: Maps a maximum of 256 characters of a given alphabet, including control characters and diacritical characters to a string of eight bits (Barbour & Yeo, 1996; Davis et al., 1996). Switching between alphabets for different languages means switching the code page. Most code pages are standardized in ISO/IEC 2022.

Culture: We understand *culture* as the shared complex system of language, value system, norms, religion, myths, beliefs, manners, behavior, and structure which is characteristic of a society or part of it.

Cultural Divergence: Hampden-Turner & Trompenaars (2000) describe six basic culture-defining dimensions (“cultural dilemmas”) differentiating various cultures on the sociological and cultural level (Changing Minds, 2006):

- Universalism-particularism
- Individualism-communitarianism
- Specificity-diffusion
- Achieved status - ascribed status
- Inner direction-outer direction
- Sequential time-synchronous time

In a similar study (Hofstede & Hofstede, 2005) identified five “Cultural Dimensions” which are to some extent overlapping with the previous list. They are:

- Power distance index
- Individualism (with the opposite, collectivism)
- Masculinity (with the opposite, femininity)
- Uncertainty avoidance index
- Long-term orientation (with the opposite, short-term orientation)

Human-Computer Interaction (HCI): The interdisciplinary study of interaction between people (users) and computers in all its aspects ranging from hardware and software interfaces to questions of information presentation, of psychological and ergonomic issues.

Internationalization: (also *i18n*) means the *enabling* of a software artefact to be adaptable (He et al., 2002; Kubota, 2003). A first step is the separation of text and code. IBM called this step ‘NLS enabling’. Sometimes it is also understood as ‘eliminating as many culture specifics as possible’ (Nakakoji, 1996).

Locale: A subset of a user’s environment that defines conventions for a specified culture (He et al., 2002; Herden, 2006; Kubota, 2003; Trager, 2006) which affects the representation of many concepts and objects.

- Text representations (characters, punctuation, symbols, addresses, currency symbols ...)
- Numerics (date/time, currency, telephone numbers, measures, decimal and list separators...)
- Sequencing (character sorting order, character search orders, word wrap...)
- Graphics (icons, banners, colors, buttons...)
- Sounds (type, intensity,...)
- Translation for geographic names

Localization: (also called *i10n* (He et al., 2002)) is the process of adapting a product to reflect the local standards, culture and language of a specific other market (Ishida & Miller, 2005) (GSSI, 2000). It includes translating the user interface, customizing features, exchanging culturally dependent texts, pictures, animations and metaphors (see also SDL International, 2006). To circumvent the non-uniformity of the mapping of national characters into code pages (Barbour & Yeo, 1996; Davis et al., 1996) Unicode as an industry standard and the parallel standard ISO/IEC 10646 (‘universal character set’) try to consistently represent all existing writing systems using a word with several bytes.

National Language Support (NLS): Historical term for localization, essentially only considering the representation of characters (Hensch, 2005).