Sapient Report

Translation is not enough.

Considerations for global Internet development

John Harris and Ryan McCormack
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The digital economy is unavoidably global, yet truly globalized e-businesses are still rare. Global Internet development is not a simple undertaking. It involves a variety of complex issues, and translation is just the tip of the iceberg. Failure to adequately address globalization can alienate entire markets and erode the relationship between your company and the marketplace. Consideration of all aspects of global Internet development can ensure your place in the new economy, enabling your business to take advantage of a world of new possibilities.

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Introduction

The Internet is a global phenomenon. It knows no national boundaries, and actions within its virtual space are not subject to the limitations of the physical world. As a result, business can be conducted on the Internet in ways that would not otherwise be possible. A vast world marketplace awaits, with all of the attendant consumers and competition this implies. It is an exciting time, indeed, but businesses must not be blinded by the promises of the new global economy. Reaping the Internet's potential rewards requires more than just making your business Internet-enabled. If you want to offer your services to the world, and compete in the new global marketplace, you must fundamentally change the way you think about business.

Global Internet development is about adapting your product and message to meet the varied expectations of markets around the world. There isn't any universal recipe to achieve this end. Producing a global offering requires careful consideration of linguistic, cultural, economic, and legislative differences. In the past, only the largest companies have attempted to create a truly global brand presence. Companies not ready to compete at this level simply confined themselves to a domestic market, or a very limited subset of global markets. The Internet radically modifies the picture—erasing distance, lowering the barriers of entry to the global marketplace, and fostering an atmosphere of hyper-competition. Even businesses with traditional globalization strategies must adopt new strategies or face real jeopardy.

New and old businesses alike must contend with the challenge of how best to function in the global Internet economy. Initially, global Internet development may appear to be merely a matter of language translation. But translation is not the panacea many companies—and globalization consultants—assume it to be. Even though it is an integral part of globalization, translation only addresses some of the issues faced when competing in a culturally diverse marketplace. Nor is globalization a simple extension of the existing localization practices common in the software development industry. Localization of software is usually a one-time occurrence: during installation, the software is tailored to meet the cultural requirements of the user, and it is assumed that these requirements and the user's location will not change. An Internet system, on the other hand, may have to simultaneously provide localized services to users in dozens of different countries while meeting strict performance requirements and handling dynamically changing content.

The following report presents an iterative approach for global Internet development. Our approach focuses on finding a cost-effective balance between three crucial elements: market selection, internationalization, and localization.

Business context

The advent of the Internet has brought a substantial reduction in the cost of entry to global markets. For the first time, small and large businesses alike can now extend their businesses globally, a capability that was previously restricted to the largest multinational corporations. Suddenly, a wide spectrum of businesses—from those using the Internet solely for e-mail to those engaging in end-to-end Web commerce—must decide if and how to globalize. As the following diagram shows, the more sophisticated your Internet or Web offering, the more complex global Internet development will be.
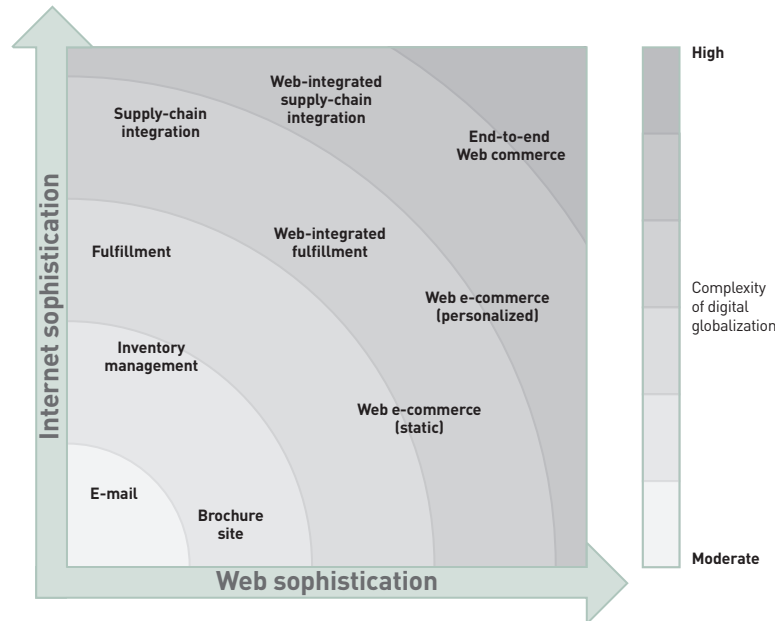

Figure 1: The business spectrum of digital globalization
The complexity of globalization increases with Web and Internet sophistication. (Note: We define the Internet as the network infrastructure and standard protocols that connect computer systems around the globe. The Internet in turn supports the Web, which is a network of software systems with certain standard protocols such as HTTP.)

Regardless of the degree of complexity, however, global Internet development clearly offers significant rewards. Forrester Research found that early movers in Web globalization cite a greater number of longer visits, higher sales, and more satisfied customers (DePalma et al. 1998):

• Visitors linger twice as long at multilingual sites, compared to English-only sites.
• Business users are three times as likely to buy when addressed in their own language.
• Customer service costs drop when instructions are displayed in the user's native language.

A number of other research firms predict rapid rates of growth for international Internet markets. According to International Data Corporation (IDC), the number of Internet users in the Asia-Pacific region (excluding Japan) grew from 12.9 million users in 1998 to 21.8 million by the end of 1999 (Glasheen 1999). IDC also reported an increase in Internet spending in the region, from $722.7 million (U.S.) in 1998 to over $2.2 billion (U.S.) in 1999. And by 2003, IDC predicts, Internet commerce in Europe will be the same size as in the United States.

Developing an implementation strategy

Sound global Internet development is based on a simultaneous consideration of three separate but interdependent elements:

Market selection
A ranking of potential national market segments (i.e., countries) to target in the globalization effort.

Internationalization
The ways in which systems and business processes are designed so they can support multiple countries easily.

Localization
The extent to which systems and business processes are tailored to meet the needs and cultural expectations of audiences within identified markets.

In an ideal world, one would simply select all 239 countries, choose to localize all aspects of business in these countries, and then internationalize for the 6,700 languages, 147 currencies, 10 calendars, 24 time zones, and numerous postcode systems, geographic location systems, and weights and measures. In the real business world, this all-inclusive approach would clearly be too time-consuming and costly.

The intelligent globalization solution involves choosing the right markets, then internationalizing and localizing to the appropriate degrees within these markets. Development based on the trinity of digital globalization elements involves finding a balance between them, within the context of a given business strategy. The cost, benefit, and speed-to-market of a digital globalization initiative is then determined by this balance.

Market selection—choosing your business world

In business, knowing your audience is key, and in digital globalization, choosing national markets (i.e., countries) defines your audience. Assuming your business already has a target demographic in its country of origin, the next task is to identify countries that not only contain this demographic but also meet a set of other economic, legal, and strategic criteria. These criteria allow the determination of those countries that must be included in a globalization effort, those that must be excluded, and those that warrant a more detailed examination.

Criteria for automatic inclusion

Countries that satisfy any of the following criteria could automatically be included in globalization efforts:
- Countries that already account for significant revenue
- Countries in which your business already has a significant e-business presence
- Countries with large physical presences or countries with strategic regional importance (e.g., Germany in Europe)

Criteria for automatic exclusion

Countries that satisfy any of the following criteria could automatically be excluded from consideration. If, at some point in the future, these criteria no longer apply, then the country may be reconsidered.
- Countries that would not be a significant source of revenue
- Countries whose local laws do not support the required intellectual property rights or copyrights
- Countries that are subject to trade embargoes or other internationally imposed sanctions

Criteria for detailed examination

A more detailed examination is needed for countries that are not clear candidates for either inclusion or exclusion. A scoring scheme should be developed to rank these countries. This scheme should rate countries based on significant economic, strategic, or business parameters, each of which should then be weighted. This allows the determination of a representative score (i.e., a weighted average) for each potential country. Parameters could include the following:

Economic viability
- Current market size
- Potential market size
- Current market penetration
- Presence or absence of competition
- Current revenue
- Target revenue

Internet readiness
- Internet penetration
- Rate of Internet growth
- Internet usage (e.g., willingness to purchase online)
- Infrastructure capabilities

Business capability
- Size of in-country business presence
- Experience with brand localization
- Existing translation capabilities

Internationalization—designing business systems for multiple countries

In the software development industry, the term "internationalization" is used to describe the process of enabling a single software product to support usage in multiple countries. In essence, internationalization involves designing systems so that culture-specific parameters (e.g., language or currency) are decoupled from system functionality. A simple example would be the error messages generated by a software system. Instead of hard-coding error messages in English, an internationalized system might store messages in a file or database removed from the generating code. The system would then provide a means to detect the current language setting, select the appropriate error message, and then display it.

In the past, due to its high cost, internationalization has only been implemented by larger software manufacturers for their most popular product lines. The advent of the Internet and its global span compels all e-businesses to consider the benefits of internationalization. This is especially true when one considers the relative ease of localization for a system that has been internationalized. Once the importance of internationalization has been recognized, the question then becomes which parameters need to be internationalized? Many international data standards have been developed that can play a significant role in simplifying internationalization problems. Standards aid internationalization by helping to avoid duplication of effort and by facilitating information exchange between culturally distinct people and organizations.

Cultural conventions and their domains of application

Successful human communication and commerce requires the existence of cultural conventions. These conventions have evolved over thousands of years, and include languages, writing systems, weights and measures, currencies, and legal systems. For a society to work efficiently, these conventions must be accepted and used by all. In most cases, countries have determined standards for these conventions, and their use is either encouraged or enforced through national legal systems. Countries can therefore be treated as atomic cultural units. For the purposes of this document, it is thus assumed that the variation in cultural conventions within countries is insignificant, while that between countries is significant. Obviously, there are exceptions to this assumption.

To facilitate international commerce there is a growing tendency to derive global standards from successful national standards. English is becoming the global business language, the Gregorian calendar is commonly used for business, and the U.S. dollar
is the currency against which others are measured. None of these systems were ever formally adopted as international standards, but they are accepted and used today throughout the business world.

Various international bodies are also attempting to develop standards that can be adopted universally. The metric system is now standard in all but three countries. The European Union is trying to standardize on the ECU as the unit of currency. In addition, the International Standards Organization (ISO) has produced many standards, including a country code that has been adopted for multiple purposes, from Internet domain names to international shipping. The process of adopting international standards is far from complete. There are still major discrepancies between the standards used in different countries.

Internationalization parameters

It is necessary, when internationalizing a system, to determine those elements of a culture that will be supported by the system. We will refer to these cultural features as "internationalization parameters" (or simply parameters). Examples of internationalization parameters include the following:

- Language
- Writing system
- Currency
- Calendar
- Time zone
- Time measurement system
- Weights and measures
- Geographic location system
- Postcode system
- Telephone dialing codes

The table below illustrates some parameters and compares the standards used in the U.S. and Japan.

Parameter	U.S. standard	Japanese standard
Language	English	Japanese
Writing system	Latin	Katakana, Hiragana, Kanji, Latin
Weights and measures	U.S. Customary System	Metric SI
Calendar	Gregorian	Gregorian, Gengo
Time zone	UTC-4, UTC-5, UTC-6, UTC-7, UTC-8, UTC-9	UTC+9
Currency	Dollars ($)	Yen (¥)
Geographic location system	GPS, U.S. Postal Service ZIP code system	GPS, Japanese postcode system
Taxation	Federal and state	National
Business practices	Determined locally	Determined locally
Import duties and customs	Determined locally	Determined locally
Legal system	Determined locally	Determined locally

Market segmentation within countries

Market segments with similar demographics and psychographics often exist in multiple countries. However, it is unlikely that these national segments can be addressed in the same way. Each country's segment must be addressed according to the cultural conventions that are most appropriate. For example, a Japanese market segment should most likely be addressed in Japanese using the Katakana, Hiragana, and Kanji writing systems with all measurements given using the metric system.

This complexity is the reason there are so few fully globalized e-businesses. While the Internet allows access to a much larger global market, that market is fragmented into national segments that are separated by different cultural conventions.

Localization—meeting cultural expectations

Like "internationalization," the term "localization" was coined by software and operating system developers. It describes the process of customizing and configuring a software system for a particular region or country (i.e., locale) other than the one where the software was developed. Essentially, localization means tailoring software systems to meet the cultural expectations of their user base.

Localization features

Contrary to what many people assume, localization is not merely about text translation. In the context of digital globalization, localization implies examining and potentially modifying systems in a number of interrelated areas, which we will hereafter refer to as localization features. The five major localization features we will consider are:

Brand
The communication systems (e.g., voice, tone, imagery) attached to an Internet presence, with attributes that can easily be associated with the business behind it. The brand is the synthesis of all the elements the audience experiences.

Information architecture
The visual layout of information, the grouping of information, the flow path(s) between logically connected groups, and the low-level data structures for information. This could refer to a software application or to a Web site.

Visual design
A visual system using color, typography, illustration, and imagery, which is integrated with any relevant user interface elements (e.g., information architecture, application functionality) in order to communicate the brand.

Application functionality
The task performed by a given software or Web-based application.

Content
A system of words, images, audio, and video that is integrated with information architecture and visual design to communicate the brand.

These features are clearly structured into a hierarchy, but the hierarchy is not strict. In many cases, localization at a given level implies localization at all levels beneath it. However, a flexible approach should be adopted, one that does not presume a single solution for every business. For example, it's easy to envision a situation that calls for localization of content and visual design but not localization of functionality.

Developing an implementation strategy Localization

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Business process localization

In addition to the five localization features presented above, it is also crucial to consider the degree to which business processes need to be localized. This aspect of localization involves setting up business processes to ensure smooth operation in varying locales. At one end of the spectrum, a completely centralized management structure could be used to govern all operations across the world. At the other end of the spectrum, local branches could be set up to manage operations in each locale.

A realistic solution probably lies somewhere between these two extremes, with a mixture of centralized and distributed management. Processes that should be managed centrally include those where economies of scale warrant a central approach, and where central control would ensure global consistency. Processes that should be distributed and managed locally include those where local control allows precise tailoring to local market requirements and more rapid response to changes.

Below are some examples of how processes could be managed centrally, locally, or as some combination.

• Marketing strategy and brand attributes could be determined centrally, but local centers would be given the task of implementing the strategy and the freedom to define the brand voice and imagery as they see fit.
• A global content management strategy could allow for major content areas to be generated centrally, but would enable local countries to manage the translation process.
• Fulfillment of orders could be outsourced to regional fulfillment centers to avoid many customs issues and allow for faster, cheaper delivery. It should be noted, however, that this introduces the overhead of managing multiple centers.
• Global customer support services could be centralized in Europe, where the employment pool contains fluent speakers of many languages. By centralizing, it becomes easier to maintain round-the-clock customer service.

The interrelationship between localization and internationalization

In practice, the effort required to localize a system varies depending on whether the system has been internationalized. There is no implicit requirement that a system be internationalized in order to be localized. However, localization for a non-internationalized system is usually very expensive and time-consuming; extensive low-level redevelopment and prolonged testing are often required. It is an exhaustive and detail-oriented task that can require modification of an entire codebase. By contrast, a system designed with a framework for supporting multiple countries (i.e., one that has been internationalized) will be much easier to localize. In this case, localization will involve dialing in the appropriate values for parameters that have been internationalized (e.g., language), and then structuring the presentation of those parameters appropriately for display.

It is important to note that while internationalization and localization are distinct processes with different aims, they are interrelated and complementary; each informs the other at various points in the development and implementation of a global Internet solution.

Iteration

In order to develop a strategy for global Internet development, it is necessary to find a balance between the selected markets, the localization features chosen for those markets, and the degree of internationalization. Decisions about any one of these things cannot be made without consideration of the others. This interrelationship dictates an iterative approach to Internet development, as shown in Figure 2.
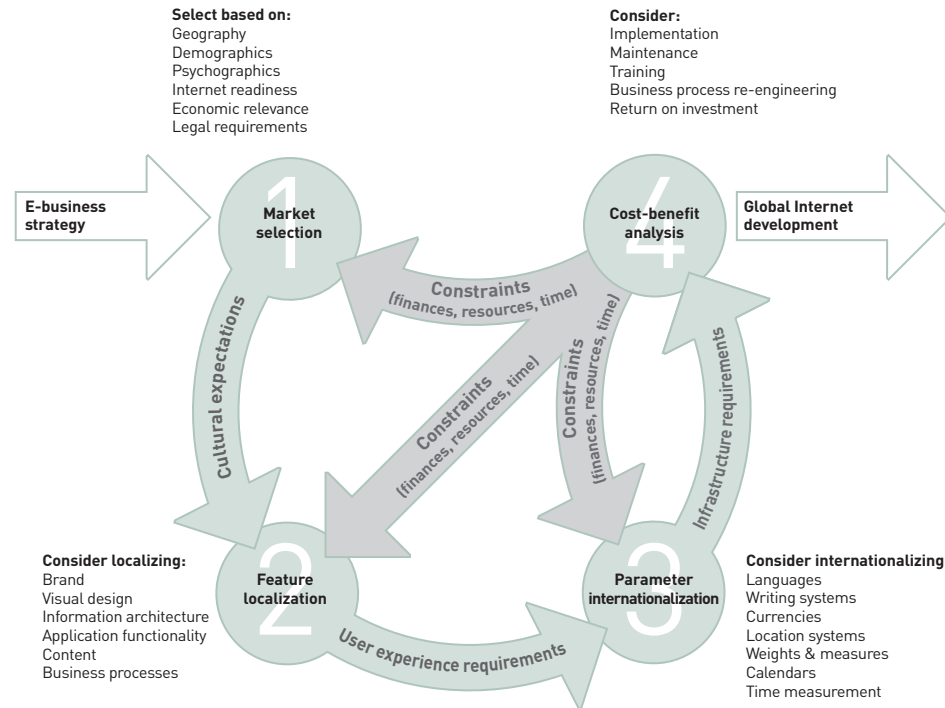

Select based on:
Geography
Demographics
Psychographics
Internet readiness
Economic relevance
Legal requirements

Consider:
Implementation
Maintenance
Training
Business process re-engineering
Return on investment

E-business strategy

1 Market selection

4 Cost-benefit analysis

Global Internet development

Constraints (finances, resources, time)

Constraints (finances, resources, time)

Constraints (finances, resources, time)

Cultural expectations

Infrastructure requirements

Consider localizing:
Brand
Visual design
Information architecture
Application functionality
Content
Business processes

2 Feature localization

3 Parameter internationalization

Consider internationalizing:
Languages
Writing systems
Currencies
Location systems
Weights & measures
Calendars
Time measurement

User experience requirements

Figure 2: A global Internet development strategy
A globalization strategy can be developed from an e-business strategy through an iterative four-stage approach.

The iterative approach proceeds as follows:

Baseline strategy and business development: In developing a method for global Internet development, the following elements should already be in place before a business embarks on the process:
- Clearly articulated business and e-business strategies
- A knowledge of target markets in the country of origin
- A brand identity strategy

Market selection: Beginning with an e-business strategy, select the group of markets (countries) in which globalization seems desirable. Geography, demographics, Internet readiness, and economic relevance should all be considered when selecting potential markets.

Localization: For each market selected, there is a set of cultural expectations to be met regarding how an Internet presence should behave. Based on these expectations, localization features can be selected for each market. Brand, information architecture, visual design, application functionality, content, and business processes should be considered. Localization features need not apply across all selected markets. For example, it may be that brand only needs to be localized in a subset of the markets chosen.

Internationalization: For the given markets and localization features, internationalization parameters can then be decided upon. All relevant parameters should be given due consideration. In some cases, localization features can dictate internationalization parameters (e.g., if one business application to be localized involves e-commerce functionality, it may imply currency as an internationalization parameter). Note that not all localization features require internationalization; it may in fact be more cost-effective in some cases to localize systems without internationalizing them. However, if a parameter is internationalized, it is for the express purpose of localizing it at a later date.

Cost-benefit analysis: With all of the elements of a global Internet development strategy chosen, it is possible to perform a cost-benefit analysis. In determining costs, one should consider not only implementation costs, but also the costs of business process re-engineering, maintenance, and training (to name a few). These costs can then be weighed against the benefits (strategic and financial) offered by globalizing in various markets.

Optimization: The cost-benefit analysis may reveal points in the initial global Internet development strategy that are not viable. For example, it may be that the cost of internationalizing language and writing systems for the Chinese market is too high, whereas localization is manageable. In order to optimize the strategy, one can add or remove markets, localization features within markets, or internationalization parameters. Depending on what is added or removed, it may be necessary to revisit features to be localized, or parameters to be internationalized. After each set of adjustments, the cost-benefit analysis is adjusted accordingly, and the viability of the strategy is revisited.

When the cost-benefit ratio is deemed optimal, the result should be a global Internet development strategy with the following elements:
- National markets to be pursued
- Features to be localized within the selected countries
- General notions about the level of business process localization required
- Parameters to be internationalized within various business systems
- A knowledge of the costs and benefits of the chosen globalization approach

High-level features of a global Internet development strategy

Regardless of the specifics surrounding a global Internet development strategy, it should have these three general features:

Flexibility: The strategy must be flexible in the approach taken toward globalization across markets. Localization features applicable in one market may not apply in another. Internationalization parameters deemed critical to support a single market may render the strategy as a whole completely cost-ineffective. There is no single, correct solution, and any business strategy must be open to trade-offs.

Adaptability: World and national financial markets change. The Internet changes. National politics and laws change. Any globalization strategy must be able to adapt to these types of changes.

Manageability: It must be possible to implement a stable management structure for a globalized e-business. This is particularly relevant when considering business process localization, since one obvious thing to localize would be management of country-specific e-business functions.

Strategy vs. implementation

Once a business has settled on a particular approach to globalization, it will need to develop an implementation plan. Implementation is beyond the scope of this document. However, it should be noted that implementation may—and probably should—proceed along slightly different lines as the iterative process described above. For example, implementation could involve the following steps:

- Perform the required business process localization
- Internationalize relevant parameters
- Localize internationalized features within selected markets
- Localize non-internationalized features within selected markets

Some of these steps may be done concurrently. A staged approach could also be taken, performing globalization for the most strategic countries first. Many other ways of implementing a globalization initiative are possible. The method chosen for a given strategy will depend on the unique challenges of each case.

Market analysis

The following illustrations provide examples of the kind of analysis that must be performed to identify target markets. In reality such analysis must be performed in much greater detail and must consider many more parameters. These examples compare national markets using gross metrics, as such they only provide a high level overview of Internet adoption and relative economic strength.

Total market size by GDP

One of the obvious factors affecting market selection is economic relevance, and the size of a given market is one metric for this relevance. The illustration below provides a high-level overview of the relative size of various national markets based on their 1999 GDP. Several interesting conclusions can be drawn from studying this map:

- Canada, commonly the first choice for U.S. organizations starting to internationalize, is a relatively small market and may not be the best first choice.
- Japan, a country with difficult internationalization and localization requirements, is a huge market.
- Europe, a diverse market, is the largest in the world.
- Africa is a very small market.
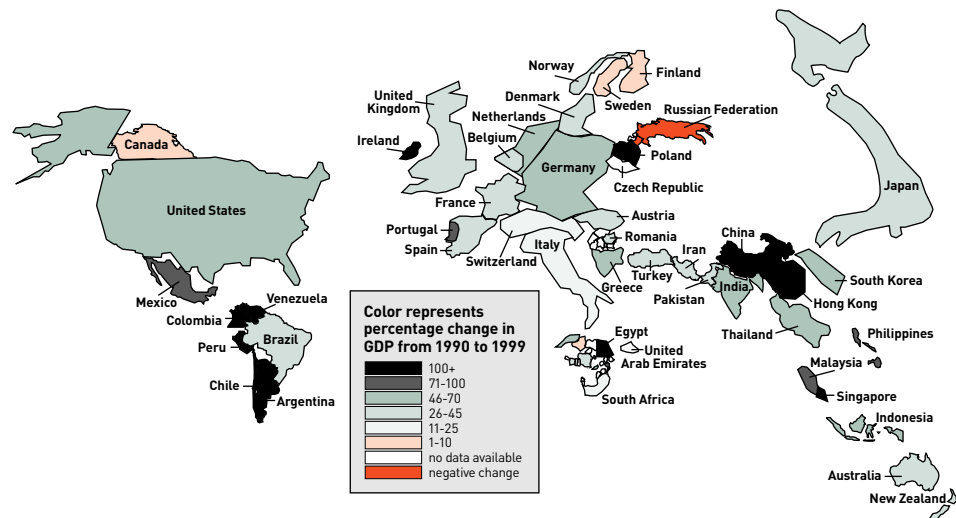- South Korea, Hong Kong, and Taiwan together are significant.

Figure 3: Current market size (GDP) of major countries
The map has been scaled so that the area of each country is proportional to its 1999 GDP. Countries not shown have relatively insignificant GDP values.
Source: Sapient Analysis based on data from The World Bank

Projected relative GDP growth rates

Economic relevance is clearly something that can change over time, so it is also important to examine relevance with an eye toward the future. The graph below shows the predictions of the International Monetary Fund (IMF) World Economic Outlook for 1999. The percentage of total world GDP is plotted against time for six major economic regions over the next 20 years. The main prediction shown is that of the rapid rise of China as the dominant economic region of the world. Also of note is the less rapid, but still significant, rise of India.
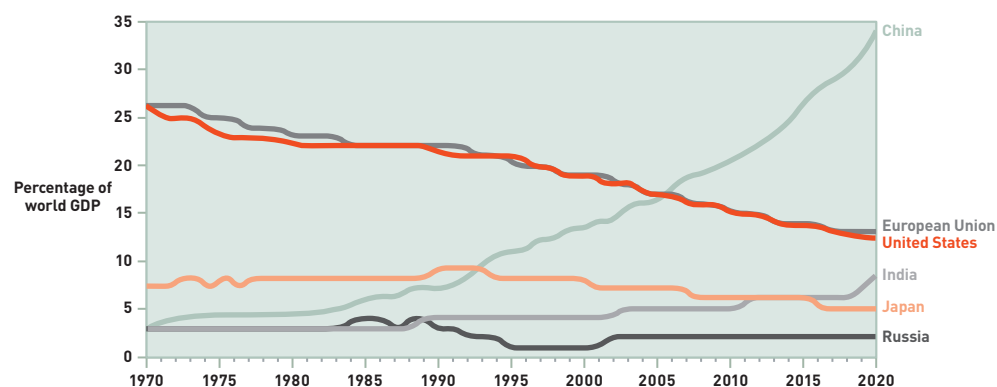

Figure 4: Major world market projections
The chart illustrates projected GDP growth for six major world markets (shown as a percentage of world GDP). Based on these projections, by 2020 China and India will have a combined GDP greater than the combined GDP of the United States and the European Union.
Source: International Monetary Fund

National e-business readiness

Another factor to consider in market selection is whether a country can support competition in the Internet space. As a rough measure of national e-business readiness, we have examined the average per capita wealth of countries as it relates to the density of Internet servers. The rationale for using this as a metric for e-business readiness is that two things are required for e-business: capital (with which one purchases goods) and the infrastructure to conduct transactions online.

In Figure 5, countries at the top right of each chart are the wealthiest and have the highest Internet penetration, while those at the bottom left are the poorest with the lowest Internet penetration. Figure 5 also includes a layer of information regarding population, which is an indicator of potential market size. The diagram reveals roughly five groupings of countries in the world:
• Internet leaders
• Internet followers
• Emerging Internet nations
• Trailing Internet nations
• Currently left behind by the Internet

There is one important caveat to consider when examining this diagram. The data represents average values for entire populations and may not be accurate for specific market segments. For example, while on average India appears to have been outdistanced by the Internet, there may be substantial market segments that make extensive use of the Internet and have a relatively high per capita income.
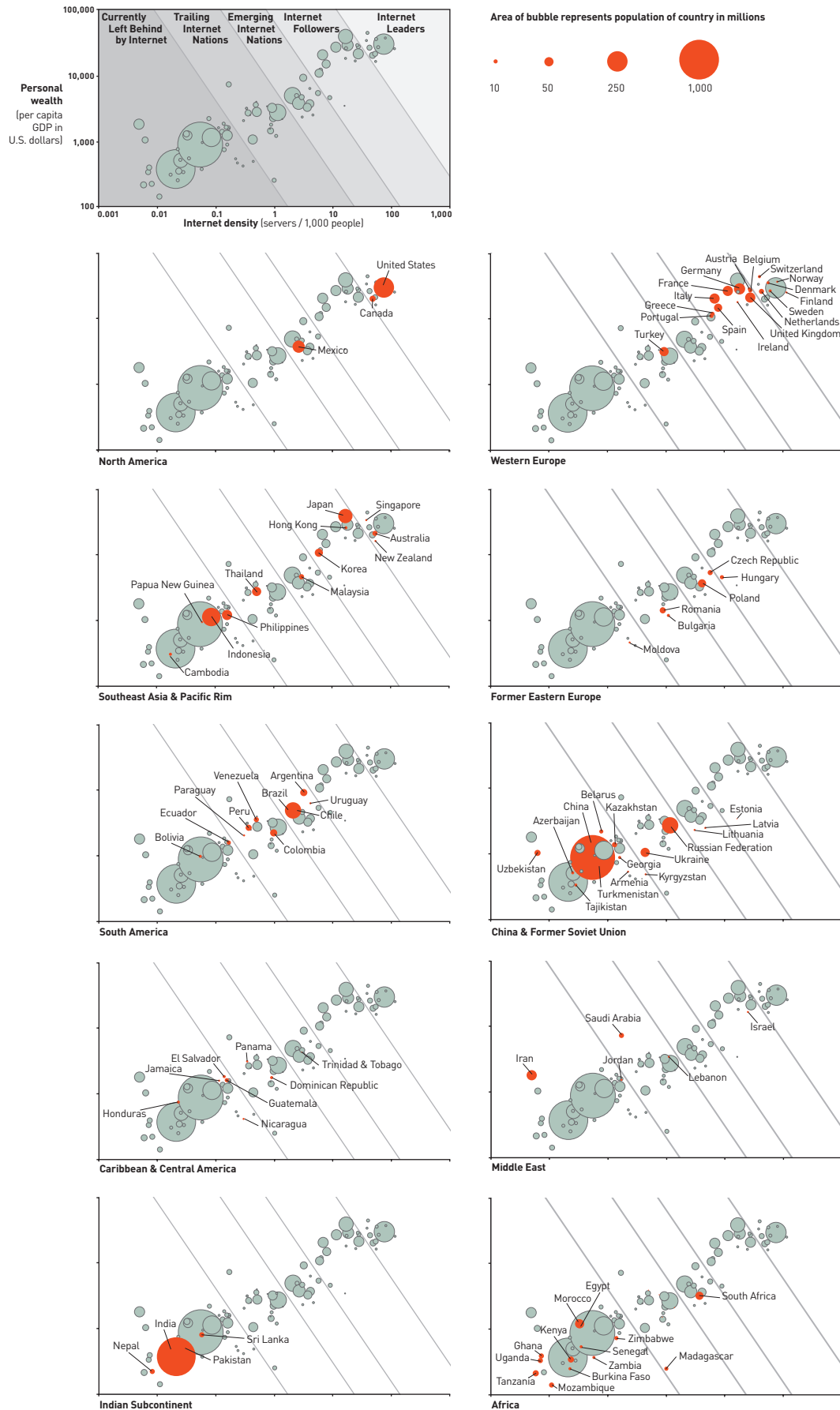
Figure 5: National e-business readiness
Source: Sapient Analysis based on data from The World Bank and The Internet Consortium

Internationalization parameters

In the following section, we provide a more detailed discussion of the various parameters that will make up an internationalization strategy. Relevant national or international standards are provided where they are available.

Countries

Countries are often synonymous with cultures. Countries with stable homogenous cultures, such as Japan and France, tend to have more stable borders. Where countries contain multiple cultures, their boundaries have historically been more volatile. The former Yugoslavia is an example of this kind of volatility. Countries are continually being created, re-created, renamed, and in some cases destroyed. This process is happening so fast that attempts to authoritatively define the number of countries in the world are usually ambiguous.

There are 239 countries defined by the International Standards Organization in its "code for representing the names of countries, dependencies, and other areas of special geo-political interest for the purposes of international interchange" (ISO 3166-1). By contrast, there are 263 countries defined by the U.S. government's FIPS 10-4 code, which is "intended for general use throughout the U.S. government, especially in activities associated with the mission of the Department of State and national defense programs" (Central Intelligence Agency 1999). These two codes are the most commonly used in the world today. The discrepancies between them are mostly due to small islands and disputed territories.

Languages

Language is one of the primary differentiators for many cultures. Indeed, disputes over language usage in culturally diverse regions have led to conflict throughout history. The importance of language clearly makes language-related functions prime targets for internationalization. This is no simple task, however. Languages are extremely diverse, and they change very rapidly. Languages can develop or die out in a single generation. The latest edition of the *Ethnologue* (Grimes et al. 1999) identifies 6,700 living languages in the world. It is worth noting, though, that only 435 of those languages are included in ISO 639-2 (1996), a code intended for commercial use.

Only a small fraction of living languages are spoken by a significant number of people. Most living languages have less than 10,000 native speakers. The popularity of languages varies enormously. The 15 most commonly spoken languages in the world account for 49.5% of the world's population. The remaining 51.5% of the population speak over 6,600 languages between them (see Figure 6). At a high level, there are:
• 100 languages with more than 10 million native speakers
• 20 languages with more than 50 million native speakers
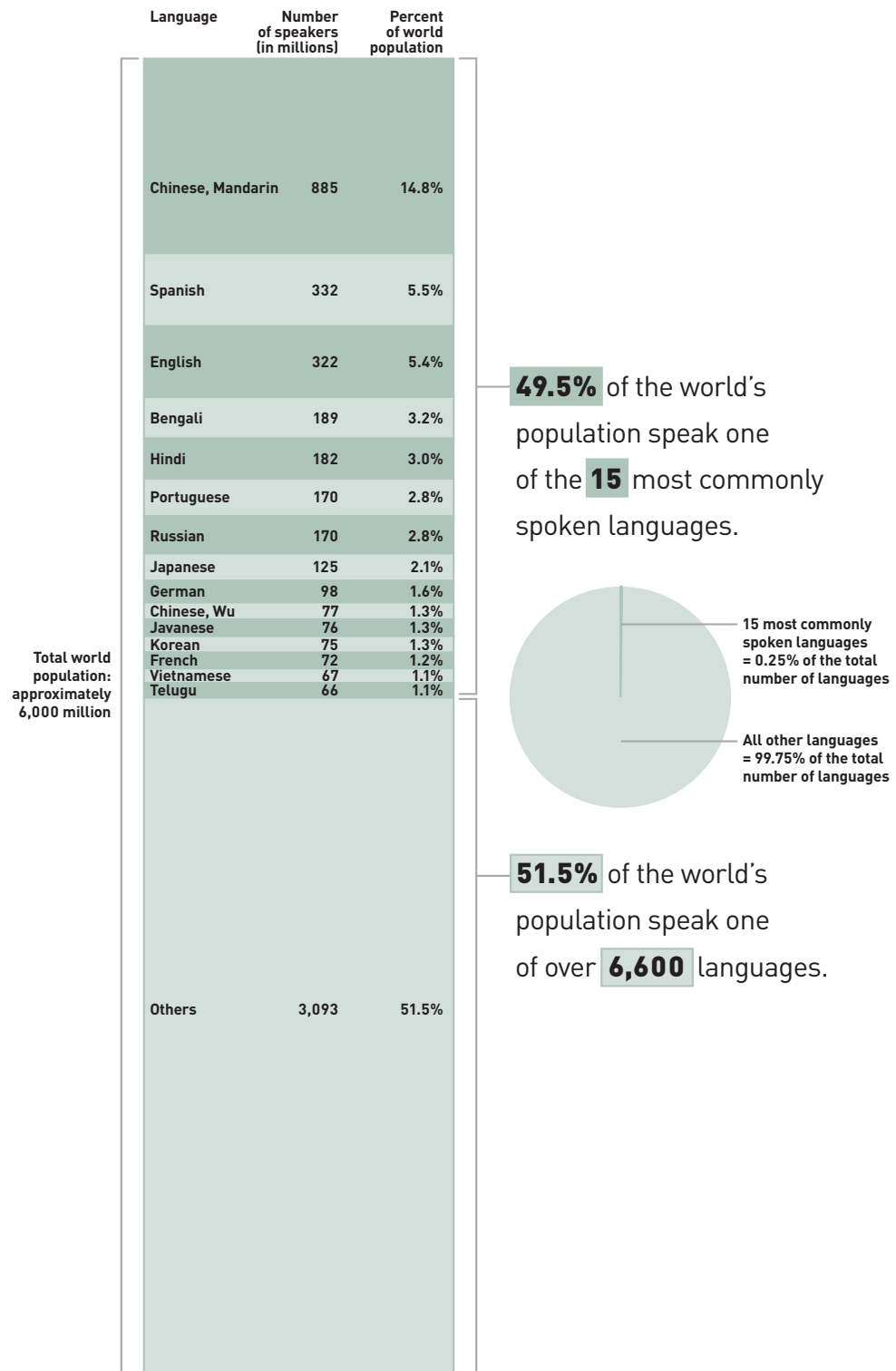• 8 languages with more than 100 million native speakers

Language	Number of speakers (in millions)	Percent of world population
Chinese, Mandarin	885	14.8%
Spanish	332	5.5%
English	322	5.4%
Bengali	189	3.2%
Hindi	182	3.0%
Portuguese	170	2.8%
Russian	170	2.8%
Japanese	125	2.1%
German	98	1.6%
Chinese, Wu	77	1.3%
Javanese	76	1.3%
Korean	75	1.3%
French	72	1.2%
Vietnamese	67	1.1%
Telugu	66	1.1%
Others	3,093	51.5%

Total world population: approximately 6,000 million

49.5% of the world's population speak one of the **15** most commonly spoken languages.

15 most commonly spoken languages = 0.25% of the total number of languages

All other languages = 99.75% of the total number of languages

51.5% of the world's population speak one of over **6,600** languages.

Figure 6: World language usage
Source: Ethnologue

Writing systems

Languages are visually represented using writing systems, each of which is composed of a set of characters. At present, there are roughly 30 living writing systems in the world, where a living system is defined as one used for newspapers, stamps, and/or currency. The spread and evolution of writing systems seems to have followed the spread of religious and political power, since religious texts were one of the first uses of writing. The following map shows the geographic distribution of living writing systems in the world.
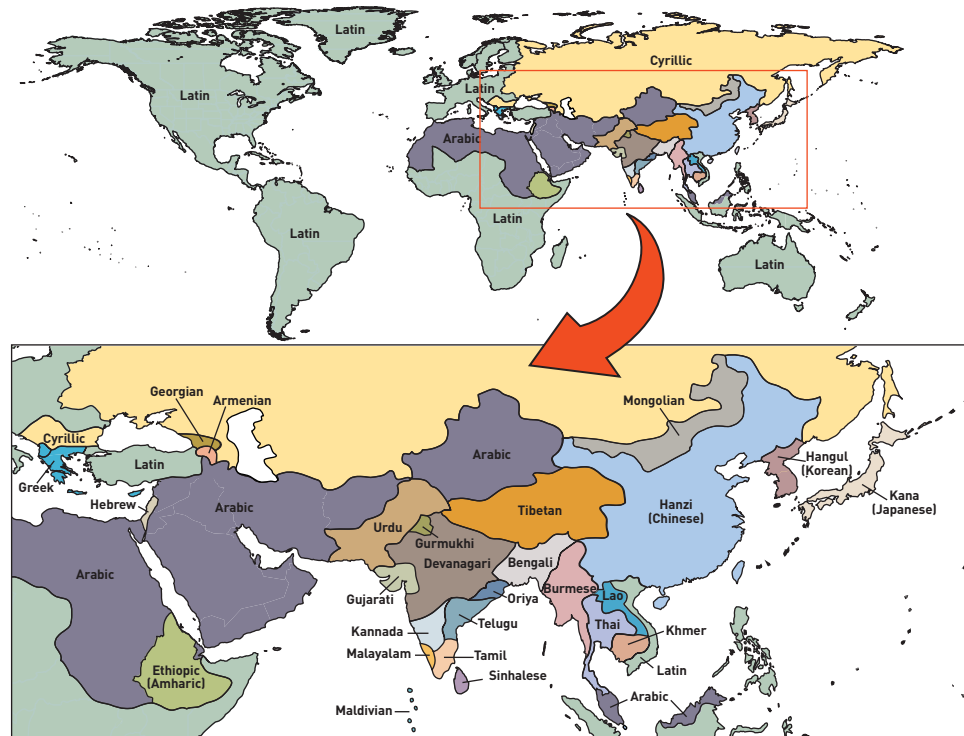

Figure 7: Writing systems of the world as used in major newspapers
Source: Writing Systems of the World

Writing systems are often thought of as synonymous with languages. However, this is not the case. In some instances, a number of languages may share the same writing system. For example, the Latin and Cyrillic writing systems are each used by many languages. In other cases, a writing system may be used by only one language. For example, the Greek, Telugu, and Hangul writing systems are each used by only one language (Greek, Telugu, and Korean, respectively). In still other cases, a given language may have no corresponding writing system.

One widely accepted classification for writing systems is as follows:

Phonetic systems: Each character corresponds to one or more sounds.
- Phonemic systems (alphabets): Each character represents a phoneme (the smallest unit of speech). Examples: Latin, Greek, Cyrillic, Arabic, Bengali, Armenian.

- Syllabic systems (syllabaries): Each character represents a syllable. Examples: Katakana (Japanese), Hiragana (Japanese), Hangul (Korean).

Ideogrammatic systems: Each character represents a concept. Examples: Hanzi (Chinese), Kanji (Japanese).

Writing systems have a major impact on the way information is presented. Direction of script varies significantly between writing systems. The direction of Latin script is from left to right, top to bottom. The direction of Japanese scripts is generally from top to bottom, right to left—although there can be a mixture of directions on a single page. Not only does direction of script vary between systems, but the method used to sort words differs as well. The Latin writing system sorts words and letters using a process based on a fixed sequence called alphabetical order (A to Z). The Japanese Hiragana writing system arranges the syllables in the order they appear in a famous Buddhist poem. The Chinese Hanzi writing system orders symbols by the number of brush strokes it takes to draw them (Coulmas 1996).

Writing system encoding

In order to successfully internationalize writing systems, it is important to understand their digital representation. Encoding schemes are used to represent the characters of a writing system for computer manipulation. This is achieved by mapping bit sequences onto characters. The complete encoding scheme for a writing system is called its character set. A single-byte character set containing 8 bits per character (e.g., ASCII or ISO 8859-1) can only represent 256 characters. This is barely sufficient for a single writing system, let alone all 30 living writing systems. To rectify this situation, the International Standards Organization developed a specification for a double-byte encoding system called ISO 10646. A double-byte system uses two bytes (16 bits) to record each character and can thus theoretically encode 65,536 characters.

The ISO 10646 standard has been adopted by the Unicode consortium, which is responsible for producing Unicode v2.0. "Unicode begins with U.S.-ASCII and ISO-8859-1, but goes beyond the 8-bit barrier and encodes all the world's [writing systems] in a 16-bit space and a 20-bit extension zone for everything that does not fit into the 16-bit space. The ASCII-compatible Unicode transformation scheme UTF-8 lets all ASCII characters pass through transparently and encodes all other characters as unambiguous 8-bit character sequences" (Czyborra 1998). Unicode is the encoding scheme compatible with internationalization objectives; hence, systems that support it (e.g., Java) are highly desirable from a globalization standpoint.

Currencies

Currency is involved in most commerce, and is thus another prime target of internationalization. There are 147 currencies defined by the International Standards Organization (ISO 4217). It is interesting to note the difference between this figure and the 239 countries recognized by the ISO. Many countries do not have their own currency; still others accept multiple currencies.

Many potential customers in countries around the world expect to purchase goods using their own currencies. While offering them this service is desirable, it can also expose an organization to considerable risk if not done correctly. Consider the arbitrage that can result when selling products in multiple countries using different currencies. Currency conversion rates fluctuate on a very short time scale due to trading in global currency markets. This fluctuation makes the setting of fixed prices in different countries difficult to coordinate. The fluctuation of exchange rates can result in situations where it is profitable to buy a product in a foreign country using a foreign currency and then import the goods and re-sell them. This is particularly true of high-value goods that can be easily shipped. This is already a problem for some multinational manufacturers of automobiles and cell phones. The Internet makes this form of arbitrage even easier.

Weights and measures

Commerce often involves the exchange of fixed quantities of goods or materials that meet certain dimensional specifications. For this reason, it is important to consider internationalizing weights and measures. The International System of Units (SI), or metric system, is effectively the world standard for measurement. A few countries still cling to old systems: "At this time, only three countries—Burma, Liberia, and the U.S.— have not adopted the International System of Units as their official system of weights and measures. Although use of the metric system has been sanctioned by law in the U.S. since 1866, it has been slow in displacing the American adaptation of the British Imperial System known as the U.S. Customary System. The U.S. is the only industrialized nation that does not mainly use the metric system in its commercial and standards activities, but there is increasing acceptance in science, medicine, government, and many sectors of industry" (Central Intelligence Agency 1999). A dramatic example of how oversights in this area can lead to disaster can be found in the accidental destruction of NASA's Mars Climate Orbiter in 1999. The root cause of the loss of the spacecraft was the failed translation of U.S. Customary units into metric units in one segment of navigation-related mission software.

Weights and measures present one of the few cases in internationalization where the course of action is clear. A U.S. company expanding into global markets must embrace the metric system, for the simple reason that no other country in the world uses the U.S. Customary System. A foreign organization seeking access to American markets must similarly adapt to the U.S. Customary System, or risk alienating U.S. customers or business partners.

In addition to standardized weights and measures, there are many types of measurement systems that are not covered by the metric system. Clothing, shoes, beds, and many other goods use local units of measure that make little or no sense outside the country of origin. For e-businesses that trade in goods or services based on non-standard systems, internationalization should also be considered.

Time measurement systems
Calendars

Calendars, in an e-business context, are very useful in determining things like holidays, shipment dates, or the date on which a transaction took place. Calendars, like writing systems, come in several flavors. Each calendar determines the number and names of days and months in the year. Calendars also determine when leap years occur. On several calendars the day changes at sunset or sunrise, not midnight as is customary with the Gregorian calendar. These differences can lead to significant confusion when conversion from one calendar to another is required.

There are three calendar types and at least 10 calendars in daily use around the world. Below are the three calendar types with examples of each type.

- **Solar:** Calendars based on the yearly solar cycle. Example: Gregorian, Julian, Ethiopic, Coptic, ISO, Modern Hindu.
- **Lunar:** Calendars based on the cycle of the moon. Examples: Islamic.
- **Lunisolar:** Calendars that attempt to reconcile the cycles of both the sun and moon. Examples: Chinese, Hebrew, Old Hindu.

The ISO and Gregorian calendars are used for most business purposes, although religious holidays and national days are often calculated on the local calendars. It is therefore important to know how to convert from one calendar to another. This conversion is necessary to identify the same date on different calendars. The table below (Dershowitz and Reingold 1997) shows the same day on several calendars.

Calendar system	Date
Gregorian	Monday, November 12, 1945
ISO	Day 1, week 46, 1945
Julian	October 30, 1945 C.E
Coptic	Hatur 3, 1662 (until sunset)
Ethiopic	Khedar 3, 1938 (until sunset)
Islamic	Dhu al-Hijja 6, 1364 (until sunset)
Hebrew	Kislev 7, 5706 (until sunset)
Chinese	Day 8 of the 10th month in the 22nd year (Yi-you) of the 77th sexagesimal cycle (after sunrise)

Note: In Japan, the Gengo system is still in common use, and official government documents must be dated with this system. In the Gengo system, the years are numbered to indicate the length of the emperor's reign. So A.D. 1999 is the year Heisei 11, the eleventh year of the Heisei era, the reign of Emperor Akihito.

Time measurement and coordination

For certain types of e-business systems, the measurement of accurate time is crucial. This is especially true when systems comprise multiple components distributed geographically. The management of time can become a significant hurdle. Coordinating multiple clocks and managing time changes to and from daylight saving time across multiple time zones requires considerable planning. While these problems may be new to many commercial organizations, they have been recognized and solved by scientific and military institutions.

Several examples may help illustrate the potential need for highly accurate time coordination. A distributed international Web-based betting system for horse racing would require second-accuracy time synchronization to ensure betting closes exactly at the time races start. Many commodity market maker systems that provide auctions also require accurate time synchronization, so that auctions can close exactly when required and bids can be "time-stamped" with the correct time. Such time stamps are also very useful in many cryptographic protocols, where time is intimately connected with the exchange of messages.

> **Time measurement**
>
> Coordinated Universal Time (UTC), formerly Greenwich Mean Time (GMT), is the international time standard used around the world. UTC is based on two time measurement methods, International Atomic Time (TAI) and Universal Time (UT1). TAI is calculated by averaging the time indicated on a large number of atomic clocks. UT1 is the rotational time of a particular place of observation corrected for the effect of polar motion on the longitude of the observing site. Due to irregularities in the Earth's rotation, UT1 is not uniform.
>
> UTC is kept within 0.9 seconds of UT1 by the introduction of one-second steps to UTC. The difference between UTC and TAI is always maintained as a whole number of seconds. These steps are known as leap seconds. To date, these steps have always been positive. Leap seconds are usually added at the end of the year (Matsakis 1999). For example, the last minute of 1998 was 61 seconds long. The addition of leap seconds can be significant for time-critical applications.

Internationalization parameters Time measurement systems

Time coordination
There are many organizations around the world responsible for maintaining correct time. Some of these are listed below.

Organization	Location
British Broadcasting Corporation (BBC)	United Kingdom
Federal Institute of Physics and Metrology	Germany
National Research Council	Canada
National Electrotechnical Institute	Italy
National Institute of Standards and Technology (NIST)	United States
Swedish National Time Service	Sweden
Technical University of Graz	Austria
Telecom Australia	Australia
Telecommunications Laboratory (TL)	Taiwan
United States Naval Observatory (USNO)	United States

Many of these organizations provide a time-setting service to the public. These services are delivered by a variety of protocols. Standard signals containing time information are delivered via satellite, radio wave, and telephone. Once a precise time is received by a computer connected to a network, there are four significant protocols available for sharing the correct time across the network (Lombardi). The most appropriate protocol depends on the accuracy required; Network Time Protocol is the most commonly used on the Internet and the most accurate. The four protocols (referenced by their Internet Request-for-Comments number) are listed below.

RFC	Name	Format	
868	Time Protocol	Unformatted 32-bit binary number contains time in UTC seconds since January 1, 1900	37
867	Daytime Protocol	Exact format not specified in standard. Only requirement is that time code is sent as standard ASCII characters.	13
1305	Network Time Protocol (NTP)	Server responds to each query with a data packet in NTP format. The data packet includes a 64-bit time stamp containing the time in UTC seconds since January 1, 1900, with a resolution of 200 picoseconds. NTP provides accuracy of 1 to 50 milliseconds.	123
1769	Simple Network Time Protocol (SNTP)	A version of NTP that does not change the specification, but simplifies some design features. It is intended for machines where the full performance of NTP is "not needed or justified."	123

Time zones

Specification of time zones is important for standard time measurement, and could be highly relevant in computer transactions. There are 24 international time zones (shown in Figure 8). Countries set their local time according to the time zone they are in and the time zones adopted by their trading partners and neighbors.
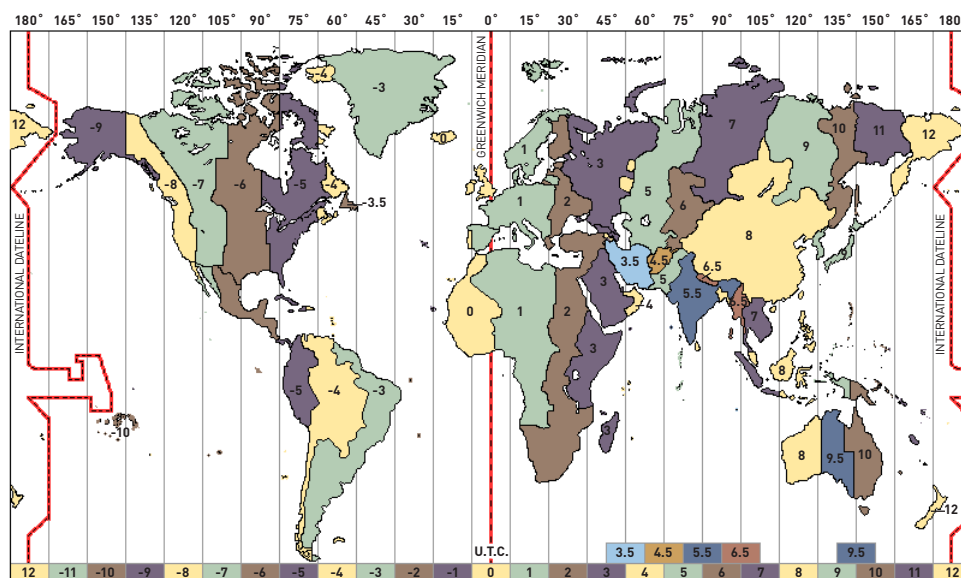

Figure 8: World time zones

All countries define their own local time in terms of hours ahead or behind UTC (up to a maximum of 11 hours ahead or behind). The situation is complicated by the fact that many countries observe daylight saving time, usually one or two hours ahead or behind local time. Different countries begin and end daylight saving on different dates. Individual countries may also vary the start and end dates of daylight saving from year to year, further complicating matters.

To preserve precise global chronological sequencing of transactions, time stamps must be recorded in three parts:
- The time using UTC
- The time zone in which the transaction occurred (e.g., UTC-8, UTC-6, UTC+3)
- An indicator of whether daylight saving is in effect and the size of the time shift (e.g., 0, +1, -1)

For example, 12:00 p.m. in San Francisco (daylight saving time in effect) would be recorded as follows: 19:00 UTC-8 DST+1. With these three pieces of information (time = 19:00, time zone = UTC-8, daylight saving indicator = DST+1), it is possible to display the local time at which a transaction occurred and the absolute UTC.

Geographic location systems

Geographical location systems provide a method for specifying a location based on a standard frame of reference. This is highly relevant, for example, if one wishes to determine the location of the physical store nearest to a given point. It also becomes relevant when attempting to ship a package to someone. By specifying all locations within the same frame of reference, many types of comparisons can be performed (e.g., proximity searches, route planning). The system of latitude and longitude is the internationally accepted method for representing location on the Earth's surface. An accurate map or the Global Positioning System (GPS) can be used to determine latitude and longitude for a given location, and with a fairly high degree of accuracy.

There are two main alternatives to the GPS available for representing location: national postcode systems and telephone dialing codes. People commonly know their postcode or telephone dialing code. It is usually possible to map from a postcode or a dialing code to a relatively small geographical area, which can be assigned a representative latitude and longitude. Unfortunately, there are no international standards for either postcodes or telephone dialing codes. They must therefore be handled on a country-by-country basis. This presents a challenge from an internationalization standpoint, since the methods of representing postcodes vary significantly between countries. Telephone dialing codes all have a country code in common but diverge from that point forward, thus presenting an internationalization challenge as well.

The Global Positioning System

The GPS is a U.S. military system, freely available for commercial use, that can be used to accurately determine latitude and longitude. Given a signal from four satellites, a GPS receiver can determine for an observer the correct time and the person's XYZ coordinates relative to the center of the Earth. The GPS provides two services with varying degrees of accuracy.

The Precise Positioning Service will deliver data accurate to
- 22 meters horizontal
- 27.7 meters vertical
- 100 nanosecond time accuracy

The Standard Positioning Service will deliver data accurate to
- 100 meters horizontal
- 156 meters vertical
- 340 nanosecond time accuracy

GPS receivers convert the XYZ coordinates into the more conventional latitude, longitude, and elevation (Dana 1998). GPS is ideal for determining the position of a person, car, ship, plane, or other moving object. In many cases, however, GPS is not a cost-effective location system. The cheapest GPS receiver costs just under $200, a price that is too high for a single use such as determining a fixed location (e.g., that of a house or office). This is why, for many applications, postcode systems and telephone dialing codes can be used as location systems.

National postcode systems

"The Universal Postal Union (UPU), with headquarters in Berne, Switzerland, is a specialized institution of the United Nations that regulates the postal services of its 189 member countries. This union forms the largest physical distribution network in the world. Some 6.2 million postal employees working in over 700,000 post offices all over the world handle an annual total of 430 billion letters, printed matter, and parcels in the domestic service and almost 10 billion letters, printed matter, and parcels in the international service" (Universal Postal Union).

The UPU is responsible for maintaining a list of national postal addressing systems. The postal addressing systems outline the elements that form the basis for proper postal addressing. These elements ensure the correct wording of addresses and guarantee the quick and efficient handling of letter-post items. Among other things, the information enables a person to:

- word addresses in the manner requested by the postal administration of the country of destination;
- obtain additional information on a country's addressing system and any other aspect of postal operations;
- determine whether a postcode is plausible by checking the number and nature of its components; and
- know the structure of a country's postcode and what each component means.

Of the 189 member countries of the UPU, 103 currently have postcode systems in effect (Universal Postal Union 1999). Each country's system is different and is valid only for addresses in that country. All of these systems can be divided into three main types:

Population center subdivision codes
This type of postcode system specifies subdivisions within urban areas only and does not extend to rural or sparsely populated areas. Both Ireland and Jamaica use this form of postcode system (for Dublin and Kingston, respectively).

Transportation codes
Transportation postcode systems are used to ensure that mail gets to the correct post office for delivery. The code generally divides the country into two or three levels of subdivision. The lowest level of subdivision usually corresponds to the area covered by a delivery post office.

Delivery codes
This is the most complex form of postcode system. This type of system uses a two-part code: a transportation code as described above and a delivery code that divides the area covered by a delivery post office into smaller units representing individual delivery routes. In the case of the United Kingdom and the United States, these delivery codes subdivide delivery routes into smaller areas, allowing mail to be sorted into the order in which it will be delivered.

Postcodes can also be used to validate text addresses. Software systems are available that can derive a postcode from a text address and a text address from a postcode. These systems are usually only available with delivery code systems. They require large supporting databases and must be updated frequently to account for new addresses and codes.

Telephone dialing codes

Telephone dialing codes are another means for geographic location; they are quite useful for communication as well. From the standpoint of internationalization, it is important to understand the relevant international standards for telecommunications, and also the degree of local variation in the way countries handle telephone numbers.

The Telecommunication Standardization Sector of the International Telecommunications Union (ITU-T) is the Geneva-based United Nations agency responsible for dealing with international telecommunications standards. In the early 1960s, the ITU-T devised a global numbering plan so that the various national telephone systems could be linked; this used country codes of one to three digits in length, assigned according to geographic regions on the Earth. For example, Burkina Faso (in Africa) has a country code of 226. The first digit of the ITU-T country code corresponds to one of nine world numbering zones:

Numbering zone	World region covered
1	North America
2	Africa
3	Europe
4	Europe
5	South/Latin America (includes Mexico)
6	South Pacific countries, Oceana (e.g., Australia)
7	Commonwealth of Independent States (former USSR)
8	East Asia (e.g., Japan, China), plus Marisat/Inmarsat
9	West and South Asia (e.g., India), Middle East (e.g., Saudi Arabia)

There are a few anomalies to the zoning. For example, the islands of Saint-Pierre and Miquelon near Newfoundland have the country code 508, and Greenland's country code is 299. ITU-T policy is that new country code assignments will be three digits.

Within a country, a numbering plan is used to determine how numbers will be allocated. This plan is usually controlled by a government agency or the monopoly telephone carrier (if one exists). The typical pattern is to use local numbers within a region, and use an area code to call a number in another region. Some countries do not use an area code; instead, the local number is unique within the country. This typically occurs in small nations, but such schemes are found in Denmark and Singapore. The most common method worldwide is to use numbers beginning with 0 as a long distance or inter-regional access digit, followed by other digits to route to the proper city (e.g., within the U.K., dial 020 for London, or 0121 for Birmingham). Digits other than 0 (generally 2 through 9) would then represent the initial digit of local numbers.

In cases where an area code is used, it is usually possible to map this code to a geo-graphical region for which representative geographical coordinates can be determined. For this to be possible, telephone numbers must be recorded in a standard manner. The method recommended by the ITU-T for formatting telephone numbers (ITU 1988) uses the plus sign followed by the country code, then the area code if any (without common area code prefix digits or long distance access digits), then the local number. The follow-ing chart (Townson 1997) displays examples of some of the domestic formats used and their representation in the international format:

City	Domestic number	International format
Toronto, Canada	(416) 872-2372	+ 1 416 872 2372
Paris, France	01 12 34 56 78	+ 33 1 12 34 56 78
Birmingham, UK	(0121) 123 4567	+ 44 121 123 4567
Colon, Panama	441-2345	+ 507 441 2345
Tokyo, Japan	(03) 4567 8901	+ 81 3 4567 8901
Hong Kong	2345 6789	+ 852 2345 6789

It seems safe to assume that most people are familiar with their domestic number, but not the proper international format. This is important, because there is clearly a wide degree of variation within domestic numbers. Each country breaks digits into groups (although of different lengths); some use parentheses, some use hyphens, some use neither. Any internationalized application would have to allow for these variations.

Location naming
The notion of naming a location to identify it is a common one. When asked where we live or work, we usually respond with a location name, rather than our latitude and lon-gitude, or our local postcode. The identification of a particular location by a common name is frequently required in information interchange in international trade and trans-port. It helps direct the movement of goods. Names for locations have many uses: addresses, shipping marks, data elements identifying ports of call, ports or places of loading or unloading, to name just a few.

Location naming is such an intuitive and simple concept that it's hard to imagine why it needs to be considered in internationalization. The basic problem is that the names of locations are often spelled in different ways, and often vary from language to language (e.g., Livorno - Libourne - Leghorn; London - Londres - Londra; Warsaw - Varsovie - Warszawa - Warschau). This clearly creates confusion and difficulties in data exchange. The identification, in a unique and unambiguous way, of any place involved in interna-tional trade is therefore an essential element for the facilitation of trade procedures and documentation.

These issues have been addressed by the UN/Locode (code for ports and other locations) 1999. The code is based on the ISO 3166-1 (1997) country code and the ISO 3166-2 (1998) subdivision code, and defines 26,471 locations worldwide. It classifies all locations by usage into ports, airports, rail centers, road transportation centers, and waterways. The code has been adopted by the Universal Postal Union and other international organizations.

Localization features

In the following section, we discuss various features that may need to be localized for a given national market. Whether these features are of strategic importance will depend on the specific market, and will be determined by a digital globalization strategy.

The tyranny of the mundane

One of the things that makes localization so difficult is that it often deals with very mundane problems, problems that seem like they should be easy to solve. A perfect example of this comes in the form of translating simple text messages generated by various software systems. Until the advent of the Web, localization of system-generated text was usually performed by major software manufacturers. It is a complex process and requires whole code libraries to handle the various issues spawned by differing grammars. The example below shows the tyranny of the mundane in action with a single system-generated sentence.

Consider the common computer-generated phrase "Your search found n files." This phrase will change its form depending on the value of "n." This generates minor headaches when dealing with the issue in English; it is another story when one considers the full spectrum of languages. The following chart (Burke 1999) illustrates the different cases required to handle the same phrase in each of several languages:

Language	Text messages required	Comments
English	Your search found 1 file Your search found n files [where $n \neq 1$]	English has a two-term grammatical category
Chinese	Your search found n files	In Chinese, number is not a grammatical category
Arabic	Your search found 1 file Your search found 2 files Your search found n files [where $n > 2$]	Arabic has a three-term grammatical category
Italian	Your search did not find any files Your search found 1 file Your search found n files [where $n > 1$]	Italian has a two-term grammatical category, but needs to express 0 as a special case
Russian	Indeterminate	Russian is an inflected language, like German and other Slavic languages, and is far more complex than the previous examples

From the complexity that can arise out of the mundane, we can move on to a discussion of other localization features, some of which are mundane and some of which are anything but.

Brand strategy

Brand as a focal point of trust between companies and consumers
In digital globalization, a brand is a uniquely powerful tool for building lasting trust between a company and highly diverse sets of consumers. Strong brands occupy a distinct and valuable position in the consumer's mind. Traditionally, brands have been thought of as an image created through the one-way communication of advertising. Today, however, brands must be seen as living, multidimensional, integrated, and interactive experiences between a company and consumers. Consumers perceive the brand as the sum total of every experience, product, person, and service that an organization provides.

Trust in a brand accumulates over time, as a consumer is consistently satisfied at all points of contact with a company. This trust can be quickly eroded, however, with inconsistent or unsatisfying experiences. A poorly localized Web presence has particular power to alienate customers and diminish the power of a brand.

The primary objective of a brand is to add value to people's lives. Brands help consumers by simplifying decision making. Brands signify quality and act as a symbol of trust between the company and the consumer. This is extremely relevant in the globally networked economy. While some consumers are reluctant to trust the Internet, they do trust brands. Brands also help companies by providing a source of sustainable and valuable competitive advantage. Brands allow companies to endow products or services with unique associations, adding perceived value and quality resulting in increased financial returns. Fundamentally, brand strategy focuses on leveraging the value of the brand and building the relationship of trust between the brand and consumers.

Online brand: a constant dialogue
The Internet has eliminated the distance between companies and their customers. Every brand now has the potential to be a global brand. The Internet represents the convergence of a communications medium and a distribution channel, creating a unique brand experience. In this real-time experience, a brand must support the customer's trust by providing personalization, utility, and information that each customer perceives as relevant and differentiated.

By focusing on the needs of the end customer, companies can align their offering with the expectations of the customer and deliver the value of their brand in real time.

One brand, multiple audiences

Companies wishing to build global brands must respect the unique perspectives of each national audience. Companies should not expect the brand message they employ "back home" to elicit the same desired response from its international audiences. Just as national audiences differ with regard to tangible elements such as language and currency, they are likely to differ along subtle cultural lines as well.

Differences across national audiences can include these important cultural variables:
• Desired attributes of business partners, colleagues, friends
• Indicators of quality, service, courtesy, trustworthiness
• Attitudes toward foreigners and foreign businesses
• Perceptions and symbolic associations of colors, images, graphic systems, metaphors

To ensure that a company's offering meets the needs of end customers and engages them in a relevant experience, the unique perspectives of each national audience must be understood and addressed.

Localizing the brand experience

Companies wishing to ensure that their brand is fully engaging to each national audience of target customers must undertake a systematic approach to building e-businesses:

• Understand the unique perspectives of each national audience. Through research and experience modeling, companies can learn the needs, desires, and points of view of each set of target customers. This knowledge is integral to the building of compelling online brands.

• Monitor the effectiveness of audience engagement by establishing feedback channels. User response can be gauged in multiple ways, including purchase and transaction behavior, e-mail and other verbal communication, and site usage patterns.

• Build a Web experience to engage each target audience by employing localized information architecture, visual design, and content strategy.

Information architecture

Information architecture (IA) refers to the ways in which information can be structured. In software applications, a variety of different information structures exist: visual information (displayed by a user interface), hierarchically structured groups of information (e.g., the pages in a Web site), task-driven flows between groups of information (e.g., a decision tree), and the actual computer data structures used to hold information (e.g., database schema).

At first glance, it may not be immediately obvious how IA is related to localization, but elements of culture often dictate the ways in which information should be structured. Many of the parameters that affect information architecture are so deeply ingrained in local culture that they are often taken for granted and can be easily overlooked. Anomalies may only be obvious to viewers within a specific target locale.

Consider, for example, a retail clothing company that has created its Web site information architecture around a seasonal theme. The main sections on the Web site follow the four seasons Spring, Summer, Fall (Autumn), and Winter, with new clothing lines continually added on a seasonal basis. This approach seems perfectly reasonable for a U.S.-based company, but there is a flaw in this strategy if the company has an international presence. A site architecture designed around the seasonal theme fails to take into account cultures that have fewer than four seasons (e.g., equatorial countries). In addition, the architecture does not account for differences between the northern and southern hemispheres; when it's winter in the United States, it's summer in Australia.

Another example of the need for IA localization lies in the inherent direction of writing systems. Writing system direction directly affects navigation within a software application or Web site. When looking at a page of information, a user of the Latin writing system will immediately look to the top left, because Latin script runs from left to right, top to bottom. A user of the Hebrew writing system, on the other hand, will look to the top right because Hebrew script runs from right to left, top to bottom. Nearly all Web site navigation systems, and even the layout of browser controls, assume a Latin writing system view of the world. The following table shows the direction of script for a few writing systems.

Writing system	Direction of script
Latin	Left to right, top to bottom
Arabic	Right to left, top to bottom
Kana (Japanese)	Top to bottom, right to left OR left to right, top to bottom
Mongolian	Top to bottom, left to right
Hangul (Korean)	Top to bottom, right to left

Visual design

Cultural differences can have a large impact on the interpretation of visual design. What is considered a cutting-edge design in one culture can appear rude and unprofessional in another. Common interpretations of visual design simply cannot be assumed when working internationally. By their nature, visual messages are often more ambiguous and open to interpretation than the written word.

Colors are a part of most people's everyday worlds. We attach a great deal of significance to them, whether we realize it or not. However, the meanings attached, and even the words we use to describe them, vary between cultures. For example, German has words for lilac and violet, but the word for purple is seldom used. The names of colors for traffic lights in the U.S. are red, yellow, and green; in the UK they are red, amber, and green; and in Japan they are red, yellow, and blue. In the Netherlands, blue connotes quality, and in China, red has positive connotations but Chinese speakers outside China may not always agree (Ishida 1998). Different interpretations of color abound throughout the world.

Images are also interpreted differently across cultures and locations. It is very difficult for a central organization to make appropriate choices about local imagery. Apart from the obvious case where images contain text, images themselves often contain cultural assumptions. Images must be made locally appropriate; what appears as an innocuous pictogram of the thumbs-up signal (representing approval) is in fact an offensive gesture in some cultures. A car driving down the right side of the road would contradict experience in several countries, thus disrupting the intent of a carefully built design.

Colors, images, and text combine to create a graphical interface, and changes to any one of these things can have an impact on the entire visual design. Text translation can cause significant expansion in the length of text (see the discussion of text translation below), which can in turn have a negative impact on a visual design. Substantial modification of text can disrupt the flow of information and qualitatively change the look-and-feel of an interface. Careful localization of text helps preserve the original intent and spirit of a visual design.

Application functionality

Cultural assumptions affect function in a way similar to information architecture and visual design. As a result, the function of a system may have to be localized to meet cultural requirements. For instance, the concept of the shopping cart on a commerce Web site does not translate for all cultures. The supermarket as an archetype for a commerce experience is only justified when most customers experience supermarkets as a regular part of daily life and therefore know what to expect.

Functionality may also need to be localized to meet legal requirements. Legal constraints in some countries prevent credit cards from being used online. And expectations regarding privacy and freedom of speech mean that community-building functionality may require alteration in each country.

Localization of functionality can be crucial, in the sense that it can ensure the utility of an application. If an application offers a negative or confusing experience to a user with a different set of cultural expectations, then it is no longer useful and thus fails in its intent. Localization helps remedy this problem.

Content

Before creating any content—be it words, images, audio, or video—an Internet presence must first develop a content strategy that articulates the voice and tone of the brand. Such a strategy ensures that the content is consistent and compelling, and that it properly communicates the brand. Ideally, any localization of content would likewise be preceded by localization of the overall content strategy.

As is the case with information architecture and visual design, the localization of content must account for subtle and not-so-subtle cultural variations. For example, localizing the audio portions of a Web site requires not only translating the audio into the appropriate language, but accounting for dialect and pronunciation differences. The localization of text requires a similar attention to idiomatic expressions, differences in usage, and culturally specific grammatical conventions.

Text translation

Translation is an art, not a science. Literal translation is almost never sufficient. At best, it can produce stilted approximations of the original and, at worst, it can erode a brand's credibility by being unintentionally amusing or even insulting to the target audience and others. The following examples (CEMA 1996) may seem humorous in retrospect, but they probably cost some of these companies a good deal of money:

• In China, the name Coca-Cola was first rendered as "ke-kou-ke-la." Unfortunately, after thousands of signs had been printed the company discovered that the phrase means "bite the wax tadpole" or "female horse stuffed with wax," depending on the dialect. Coca-Cola then researched 40,000 Chinese characters and found a close phonetic equivalent, "ko-kou-ko-le," which can be loosely translated as "happiness in the mouth."

• In Taiwan, the Pepsi slogan "Come alive with the Pepsi Generation" was originally translated as "Pepsi will bring your ancestors back from the dead." Likewise, the Kentucky Fried Chicken slogan "Finger-lickin' good" came out as "Eat your fingers off" in Chinese.

• When Parker Pen marketed a ballpoint pen in Mexico, its ads were supposed to say, "It won't leak in your pocket and embarrass you." However, the company mistakenly thought the Spanish word "embarazar" means "to embarrass." Instead, the ads said, "It won't leak in your pocket and make you pregnant."

The nuances of word meaning require an expert in the local language to perform the translation. It is generally accepted that translation is best performed by a native speaker of the target language (e.g., French-to-English translation is done best by a native English speaker). Exceptions to this rule are made when the source text is exceptionally complex, as is the case in some scientific or legal documents.

Ensuring that text is vetted by a native speaker is essential even when the text is not ostensibly being translated into another language. Winston Churchill's famous remark that Britain and America are "two countries separated by a common language" is not just a humorous comment. In different countries with a common language, usage can differ significantly. In Spain the verb "to take" is perfectly acceptable, whereas in Mexico it is crude. At first glance, a manufacturer may believe that the American version of a product catalog can be reused in all English-speaking countries. This may be the case; the catalog would probably still be understandable. However, it might also cause serious brand erosion if local language usage is not taken into account. In effect, this means that language and country are inseparable. For example, American, British, Australian, Canadian, and South African English should be treated as separate languages. Each country has its own language variation that must be handled individually.

Another factor to consider when localizing text is that translation can have a significant, even damaging, effect on visual design and information architecture. When text is translated, the amount of space required to hold that contiguous block of text can change dramatically. On average, English increases by 30% when translated to other European languages, and can increase by 400% in extreme cases (Ishida 1998).

Translation software

Translation software is often viewed as a silver-bullet solution to the problem of text translation. These systems have evolved from specialized tools designed to support professional translators into general, automatic tools for non-linguists who need to read text written in a foreign language. Most translation software systems available today can perform both tasks. It is important to recognize, however, that the outcome of these tasks is not equivalent. The professional translator is trying to produce an accurate translation in the target language that precisely conveys the meaning and intent of the original. The non-linguist is trying to extract information from text written in an unfamiliar language. The non-linguist expects the translation to be imperfect, whereas the professional translator is aiming for a translation that would fool a native speaker into believing it was originally written in the target language.

Translation software designed to support the professional translator consists of an editor linked to a series of dictionaries, glossaries, and phrase collections for both the source and target languages. Mappings exist between the source and target language data sets and additional, context-specific data sets and mappings are available. The translator can also compile custom data sets that are specific to the particular work being translated. The software uses all these data sets to analyze the source text and make automatic translation suggestions that the translator can accept or reject. Professional translation software requires training and expertise to use correctly.

Automatic translation is suitable as an aid to someone who has to read e-mail from foreign colleagues or read Web sites written in foreign languages. It is a personal tool to be used when gathering information. It is not suitable for producing documents for the dissemination of information, such as sales material and manuals for a foreign market.

The paragraph below illustrates some of the many problems of automatic translation. It is taken from a review of a translation software package published in Uruguay. The review was written in Spanish, and has been automatically translated into English. While the review is partly intelligible, it is not of a quality that could be presented to consumers.

> "This software is a package of translation dictionaries inglés/espanol that provides 600,000 entrances and is able to unfold synonymous translations or, in addition to parts of oration, description, shades and meanings of words just by to press a button. Its design of screen in mirror, allows to unfold conjunctions of verbs simultaneously and to make searches of idiomáticas expressions, adverbial proverbs, phrases, verbal locutions, phrases and idiomáticas phrases of all type in both languages, with its respective synonymous translations and."

This example also demonstrates the necessity of professional translation skills. Starting with the automatic translation above it is not possible to extract the exact meaning of the original. A human translator is needed to compare the automatic translation with the original and make corrections where necessary.

Translation services
Business translation services have been in existence for many years. A typical fee for translating English to Spanish is 20 cents (USD) a word, about $500 for a 10-page document. Less common languages can cost up to 30 cents a word. Some advanced services are now beginning to network thousands of professional translators, editors, and proofreaders using Web-based auction and workflow systems. These organizations are offering 24-hour industry-specific translation e-services with help desk support, quality assurance, and fast turnaround times (sometimes less than two hours). For organizations that have their own in-house translators, or are willing to manage multiple contract translators, multinational content management systems that provide limited translation and workflow management tools are available.

Number presentation

Number presentation is crucial in e-commerce systems; a misplaced comma could lead to a substantial discount for some consumers in some countries. Most cultures around the world have adopted the modified Arabic numeral notation system developed during the Middle Ages in Europe. While most countries agree on the numerals that represent the concepts of zero through nine, several writing systems have their own numbering schemes that replace the ideograms (0 to 9). Some writing systems use a system similar to Roman numerals, although this practice is dying out. In addition, there are differences in the marks used to indicate the decimal point and the thousands separator. These differences can be significant and lead to considerable confusion (Thompson 1999).

Consider the following examples. The first group shows the thousands separator in the number one thousand and one:

- 1,001   a comma
- 1.001   a period
- 1 001   a space
- 1001   no separator

The second group shows the decimal separator in the number one and one-thousandth:

- 1.001   a period
- 1,001   a comma

The ambiguity in these examples is obvious. Most advanced computer operating systems have libraries that allow the user to specify the character to use as a thousands and decimal separator when displaying numbers.

Currency presentation

Just as it is important to present numbers correctly, it is equally crucial that currency formatting be appropriate (in e-commerce systems, for example). The presentation of currency and the symbols used vary widely, to the extent that the shape and position of the symbol is significant. The following examples show some of the many possible combinations. Note the special formatting for the last three digits of the Italian lira:

- $1,000   (USD)   1,000 U.S. dollars
- 1000$ (MXN)   1,000 Mexican dollars
- £1,000.$_{000}$ (ITL)   1,000,000 Italian lira
- ¥ 1,000   (JPY)   1,000 Japanese yen

Date and time presentation

Date and time formats vary from country to country. ISO 8601 (1988) defines various formats for dates and times. Below are some examples of standard formats used around the world.

Date presentation
- 01/19/67   U.S.
- 19/01/67   Europe
- 1967/01/19   Japan, ISO standard

Time presentation
- 13:00   Europe, ISO standard
- 1:00 p.m.   U.S.

Legal requirements

A part of localization that is unavoidable is the existence of multiple legal systems in various countries. The ramifications of dealing with these systems are complex and require expert guidance to avoid the many pitfalls that exist. This section briefly covers some of the major issues that need to be addressed.

Jurisdiction

Jurisdiction on the Internet is often difficult to determine. In a transaction there may be three parties involved: the buyer, the seller, and the mediator. If each of these parties is in a different country, then which country's laws have jurisdiction? Unless it is explicitly defined in a contract, this question is difficult to resolve. Contract law differs from country to country, and the parties involved in a transaction will all probably want to use their own legal system for the transaction since they are familiar with it.

Enforcement

Similar to jurisdiction is the issue of enforcement. Who enforces contractual obligations and how is it done when the parties to the contract are in different countries and subject to different legal systems?

Customs and taxation

Customs fees and taxation are usually based on geography (where a product was purchased, for example). "The Internet lacks the clear and fixed geographic lines of transit that historically have characterized the physical trade of goods. Thus, while it remains possible to administer tariffs for products ordered over the Internet but ultimately delivered via surface or air transport, the structure of the Internet makes it difficult to do so when the product or service is delivered electronically" (Clinton and Gore 1997).

Electronic payment

Wire transfers and inter-bank transactions have been commonly performed electronically for some time. Credit cards have emerged as the most popular method of online payment for smaller sums. In some countries, however, credit card transactions must include a physical signature. This need for a signature can make the online purchasing experience needlessly complex. In addition, credit cards are not suitable for small transactions, since they usually have a minimum charge limit. Other forms of payment for micro-transactions are under development, but they lack the support of the international market.

Intellectual property protection

"Commerce on the Internet often involves the sale and licensing of intellectual property. To promote this commerce, sellers must know that their intellectual property will not be stolen and buyers must know that they are obtaining authentic products.

"There are several treaties that establish international norms for the protection of copyrights, most notably the Berne Convention for the Protection of Literary and Artistic Works. These treaties link nearly all major trading nations and provide them with a means of protecting, under their own laws, each other's copyrighted works and sound recordings.

"Trademark rights are national in scope, and conflicts may arise where the same or similar trademarks for similar goods or services are owned by different parties in different countries. Countries may also apply different standards for determining infringement" (Clinton and Gore 1997).

Privacy and freedom of speech

Guarantees of freedom of speech and privacy vary from country to country. Message boards and reviews may leave individuals or organizations liable in some countries, and collection of data about customers may obligate organizations under data protection legislation.

Local legislation

Local legislation covering consumer rights, third-party liability, and a plethora of other issues can affect how business processes and systems must be localized. This issue alone is a major argument for decentralized management of localization.

Conclusion

The Internet is the greatest information-sharing resource ever seen, and globalization makes this information accessible to a wider audience. The Internet also offers the chance to build virtual communities of geographically distant individuals. The more people your business reaches effectively (either through sharing information or building community), the greater your chance for success.

Global Internet development, the process of adapting to a global Internet economy, is a necessity for any business wishing to exploit all the opportunities presented by the Internet. In order to successfully navigate the global digital marketplace, there are two key points that every business should keep in mind:

• The Internet connects a wide audience with a diverse set of cultural expectations. Businesses need to be sensitive to these cultural expectations, and to the user experience requirements they generate for Internet development.

• Globalization is not a simple problem; it is not merely a question of translation or software localization. A successful globalization effort will take into account all of the relevant factors that vary between target markets.

Given these factors, we have elucidated an iterative approach for developing a global Internet solution. This approach requires finding a cost-effective balance between three elements:

Market selection
Select the group of markets (countries) in which globalization is desirable. These choices are based on a variety of factors, including economic relevance and Internet readiness.

Localization
Determine the features (e.g., brand, information architecture, content) that need to be tailored to the selected markets. These features are driven by the cultural expectations in these markets. Business process re-engineering may be a significant aspect of localization.

Internationalization
Select the parameters of business systems (e.g., language, time zone) that need to be designed or re-engineered in order to support multiple countries. The choice of these parameters will be strongly influenced (if not dictated by) the localization features.

A global Internet development strategy that successfully balances these three elements will provide a solid foundation for establishing a global Internet presence.

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Globalization

If your business is on the Internet—anywhere on it—you have the ability to reach customers, suppliers, and business partners all over the world. But to reach them requires more than speaking the same language. You need to consider a range of cultural, economic, and legal issues from time zones to taxation, customs to currency.

Do you have the tools to develop a global Internet solution?
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