Design and Development for a Global Market

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In the past decade, AT&T has increased efforts to ensure that its products and services meet or exceed the expectations of customers around the world. The expectations of these customers, the final judges of quality and value, have shaped an evolution in the design and development processes at AT&T Bell Laboratories. AT&T has achieved significant economies of scale by designing high-quality global product platforms that can be tailored for different geographical regions and market segments. One key to attaining high quality is close partnering within AT&T and between AT&T and its customers, suppliers, and joint venture partners. This issue of the *AT&T Technical Journal* presents specific examples of the evolving design and development process, as well as product globalization concerns.

Introduction

The world is shrinking: Supersonic commercial jet flights cross the Atlantic in three hours. On-demand computer bulk-encrypted data is transferred instantaneously between Denver and Milan. Faxes traveled in and out of the Soviet Union even as the coup against then-President Mikhail Gorbachev was unfolding. Multinational corporations are establishing manufacturing and sales operations on all continents. Indeed, the world is shrinking; and at the same time, the need for global communications is mushrooming.

Within this scenario, AT&T views as its role that of global communications provider. It will not be an easy task, because other powerful, sophisticated corporations are vying for a similar role in the future of communications. Telecommunications consultants predict that, after a tumultuous shakeout, only a handful of progressive companies will survive as communications providers for our shrinking world. AT&T is determined to remain in the vanguard of that group. By the year 2000, Robert Allen, chairman of the board of AT&T, projects that 50 percent of AT&T's revenues will be earned outside the U.S. Each of AT&T's business units is striving to play its part in that plan.

Success in the global market depends on improving the quality of global offerings, as perceived by customers. One key to attaining this high quality is ever-closer partnering

- Within AT&T, across functional, geographical, and business unit boundaries
- Between AT&T and its customers, suppliers, and joint venture partners.

Many other elements are necessary to ensure global success, some technical in nature, others consisting of marketing presence and an understanding of local conditions in any given country. This issue of the *AT&T Technical Journal* describes technical steps that have been and are being taken to make our products truly global.

Before a product is marketed in a country, it must successfully pass through three stages of technical requirements:

- Type approval, i.e., mandatory standards
- Additional interfaces to the public networks, i.e., voluntary standards
- An understanding of the features that make a product successful in that country, i.e., customer expectations.

In the first stage, *type approval*, or *homologation*, each country's regulatory government agency identifies the minimum requirements that a product must meet before it can be offered in a country. Typically, these requirements include power and safety, as well as a definition of product interfaces, such as the frequency and levels of

tones used in signaling protocols. The process differs from country to country, but in general the equipment must be tested by the appropriate official body of the country where the product will be offered. It is extremely helpful to have a local partner who not only understands the type approval requirements, but can also shepherd the product through the typical red tape. In some circumstances, a company may be able to certify its product without local help. Adherence to quality process standards, such as the International Organization for Standardization (ISO) 9000 standard,[1] is an important part of the approval process.

Another requirement for offering a product is determining the additional interfaces it may need, and the country-specific features that increase its marketability. For example, in many countries a private branch exchange (PBX) may be approved for use only with analog central office trunks, but, to be marketable, it may need approval for use with multifrequency-compelled (MFC) or Integrated Services Digital Network (ISDN) trunks.

To be successful, a product must have features dictated by its market. For example, in many overseas PBXs, the PBX attendant, or operator, still plays a major role, as opposed to the U.S., where direct inward dialing has become commonplace. Overseas markets require PBXs that offer a much richer set of attendant features.

In the past, AT&T had adapted products developed for the U.S. markets to the needs of customers around the world. However, this is no longer enough. AT&T is now designing products specifically for globalization. The papers in this issue of the *AT&T Technical Journal* describe several such cases.

Product Planning

Defining a common global platform lays the groundwork for successful globalization. The paper "Evolution of Global Key-System Platforms,"[2] by V. J. Silverio et al., is a classic case study in globalization. Even though it is technically possible for a product designed for one market to be adapted to another, this approach is unnecessarily costly. However, the experience gained in this way can be used to identify parameters that can be generalized to build a global platform, i.e., a product that can be readily modified to meet the needs of each relevant market. In another approach to globalization, J. J. Horenkamp et al. describe how to design a product that meets worldwide market demands from the start, as was done for the Premises Distribution Systems.[2] Regardless of whether it is evolutionary or intentional, identifying the global platform is a key part of the product development process.[3]

Although technical standards are published in each country, designing products requires not only analyzing regulations, but also building a partnership with local engineering resources. Every aspect of design demands careful consideration of local concerns, concerns that often cannot be uncovered by reading standards. Indeed, the liaison with local partners is the most important part of the design process. As B. Katz et al. establish, only with this kind of cooperation can user interface issues be identified.[4]

Product Design

Behind every paper in this issue of the *AT&T Technical Journal* is a bookshelf of national, regional, or international standards. Analysis of technical standards is necessary for designing accurate, up-to-date products. Even ISDN, which was defined from its inception as a standard protocol, requires country-by-country analysis,[5] as described by K. H. Dorato and L. J. Klau. However, ISDN is a relatively stable standard; a more difficult challenge lies in trying to meet standards that are under development. In these cases, the developers must become involved in the standards process to keep abreast of new and pending interpretations. The paper addressing mandatory product standards, written by D. N. Heirman et al.,[6] describes the result of just such active involvement. The authors are familiar faces at international standards meetings, and they also consult with AT&T Bell Laboratories' developers about product design.

National standards also evolve; therefore, we have found that close consultation is needed for all levels of standardization. Of particular importance, though, are interactions with local experts, carried out through telephone or video conferences, faxes, face-to-face meetings, local pretests, development lab simulation, and customer trials.

While becoming familiar with technical standards is important, designers must keep them in perspective. To meet the world-class design philosophy, a design for any specific national standard should fit into an overall global context. The types of issues faced in this process are detailed in "World-Class Hardware and Transmission Design,"[7] by N. E. Gallensky et al.

Products to be sold in other countries must be validated; this includes system testing, conformance assessment, and type approval. High-quality development processes are essential to success, as is adherence to international quality standards (e.g., ISO 9000).

System Testing. System tests of globalized products can be more difficult to conduct than tests of products designed for a single country. Product use may vary in different countries.[4] Testing global products may also be complicated when it is conducted in several countries. In some projects,[8] "customer modeling" provides product application and usage information for specific high-volume customer segments, such as call centers. In others, a reliable method involves defining metrics (such as call failure rate) that provide better correlation with customer satisfaction than "traditional" quality measures (such as software fault density), setting goals for these metrics, and then using them to manage product development. Optimum testing involves focusing on how usage will affect customer satisfaction.

Testing may also be complicated by the lack of network interfaces in system test facilities. Because network interfaces vary from country to country, a global system test lab requires a number of different simulators. These simulators tend to be expensive, difficult to acquire, and/or not completely accurate. Verifying that a product operates as specified, while interfacing with the local host network, often during the final stages of product realization, can be a challenge. Accurate simulations of the network environment and proper planning for this testing are vital to providing products in a timely fashion. Working closely with distributors and/or local partners is an important part of final testing.

Conformance Assessment. Global products must meet an ever-increasing array of mandatory standards, which are often more stringent than those in the U.S.[6] Rapid changes in the regulatory environment, particularly in the European Community, have made the process of conformance assessment a critical part of global product realization. For example, the radio-frequency emission limits of the International Electrotechnical Commission Special International Committee on Radio Interference are more stringent than corresponding Federal Communications Commission (FCC) limits. Similarly, emission and immunity requirements (e.g., immunity to electrostatic discharge) vary from country to country. Indeed, the FCC has no regulations on immunity, but there are specific regulations for the European Community. Inadequate attention to these mandatory product standards can lead to significant delays. Several AT&T resources can assist with conformance assessment. The Global Product Compliance Lab in AT&T Bell Laboratories helps AT&T business units interpret and apply all conformance assessment requirements and provides access to local and international contacts to secure conformance assessment.

Type Approval. Type approval is often the final step in introducing a product. Each country's type approval authority has its own priorities. It may accept a range of implementations for one requirement, but demand strict compliance to another. Knowledgeable type approval consultants can help clarify points and judge the importance of exceptions. The process, which varies considerably from country to country, may range from simply filling out forms to extensive local testing lasting up to six months or more. Because government agencies are involved, local expertise (preferably with both technical and diplomatic skills) is essential for timely introduction of the product.

Summary

The examples of technical product changes discussed here lay the foundation necessary for AT&T to enhance its presence in the global marketplace. Technology is not the only motivator in this initiative. The key to success is effective local partnering.

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