Chapter 3
Implications of New Technologies and Services

It is now difficult to distinguish clearly between telecommunications services and telecommunications infrastructure, networks, or equipment. Software-related functions embodied in networks often support both message transport and data processing and protocol conversion. Equipment and services issues are linked by the possibility of cross-subsidy; profits from services can be used by telecommunications companies to develop new technology, and vice versa. Both equipment and services increasingly require standards.

Most studies of the ways in which telecommunications markets are changing have focused on equipment markets. But Robin Mansell points out that as we shift from technology based on cheap inputs of energy to technology based on cheap inputs of information, there is often a mismatch between the established social and institutional framework and the new paradigm.[1] Thus new services, based on new kinds of equipment that nearly always require new kinds of software, often confound established regulatory categories and trade agreements.

With large central telephone switching systems, new technology must achieve a global market share of about 15 percent to recover research and development (R&D) costs plus profit.[2] Most American telecommunications manufacturers have done poorly in European markets; but U.S. computer systems and services have done well, and much of the U.S. dominance in that market cart be linked to the spread of financial/processing services for banks. NCR (now owned by AT&T) is the leading supplier of automated teller machines (ATM) systems to financial institutions in the United Kingdom, with 62 percent of the market share in 1990.[3] Barclays Banks, Britain's largest clearing bank, has approximately 2,600 ATMs in service, all manufactured by NCR. If European postal telephone and telegraph (PTTs) increasingly offer value-added services for banks, this could indirectly reduce the market for data processing equipment sold to banks by U.S. manufacturers.

The European Community (EC) now requires competitive, nondiscriminatory procurement of equipment by all companies that have special rights (e.g. state monopolies or private firms that are regulated monopolies). In General Agreement on Tariffs and Trade (GATT) negotiations, the EC says it is prepared to allow foreign firms to compete under these same conditions, so long as there is reciprocity. The United States holds that it cannot guarantee reciprocity because our telecommunications companies are private and the government cannot regulate their procurement. In 1988, however, the Federal Communications Commission (FCC) ordered telecommunications companies to report their purchases of switching equipment from foreign sources who shut U.S. firms out of their markets.

There are still some U.S. restrictions on the transfer of telecommunications technology in the interests of national security (" Cocoon" restrictions), but these are now under review and likely to be further reduced. For some banks this was a real problem in the past because specific applications of the restrictions often appeared unreasonable. For example, Citicorp wanted to put encrypted videoconferencing equipment in its own facilities in Central and Eastern Europe for use by its own officials, but it ran into so many CoCom problems that it gave up the plan.

Integrated Services Digital Networks

The concept of an ISDN, first publicized in the CCITT Orange Book of 1980,[4] calls for an end-to-end digital network that can carry data, voice, video, and graphics. This would in effect combine telephone and computer networks and allow public

1 Robin -en, "Rethinking the Telecommunications Infrastructure: The New 'Black Box,'" *Research Policy 19,* 1990, pp. 501-515.

2 Kenneth Lindhorst (AT&T), "New Telecommunications Trends and International Relations," Hamid Mowlana and Nanette S. Levinson (eds.), *Telecommunications and International Relations: An East-West Perspective,* International Communications Program, School of International Service, American University, Washington DC.

3 Guy Daniels, "Case Study: Networking Bank ATMs," *Telecommunications,* January 1992, pp. 27-29.

4 Margrit Sessions, "ISDN Tariffs in Europe," *Telecommunications,* January 1992, pp. 57-59. The concept of ISDN was first publicized in the Consultative Committee for International Telephone and Telegraphy (CCITT) Orange Book of 1980.

networks to provide specialized services now available only on specialized private networks.[5]

In April 1989, European telecommunications organizations signed a Memorandum of Understanding on the implementation of European ISDN service by 1992. It is generally assumed that ISDN should begin with digital telephony and progressively incorporate additional functions and network features, including those of other dedicated networks.

Some ISDN services are available in the United Kingdom, France, and Germany, and the claim is made that by 1997 commercial ISDN services should be available throughout Europe.[6] The French and German PTTs, unlike U.S. carriers, decided to consider ISDN "amass medium" intended for both large and small customers;[7] these countries are committed to rapid deployment and ISDN is priced about level with regular phone service. British Telecom, however, is targeting large corporate users such as financial institutions, and U.K. tariffs are much higher than in France and Germany.

Until recently, deployment of ISDN in the United States has been slow. But it is projected to increase significantly in the next 2 years. The plans announced by the seven regional Bell operating companies would result in a total of over 61 million access lines with ISDN capability by 1994. The percentages of access lines capable of ISDN would vary considerably among the Regional Bell Operating Companies (RBOCs), from 27 to 90 percent, with an average of about half of the access lines capable of ISDN.[8]

Final standards for ISDN have not yet been accepted, and there is little interconnection between such ISDN services as exist. It is not yet available for residential and retail business ends and not yet transferable to most consumer applications such as ATM and electronic funds transfer.[9] At 64 kbps, ISDN is too slow for many of the needs of large corporations. In some countries the introduction of ISDN may deliberately be slowed, to allow economic resources to be used to extend telephone service to underserved areas, or to extend existing public packet-switched network nodes. Thus, the Organization for Economic Cooperation and Development (OECD) concludes, "There maybe reasons to encourage large business users to [continue to develop] leased circuit networks to meet their needs. 10 In some cases, leased circuits can offer a cheaper method for meeting the needs of a small number of large users; therefore, some people argue that it should not be necessary to incur the costs of upgrading public networks to the level of sophistication required by these users.

For financial institutions the approach of ISDN holds both promise and concerns. There is concern about ISDN tariffs. ISDN promoters and regulators may assume that all users will want an entire 64 kbps data channel between two locations. However, many financial institutions need to move large numbers of messages consisting of small chunks of data (e.g., credit authorizations). If the smallest unit of data transmission for which tariffs are set is larger than these chunks, financial institutions could end up paying more than they do now to move data and, in their view, a disproportionate share of the estimated cost of transition to all digital networks.[11]

Other New Developments

Beginning with Bellcore's IN/l concept in 1985, software design aimed at giving operating companies highly computerized switching nodes to create

5 CCITT standards call for multiples of a digital voice-grade channel (64 kps). The Basic Rate Interface, or 2B+D format, provides a total channel capacity of 144 kps. The Primary Rate Interface, or 23B+D format, provides a total capacity of 1,544 reps. Broadband ISDDN will provide dynamically configurable channels, or packets, at rates up to 150 reps.

6 Organization for Economic Cooperation and Development (OECD): *Telecommunication Network-Based Services: Policy Implications*. Information Computer Communications Policy 19, chapter V, p. 86.

7 Sessions, op. cit., footnote 4.

8 U.S. Department of Commerce, National Telecommunications and Information Administration, *Telecommunications in the Age of Information (Washington DC: 1991)*.

9 OTA *discussion* with Michael Nugent, Vice President and Associate General Counsel, Citibank, NA, April 1992.

10 Organization for Economic Cooperation and Development (OECD): *Telecommunication Network-Based Services: Policy Implications*. Information Computer Communications Policy 19., chap. V, p. 86.

11 Marjorie Greene, "Public Policy and International Telecommunications Technology in Financial Markets-An Overview," OTA contractor report, February 1992.

virtual private networks and wide area centrex,[12] with standard network interfaces to provide a flexible platform for many services. This concept was intended to help public networks hold on to big users like financial institutions, but services could also be offered to small business or residential users if end-to-end digital interconnectivity existed.[13]

Frame relay technology and switched multimegabit data services (SMDS) are for high-speed data transfer. Frame relay lets financial institutions send bulk data in irregular bursts, by providing bandwidth on demand. It is an efficient form of packet-switching that can boost performance up to 35 percent. This allows firms to squeeze more out of their existing networks, or public switched networks can provide this "dial-up" bandwidth. SMDS is a 1.5 to 45 million bits per second high-speed switched technology now being offered by some public networks services providers.

Bankers' interest in high-bandwidth public services may be stimulated by electronic document imaging. This service provides computer-digitized "photorealistic images" of documents or paper records. For example, UNISYS has a system for processing checks at up to 1,800 front-and-back images every minute. IBM and Wang also have new image processing systems based on digital scanners and optical disks of the "worm" (write once, read many) variety. Banks need to transmit or exchange current documents, but imaging will also be valuable to them for computerizing and using old paper records.[14] However, some legal ambiguities may have to be resolved to clarify the standing of documents preserved by imaging because of the possibility of electronic altering of the documents.

Questions of Standards Development

Both technology standards and data standards are increasingly important with the spread of intercorporate sharing of information. Powerful forces are involved in standards-development struggles.[15] The development of ISDN is an example. Some kinds of international standards could cause major computer companies and data processing firms to lose market share to telecommunications companies; other kinds of international standards could benefit those firm but work against younger firms developing innovative, rapidly changing technologies by preempting the future in regard to too many key design elements.[16]

The U.S. standards community reached a consensus on January 6, 1992, on steps to improve international standards development and information sharing between the United States and the European Community.[17] The EC has assured the U.S. Secretary of Commerce that its new testing and certification program will not restrict U.S. exporters. But the financial services industry remains skeptical.

Financial institutions are principally concerned that they, as major users, should be included in the standards development process. Yet in many banks, senior managers with little understanding of technology are reluctant to approve costly participation in standards development activities. Financial institutions that have developed global private telecommunications systems have sometimes resisted switching from proprietary to standards-based systems. But there now appears to be a strong consensus in favor of international standards. The development of standards for mass-market data communications will allow Europe-wide use of ATMs, point-of-sale terminals, and electronic trading, which should bean advantage for U.S. institutions that excel in automating financial services. This should also make the balance of competitive forces within the financial services industry better for smaller firms that have limited network reach.

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12 Centrex is a service that allows business users to directly dial outside numbers from extensions within their facilitiesand to directly dial company extensions from outside the facilities. The switching system, based on a stored-program digital computer, can be located on customer premises but is nearly always located in the telephone company's centraloffice.

13 Mansell, op. cit., footnote 1.

14 Ellis Bookers, "Migration to Public Nets Accelerates," *Computerworld*, Jan. 13,1992, p. 5. Technology Futures, Inc., a futures and market research company, projects that by 2000, 60 to 80 percent of professionals will use document-based applications.

15 U.S. Congress, off& of Technology Assessment, *Global Standards: Building Blocks for the Future*, OTA-TCT-512 (Washington, DC: U.S. Government Printing Office, March 1992).

16 As argued b, Jonathan David Aronson and Peter F. Cohey, in *When Countries Talk: International Trade* in *Telecommunications Services* (Cambridge, MA: Ballinger Publishing Co., 1988).

17 U.S. Department of Commerce, International Trade Administration, *Europe Now: A Report*, winter 1991-92, p. 1.