ISDN as an Information Resource for Strategic Management of Multinational Firms*

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The global connectivity promised by the development of the Integrated Services Digital Network (ISDN) will have a major impact on the management of multinational firms in the 21st century. This paper explores this impact from two perspectives: using ISDN capabilities as an information resource to support strategic planning processes in multinational firms, and planning for the use of ISDN as the technological infrastructure for international joint ventures and strategic networks. The information systems (IS) profession can play a key role in achieving the promise of this emerging information resource technology by (1) actively supporting the link between the organization’s business strategy and its information resource strategy, and (2) anticipating how the integration of voice, data, text and video provided by ISDN can best be utilized to deliver improved information to managers.

Introduction

In today’s fast-moving, competitive business environment, many business organizations are becoming aware of the potential of digital telecommunications (Gavish, 1986; Keen, 1986a). Planning and coordination for the use of available voice, data, text and video services to provide an array of information resources (Khosrowpour, 1988) should help reduce communications costs (Kriebel & Strong, 1984) as well as improve information resource management (Guimares, 1988). Moreover, many companies are in a position to realize the potential of using telecommunications as a tool to improve organizational management through the provision of valuable information resources. At a more practical level, there is also the savings of travel costs and travel time in the case of an organization whose managers are significantly separated by geography as well as the potential for increased productivity which might be lost due to travel inconvenience.

The scramble to develop global telecommunications networks has been joined by phone companies and computer makers alike, spawning a business of moving and managing infor-

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mation estimated to grow to $560 billion by 1991 (Business Week, March 21, 1988, 140-148). The use of fiber optics technology as the basis of communications paths makes interconnect technology a major management challenge. Companies cannot afford to allocate resources for the management of networks in the 21st century as though they were the networks of the 1980s (Lorin, Ball & Elory, 1987).

Over a decade ago, as part of its long-term vision for global telecommunications in the 21st century, AT&T originated the development of an Integrated Services Digital Network (ISDN) that would provide global access for voice, data, text and video devices. Commenting on this vision Brancheau & Naumann (1987, p. 21) observed that ISDN

... has tremendous strategic potential for farsighted businesses. Telecommunications-based information systems will dramatically change the way many existing products and services are sold and distributed. Products which are prohibitively expensive today, or sold to a very limited market, may be cost-effective and in high demand. New products, perhaps new industries, will emerge. ISDN promises to be the infrastructure upon which most of our communication will be based in the future.

The ISDN thrust is international. The governmental Postal, Telegraph, and Telephone agencies of many of the world’s developed countries — Canada, France, West Germany, Italy, Great Britain, Japan — and the various telecommunications companies in the United States are currently working together through international standards organizations (such as the International Telegraph and Telephone Consultative Committee (CCITT)) to ensure the gradual successful implementation of ISDN.

It is generally recognized that the ultimate success of ISDN will depend on how closely it meets the information resource requirements of users, especially large corporate users. Today’s information systems (IS) professional has a key role in realizing the potential of ISDN. The IS professional must begin to anticipate the range of information services that will be available for integration in ISDN, so as to provide senior management with technical recommendations to support the realization of the strategic potential identified by Brancheau & Naumann (1987). In turn, senior management must establish a corporate policy which allows “telecommunications managers to be able to break out of the frustrating straightjacket that binds them into cost displacement, short-term planning horizons, and technical tactics” (Keen, 1986b, p. 131.) Although selling ISDN to senior management is not necessarily the responsibility of the IS professional, he/she must begin today to envision how ISDN can be harnessed to deliver improved information in support of organizational work in the future.

Though many areas of organizational management can be addressed in relation to ISDN, the area of strategic management is perhaps the most important from the perspective of the IS professional concerned with the derivation of an information resources and IS strategy from an organizational business strategy (King, 1988). After discussing ISDN and global telecommunications, we will address two broad areas of relevance for ISDN and strategic management: (1) the role of ISDN in the support of group-based strategic management processes in an international setting, and (2) strategic planning for ISDN identifying potentially useful changes in business strategy, including using ISDN to gain and maintain a strategic advantage in the global economy. The key role of the IS professional will be addressed throughout the discussion. Finally, some suggestions are offered as to how IS professionals may begin...
positioning their operations to offer ISDN services in support of strategic management.

What is ISDN?

ISDN is an end-to-end digital network that moves voice, data, text and video separately or simultaneously over the same pair of copper wires or optical fiber in the world’s public telecommunications network. All communications over ISDN use digital channels of two types. One type, the B (bearer) channel, carries 64 kilobits per second (kbps) of data. The other, the D (delta) channel, carries either 16 or 64 kbps of data and is used for signaling purposes. These two channel types comprise the bandwidth for ISDN communications. The total available bit capacity of “primary access” service is currently 1.544 megabits per second (Mbps) in the United States, Canada and Japan, and 2.048 Mbps in Europe (Stallings, 1989). However network architects plan a broadening of future ISDN capacity of up to 150 Mbps and beyond (Sazegari, 1987).

The large bandwidth provided by ISDN circuits allows for flexibility in the use of ISDN. As Rowe (1988, p. 255) observes:

A business with a primary access group could subdivide the bandwidth in any way necessary to meet the needs of its application set. Half of the capacity, or 772 kbps, might be used for a television transmission while the other 772 kbps is further subdivided to support 12 voice conversations at 32 kbps each and 6-64 kbps data channels. At another time the bandwidth could be configured differently, all under the control of the customer.

From a convenience perspective, ISDN will support a wide variety of voice, data, text and video devices from a single outlet in much the same fashion as the telephone is supported today. The IS professional can exploit this flexibility to provide information resources in various basic forms (voice, data, text, video) in a fast, cost efficient manner.

Scope of Planned Implementation

The CCITT is developing ISDN standards in order to set the direction for the world’s public telecommunications systems in the future. Its members include worldwide telephone companies, with input from national and international standards bodies. Among these are the International Telecommunications Union (ITU), an agency of the United Nations with 158 member countries, which encourages international cooperation in the development and use of communications by radio, telegraph cable, telephone and television.

While ISDN promises to bring an improved dimension to international communications, the transition to ISDN will be characterized by a steady migration rather than by revolutionary change. However, most experts agree that ISDN will evolve slowly into a mature, widely accepted technology (O’Brien, 1985; Brancheau & Naumann, 1987). While most transmissions will be conducted using twisted-pairs or fiber optic cables, the use of microwave radio and satellite transmissions can also be supported. However, the majority of ISDN planners supports the concept of ISDN as a terrestrial network, reflecting the focus of nationally oriented telephone companies (Pelton & McDougal, 1986).

ISDN field trials have been conducted worldwide, primarily among developed nations such as the United States, Great Britain, France, West Germany, Italy, Canada, Japan and Australia. In Europe, ISDN is a political issue as well as a technical one, and is often viewed as an economic necessity. The European Economic Community has approved a broad set of guidelines for ISDN implementation in the hopes of coordinating the development of a truly inte-
grated, continent-wide telecommunications system considered vital for Europe’s long-term economic development. Developing nations such as India, Brazil, Peru, Ecuador, the Ivory Coast, and the People’s Republic of China have expressed interest in ISDN, but, for a number of primarily economic reasons, have not carried out much testing to date (MIS Week, February 9, 1987; Bruu, 1986; Lehmann & Almgren, 1987; Pelton & McDougal, 1986; Rudov, 1985).

The services being developed for ISDN include some combination of voice, data, text and video transmissions. Among these are telephone, videotex, teletex, PC-mainframe connections, networked PCs, telecommuting, video conferencing, high-speed facsimile and telemetry. Though all of these services are currently available as telecommunications alternatives, ISDN will provide an improved integration of voice, data, text and video at lower costs and with greater speed and reliability, accessible from a single outlet. Results of early field tests have been favourable. McDonald’s Corporation teamed up with Illinois Bell, Fujitsu America, and AT&T Network Systems to transmit voice, video and data messages along one twisted pair of wires between two McDonald’s buildings. McDonald’s intends to expand its ISDN capabilities in order to track product promotion, improve cash management, and reduce corporate travel by relying on video conferencing (Altman, 1986). Intel Corporation explored ISDN voice/data applications which permitted workers to talk on the phone while simultaneously accessing different mainframe computers on a single telephone outlet. It plans to merge voice and data digital networks to realize even further economies (Feldman, 1987). In Europe, a number of companies have teamed with France Telecom to develop ISDN applications which are innovative, commercially realistic, and generalizable to other markets with only simple changes. Geostock, a French engineering firm, commits technical and administrative documents to optical disk, then uses ISDN for remote access. Federation Nationale de l’Immobilier, a service company for French real estate agencies, uses ISDN to provide simultaneous access to videotex information about available properties and to related blueprints and photographs (Mantelman, 1989).

Global Connectivity and Strategic Management Processes

The success of ISDN is dependent on the development of services and applications by IS professionals which are valuable to businesses. The various trials and early implementations of ISDN suggest the applicability of the telecommunications technology in a wide variety of contexts. Because of its range of integrated services and international scope, ISDN is ideal for the strategic management of multinational firms. Various processes and techniques have been proposed to support corporate strategic management (Grant & King, 1982; McNamee, 1985). ISDN may be utilized to support group-based planning processes involving management personnel at all levels and geographic locations of the multinational firm.

One class of strategic management processes addresses the problem of environmental assessment. Techniques for assessing the corporate environment fall into three classes: techniques for assessing the current environment (e.g. strategic databases); techniques for assessing the future environment (e.g. alternative futures, scenarios, trend extrapolation, Delphi forecasting, brainstorming); and techniques for evaluating alternative futures (e.g. policy Delphi, dialectic policy analysis, vulnerability analysis) (Grant & King, 1982). These group-based management processes could be supported on an international scale through the facilities offered by ISDN. For instance, the development of strategic databases (SDBs) may be supported by IS professionals in different ways by combining voice, data, text and video to suit the needs of developers. Current telecommunications technology makes it feasible to
consider the possibility of computerizing the SDB design process for the purpose of delivering improved information to top-level managers (Szewczak, 1988).

In the SDB design process, managers evaluate the environmental data which the organization amasses on a daily basis and make judgments about their relevance, thereby producing information that can be used in the strategic management process. King & Cleland (1977, p. 60) state that the SDB design process...

... focuses on charging task forces, which are made up of managers representing various of the parochial interests within the organization, with gathering and evaluating the data in each of a number of areas and choosing — through the consensual process that guides most task force decision making — those that are the most important to the development of the organization’s strategy.

The SDB concept fosters management control by directing a manager’s attention to useful information, and encourages managerial creativity in the generation of strategically relevant ideas in the design of the SDB as well as its use. Though not explicitly identified, the consensual process to which King & Cleland (1977) refer is brainstorming (Osborn, 1957) with the added feature of evaluating, as well as generating, ideas as to their significance to an organization’s strategic choices.

The non-computerized SDB design process involves face-to-face interaction between managers who are present in the same physical surroundings. Though the SDB design process has been empirically evaluated to be an effective process for developing strategic information (Szewczak & King, 1987), face-to-face interaction has been observed to have certain significant drawbacks. Among the more salient drawbacks are (1) the tendency of interacting groups to focus on a single train of thought for extended periods, resulting in the generation of only a few ideas, (2) the absence of an opportunity to think through independent ideas, resulting in the expression of ideas as merely generalizations, (3) the concentration on establishing social relationships to the exclusion of task performance, and (4) the domination of the process by high status, expressive, or strong personality-type individuals, resulting in only their ideas being considered (Delbecq, Van de Ven & Gustafson, 1975). These drawbacks are of particular concern to the SDB design process since the generation and evaluation of ideas is critical to the determination of the most significant items relevant to strategic management.

IS professionals may support the SDB design process by implementing electronic brainstorming using ISDN capabilities to overcome these difficulties. One current technological development which can be used within ISDN to support these techniques are message-handling systems developed on the basis of the CCITT X.400 protocol standard. Various interconnection demonstrations using X.400 have been conducted recently in Paris, Hannover and Geneva (Mantelman, 1988). In another context, a recent laboratory study of the effects of electronic brainstorming on networked PCs found that the automated version of the brainstorming model appears to neutralize many of the group effects that have been responsible for poor performance of group brainstorming in the past (Nunamaker, Applegate & Konsynski, 1987).

Generalizing from this result, it may be hypothesized that electronic brainstorming implemented on ISDN may improve managerial performance in a wide range of managerial tasks, not the least of which is the SDB design process. The challenge to IS professionals is to develop new and creative approaches to utilizing the various integrated information services pro-
vided by ISDN in support of management processes. For example, providing supporting numerical data, voice and/or perhaps even video in addition to text messages may help to improve the effectiveness of managerial processes.

Another technological alternative within ISDN is teleconferencing. Participants who are geographically dispersed can use terminals and/or PCs as links to a centralized teleconferencing service. Communications are routed through a packet-switching network (such as Telenet and Tymnet) to the service’s central computers, where the generated ideas are organized and made accessible to participants. One main advantage of using a teleconferencing service is the ability to run a number of conferences at the same time (Hiltz & Turoff, 1978), which can expedite the design and coordination of a number of SDBs. In the choice of teleconferencing service, one determination which must be made is whether a computer conference can be held in real-time or must be held in delayed-time. The choice of a service can then be made as a function of management style, of the urgency with which the SDB design process must be completed, and of the need or desire for time for thought during the process.

**Strategic Planning for Global Connectivity**

The management of information technology resources in multinational firms requires that many levels of the organization be involved in the planning process through more participative multi-level and multi-process mechanisms. In addition, there must be a strong linkage between the strategic plan of the company and its information technology resource management plan (Selig, 1982).

The importance of this linkage was clearly stated by King (1978) who stressed the explicit tie between a business’ strategy and its IS strategy. Later he developed three criteria for a strategic planning for IS process at the highest level of sophistication (King, 1985, p. vi):

1. It explicitly incorporates processes for relating IS strategy to the existing business strategy of the enterprise in the operational sense, such that a significant change in business strategy would require a significant change in IS strategy.

2. It also explicitly incorporates processes for assessing the existing and planned IS resources of the organization with the objective of identifying potentially useful changes in business strategy, tactics, or processes that they may support.

3. It incorporates the notion of information and IS as a strategic resource or competitive weapon, and explicitly involves processes for the identification of opportunities for the use of the information resource in this fashion.

Criterion (1) suggests that if an organization develops a business strategy which reflects a commitment to an international presence which in turn requires ease of global telecommunications, then the organization’s IS strategy should reflect an interest and commitment to the information resource capability promised by ISDN (see King, 1988). This commitment to ISDN prepares the groundwork for addressing the next two criteria. Criterion (2) suggests that a commitment to ISDN will require the identification of potentially useful changes in the way an organization does business. Criterion (3) suggests that ISDN may be used to gain strategic advantage in the global economy. The IS professional occupies a key role in achieving the goals suggested by these three criteria, since he/she will be responsible for delivering the information resources needed to support the achievement of these goals.
Changing the Way a Business Operates Internationally

A commitment to ISDN will change the way a business operates internationally. The increased ease and flexibility of global communications made possible by ISDN can solve basic problems associated with some types of business.

An example is investment banking, an industry where management challenges have grown significantly over the past decade. It is not unusual today for investment banks to have several thousand employees spread geographically throughout the United States, London, Tokyo, and other financial centers. Eccles & Crane (1988) argue that the underlying concept for managing an investment bank is that of a dynamic and flexible network that is both intra-organizational as well as inter-organizational in scope in order to execute unique deals that involve substantial client interaction in an environment that is both heterogeneous and dynamic. A high level of communication is key to implementing a network approach to management. While face-to-face communication is more effective, much communication is currently done over the telephone. Differences in time zones often inhibit effective communication. As Eccles & Crane (1988, p. 193) note:

The need for coordination across locations is as great as the need for coordination within a location, since these firms are attempting to implement global strategies in response to the global nature of the world’s capital markets.

The IS professional must be aware of this needed coordination and recognize the potential of ISDN services to provide it. Since ISDN will provide universal access to voice, data, text and video in a global network, coordination across locations will be as easy and flexible as coordination within a location. Services such as electronic mail and voice mail implemented in a global environment will help solve the problem of time zone differences, since the sender and receiver of a message will not have to be attending to the message at the same time. Rather a message can be sent and stored at the receiver’s location, to be retrieved at the receiver’s convenience. Even the current problem of the lack of face-to-face communication can be adequately addressed in an ISDN environment. Since ISDN will support the simultaneous transmission of voice, data, text and video, two users will be able to carry on a telephone conversation while viewing one another’s visual image on a monitor screen. Thus the visual imagery so important to face-to-face communication will be preserved as desired. Also, conversants will be able to send along supporting data and text to facilitate the communication. In a group context there is even some evidence that video teleconferencing may be a more effective method than face-to-face meetings, since a video teleconference may force participants to become more task-oriented (because it does not allow as much opportunity for extraneous social exchange (Rosetti & Surynt, 1985)) and also requires prior preparation.

Of course, a commitment to ISDN will not solve all of the problems associated with geographical dispersion. For example, ISDN can not overcome the problem of maintaining “the cultural homogeneity which so facilitates a network approach when the firm begins hiring large numbers of people from different countries” (Eccles & Crane, 1988, p. 193). However, a commitment to ISDN will bring an organization closer to the goal of global connectivity, operationally speaking, and will support the realization of its global strategy. The IS professional who is familiar with the possibilities of providing information in various integrated forms through ISDN will be in a favorable position to constructively support this realization.
Gaining a Strategic Advantage in the Global Economy

The use of information technology to gain a strategic advantage has been well-documented in the literature (McFarlan, 1984; Cash & Konsynski, 1985; Porter & Millar, 1985; Cleemmons & McFarlan, 1986; Keen, 1986b). Familiar examples which depend heavily on telecommunications technology include American Airlines’ Sabre Reservation System, American Hospital Supply’s ASAP Purchasing Order Entry System, and Federal Express’ Cosmos Package and Letter Tracking System, among others. Drawing on the work of Porter (1985), Cleemmons & McFarlan (1986) identify areas for telecommunications involvement as including inbound logistics, operations, outbound logistics, marketing and sales, service, customer infrastructure, human resource management, technology development, and procurement.

The development of inter-organizational information sharing systems (Barrett & Konsynski, 1982; Barrett, 1986-87) and logistics data interchange (Anderson, 1986a,b,c) have made it possible for organizations to explore various strategic alternatives in order to gain a strategic advantage. ISDN promises to further enhance this capability. Branchéau & Naumann (1987, p. 28) observe:

ISDN will remove many of the technological problems blocking interorganizational data communication. Systems linking one organization to another will become commonplace. Major companies will continue their current trend of extending electronic links to their suppliers and distributors, streamlining operations and improving effectiveness.

As ISDN technology matures in the international business environment, one area where global connectivity will be effectively utilized is in support of international joint ventures. Joint ventures are being used as a strategy option in mature economies to alter industry structures to the disadvantage of competitors (Harrigan, 1988). Various theories have been proposed to explain the motivations for joint ventures (Kogut, 1988). The global connectivity provided by ISDN will have the following advantages with respect to joint ventures:

1. Joint ventures create “a superior monitoring mechanism and alignment of incentives to reveal information, share technologies, and guarantee performance” (Kogut, 1988, p. 321). IS professionals can support the various organizational control mechanisms needed to effect a successful joint venture by providing a fast, flexible, cost efficient way of gathering and disseminating relevant information in various forms controlled by the user through ISDN technology.

2. During the evolution of ISDN services to the global business community, joint ventures may result in economic benefits to organizations which use ISDN technology cooperatively or jointly. As Kogut (1988, p. 322) observes:

   Where there are strong network externalities, such as in technological compatibility of communication services, joint research and development of standards can result in lower prices and improved quality in the final market.

3. Organizational learning is another motive for joint venturing. A firm may wish to acquire another’s knowhow or benefit from another’s knowledge or cost advantage (Kogut, 1988). IS professionals can utilize ISDN capabilities to address the organizational learning issue in joint ventures. Since much organizational knowledge is organizationally embedded and hence not easily communicated, the range of services and the flexibility provided through ISDN may be used to provide successful and effective communication. Rather than being restricted to a single communication medium such as voice, IS
professionals can combine voice, data, text and video in creative ways to ensure that organizational learning proceeds as desired.

Another related topic of relevance to global connectivity and strategic management is the relation between ISDN and strategic networks. A strategic network is defined as a long-term, purposeful arrangement among organizations, that allows firms to gain and/or sustain a competitive advantage against organizations which do not belong to the network (Jarillo, 1988). Even without information technology, strategic networks enjoy a special economic significance. Since (by definition) firms in the strategic network cooperate in the marketplace, they are involved in a non-zero-sum game which benefits the member firms by lowering transactions costs, especially coordination costs. As Malone, Yates & Benjamin (1987, p. 489) observe with respect to information technology, “the result of reducing coordination costs without changing anything else should be an increase in the proportion of economic activity coordinated by markets.”

One major difference between the strategic network arrangement and the classic market arrangement is that strategic network members have a stake in perpetuating the network arrangement in order to minimize transactions costs over time.”

global connectivity will represent a symbiotic relationship, the continuance of which will be in the best interests of both network members and ISDN providers.

**Positioning IS Operations to Offer ISDN**

From the discussion above, it is clear that the IS professional must play a key role in realizing the strategic potential of ISDN. Current realities of technological awareness dictate that IS professionals must support a corporate commitment to ISDN. Although the senior manager in the year 2000 will have to be comfortable exchanging information electronically (Bennett, 1989), today’s senior manager may not fully appreciate current telecommunications alternatives. Though ISDN is still in the trial stage, the time is coming when the successful IS professional “will not be interested in ISDN for connectivity alone, but for the savings resulting from increased productivity for both the individual and the corporation” (Kanupke, 1989, p. 18).

The following are some ways that IS professionals may begin positioning their operations to offer ISDN services to strategic managers (adapted from Herman & Johnston, 1987):

- Participate in ISDN trials to determine the applicability of ISDN to your own network architectures.
- Monitor the results of other ISDN trials to determine how ISDN may fit into your network design plans.
- Watch for demonstrations of significant new applications, for example, at vendor sponsored conventions (such as AT&T Network Systems NetPower ’89 (Greenstein, 1989)).
- Make sure that equipment purchases follow all the ISDN standards, which are virtually complete (Strauss, 1989).
- As greater understanding of ISDN
technology is achieved, experiment with different combinations of voice, data, text and video in support of individual and group decision making, and other areas of managerial work.

- Seek out opportunities to merge ISDN technology with corporate plans to gain competitive advantage.
- As the ISDN technology matures, support the creation of joint ventures and strategic networks to fully utilize the technology to its fullest potential.

**Summary**

The global connectivity promised by ISDN will impact the management of multinational firms in significant ways. IS professionals must begin today to anticipate major advantages of global connectivity and plan to utilize ISDN technology to its fullest advantage as an information resource. These advantages will impact strategic management processes as well as the content of business strategy in the context of international business.

Most importantly, IS professionals should heed the advice of Keen (1986, p. 142): “The business vision and application opportunities should obviously determine the policy for the architecture and the services it should be able to accommodate, not the reverse.” The strategic management of multinational firms requires global integration of telecommunications services and information resources. Slowly but surely, ISDN will provide this level of integration. Today’s IS professional should anticipate various ways in which the integration of voice, data, text and video can be best utilized to deliver improved information in support of global management processes and ways of doing business.

**References**


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