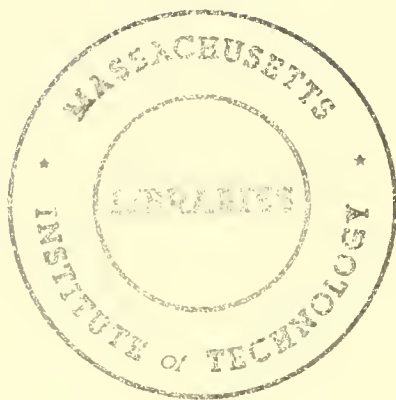TELECOMMUNICATIONS AND
BUSINESS POLICY: THE COMING
IMPACTS OF COMMUNICATION
ON MANAGEMENT

Peter G. W. Keen

September 1981

CISR No. 81
Sloan WP No. 1266-81

TELECOMMUNICATIONS AND

BUSINESS POLICY: THE COMING

IMPACTS OF COMMUNICATION

ON MANAGEMENT

Peter G. W. Keen

September 1981

CISR No. 81
Sloan WP No. 1266-81

Center for Information Systems Research

Sloan School of Management

Massachusetts Institute of Technology

CONTENTS

FIGURES

1. Introduction

There is as yet no field called Telecommunications and
Business Policy. Discussions of the impact of communications
technology generally focus either on hardware, public policy and
reputation, or specific application areas such as office
automation, teleconferencing and electronic banking.

A more integrated perspective is needed now that a multitude
of technological building blocks -- computers, information storage
devices, terminals and communication links -- provide the basis for
developing new markets, for adding new services to existing ones
and for redesigning organizations and work. It is hard to evaluate
the opportunities and problems they present. This paper avoids
forecasts but accepts the truism that communications technology
presages a new industrial revolution that will -- eventually --
reshape our society. Forecasting when and how this will happen is
a foolhardy venture. In general, technical change far outpaces
social change.[1] Our institutions adapt slowly and there seems to
be no iron law of technology; its effects depend on and interact
with unpredictable political, social and economic forces which may
dampen rather than accelerate them.

That said, even if visions of the Information Society, Office
of the Future, Terminal in the Home and Cashless Economy are
somewhat fanciful, they clearly indicate the major directions of
change stimulated by the combination of communications, computers
and information services. We need to make some pragmatic but
reasonably long range directional assessments of their
organizational implications.

That is the objective of this paper. It is deliberately conservative in its visions. We do not need yet another gee-whiz fantasy on a day in the Office of the Future or on the Electronic Consumer. It is assumed here that organizations will try to assimilate the new technologies into their existing procedures and structures. They will adapt to it cautiously, avoiding high-risk ventures but exploiting opportunities sensibly. The existing users of computers will constrain future innovations.

These assumptions are useful in providing a baseline. How radical will be the changes implied by evolutionary rather than revolutionary response to new communications-based technology? What are the choices organizations will be presented with and how are they likely to respond?

There seem to be four main strategic aspects of a business policy for telecommunications:

(1) The development of competitive products and services made possible by compunications (clumsy though it sounds, this term developed by Ottinger[2] is more convenient than "the combination of computers and communications").

(2) The delivery base needed; this relies on the integration of on-line processing and enquiry, an accessible data store and terminals as close to the customer as possible. Telecommunications is the infrastructure for this capability.

(3) The design of organizational mechanisms and structures in a world where spatial and physical constraints no longer determine organizational arrangements.

(4) The impacts on the nature of work at all levels: clerical and administrative, supervisory and managerial as it becomes more and more computer-mediated (Zuboff[3]).

The analysis presented in the rest of this paper implies that, even under conservative assumptions, communications technology will radically change the structures and processes of most organizations, well before the end of this century. The manager's job will require very new skills, in terms of planning, control and supervision:

(1) already, competitive advantage in service industries increasingly depends on compunications;

(2) organizations will be designed around their telecommunications system, which permits decentralization and centralization at the same time;

(3) this will significantly alter planning, control, communication and reporting mechanisms; already, the roles and influence of corporate staff are being changed by compunications;

(4) as more and more of the organization's activities are carried out via compunications work becomes more abstract[4]; so, too, does the organization, especially if teleconferencing becomes a substitute for travel or clerical work centers become geographically dispersed;

(5) correctly or incorrectly, organizations are assuming that necessary productivity gains can come only from long-term automation of office and administrative functions; jobs will be specified and groups formed explicitly in reaction to evolutions in compunications.

2.   Telecommunications and Industrial Markets

The U.S. has become a service economy.[5]   Manufacturing
is generally marked by economies of scale: as volume increases,
average costs decrease.
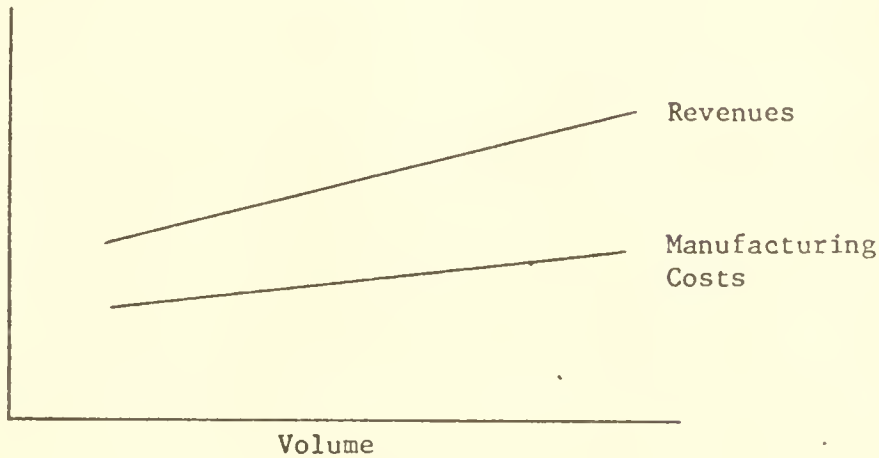
Service industries, by contrast, suffer from diseconomies of scale.
Increased volume of activities too often involves a
disproportionate increase in coordination and administration.
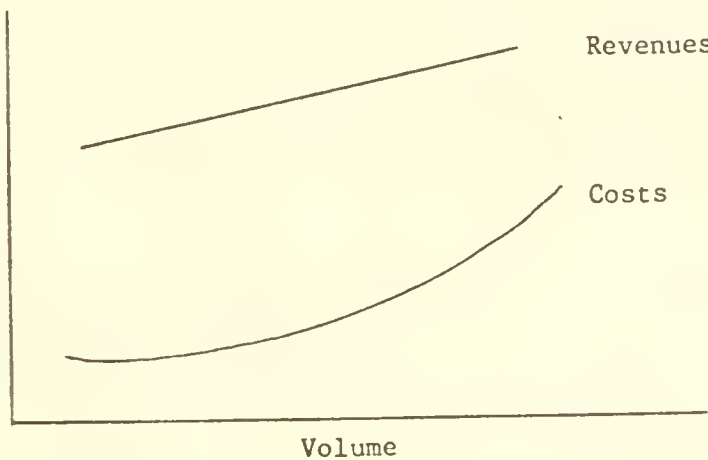
In this context, organizations need some way of improving
either effectiveness (revenues) or efficiency (costs).

Volume
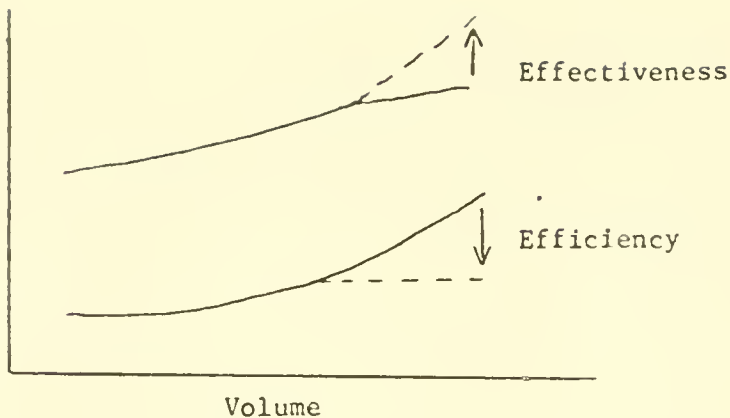
Computer-based innovations obviously offer the potential to do both, properly managed. It is now meaningless to talk of computer technology in the singular. The technologies cover as broad a range of types, complexity and capability as transportation devices. Like bicycles, microcomputers provide portable, cheap tools with a minimal need for expertise and infrastructure. Jumbo jets require both, as does distributed data processing. The analogy is a key one. The management system developed around the monolithic computer technology of the 1960's pays little attention to the variety, trade-offs and differentiated characteristics of the new technological building blocks. Many of them are casually evaluated and innapropriately subsumed under the general category of The Computer.

Gradually, however, market pressures and opportunities are shaping a more differentiated view. Computing is becoming a strategic investment that may be used:

(1) to _improve revenues_ (not necessarily the same as increase revenues)

-- improve quality of existing products (e.g. errors, turnaround)

-- provide new products and services

— leverage skills of key individuals (planning systems, decision support systems,[6] market and environmental information)

(2) to <u>improve costs</u> (again, not always equivalent to reducing costs)

-- cost displacement

— cost avoidance (e.g. to handle increased workload with no increase in personnel)

-- office productivity ("paper is the enemy")

(3) for base-building

-- provide the infrastructure needed for (1) and (2)

- telecommunications

- data management

-- R&D and pilots

-- education, especially to reduce fear of computers and the culture gap between users and technicians.

Figure 1 provides a very few illustrations of the types of investment.

Figure 1. Investing in Computing

1. <u>improving revenues</u>	example	technology base
<u>existing</u> services	customer service stations	disaggregated data store (transaction level) & terminal access

new services	- network information services - corporate cash management services - nationwide real estate information services	communications network and data store
leveraging productivity of managers	decision support systems planning languages	- stand-alone or time-sharing - personal computing - end-user languages - graphics - information access tools

2. improving costs

cost displacement	automation of manual & clerical procedures	mainframes and data capture tools
cost avoidance	personnel enquiry & reporting systems	data store & simple end-user software
office productivity	text handling, distribution & storage systems (far broader than word processing)	integrated, standardized network

3. base-building   comments

telecommunications	highways for application vehicles
data management	central, accessible resource for services
education	user is active component in on-line system management has proactive role when compunications key to market strategy and productivity

Computers have become an opportunity instead of a problem, at last. The combination of disaggregated data, stored at the most detailed level needed for processing and enquiry, and an economic, powerful telecommunications network is becoming the key to competitive advantage in service industries.

In banking, for example, it is difficult to think of any new product or service which has barriers to entry that does not depend on telecommunications: pay-by-phone services, cash management systems, electronic funds transfer, automated tellers, etc. The recent incursions of Merrill Lynch into what has traditionally been the banks' marketplace are based on its network. Reuters, American Express, Dun & Bradstreet and others are pushing new services closer and closer to the customer.

Those services rely on a data store used for enquiry or transactions. The data store may be standard random-access disk files or data bases using relational approaches, inversions or network structures. The transaction processing may be immediate or batched at the end of the day. Regardless of the degree of complexity and sophistication involved, it is the communications capability that transforms these components from tactical to strategic components of a business.

3. The Ideal Computing Capability

Virtually all major organizations are moving towards the integration of technical building blocks shown in Figure 2. This is an ideal, in the sense that it will be a long time before all the necessary components are fully available (data base management

software, for instance, is not yet adequate for high-volume, high

activity file processing) and because it represents the logical,

comprehensive capability needed for utopian visions of the

Information Society and Office of the Future to become real.

Figure 2. The Ideal Capability
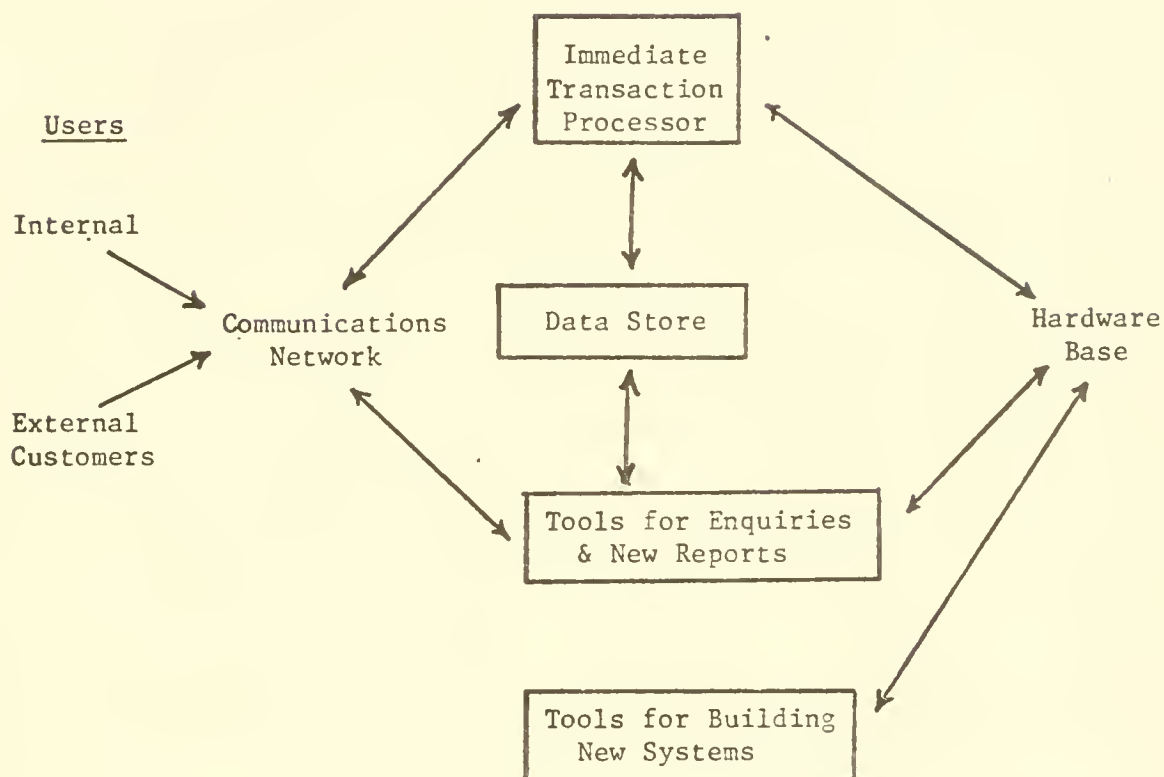
Immediate Transaction Processor: Equivalent to a perfect clerk;
                                   software for, eg, on-line order entry
                                   or cash management

Data Store: Logically, a centralized, accessible library of data, regardless
              of physical structure and location

Tools for Enquiry & Reports: Packages and nonproceedural "end-user"
                               languages that eliminate dependence on
                               professional programming staff

Tools for Building New Systems: Systems development languages and
                                  productivity aids

Hardware Base: Configuration of mainframes and/or minis; may be
                 centralized, decentralized, or distributed (using
                 communications links)

Communications Network: Voice & data network linking users to the transaction
                          processor, data store & enquiry software via the
                          hardware base

The communications and data store components are the key to customer service. The addition of an immediate transaction processor provides the customer with the fastest possible turnaround. When a transaction is made, the company's books are updated at once. This combination of facilities, in on-line order entry or electronic banking systems for example, means that the gap between the customer and the organization is dramatically shortened in terms of both time and space. The terminal provides direct access to services. In effect the organization reaches further and further into its enviroment and brings the customer inside.

This process is far reaching in its consequences for operations and innovation for intra- as well as interorganization activities. With distributed processing, electronic message systems and data base management software, the communications network is the central nervous system of the organization. Decentralized activities can be coordinated as if they were centralized.

4. The Pace of Change: Incubation and Take-off

This paper avoids predictions and gee-whiz visions. The phrase "central nervous system of the organization" is, however, close to electrobabble.[7] At this point in the argument, it is essential to show that the ideal capability really does represent a likely convergence and integration of technologies, not just another buzzword.

The extent to which progress towards it is already substantial and is accelerating can be seen from developments over the past few

years in international banking. Figure 3 summarizes these. They involve in most cases very standard transaction processing and data storage. The innovation results from the communications technology that transforms the components by linking them.

Figure 3:   Developments in Financial Market Services

Information services	Reuters' Monitor, AP/Dow Jones Telerate: provide up to date rates in foreign exchange markets and international news services
Computer-supported dealing services	permit "free dialog" trading; dealers converse with each other via CRT's Reuters Money Dealing service and EUREX
Computer-matched dealing services	these match bids and offers. ARIEL executive service and EUREX system for international bond market
Automated settlement services	Euroclear and Cedel for Eurobonds. London Stock Exchange Talisman service
Funds transfer and message systems	SWIFT; links over 700 banks in North America and Europe

Within the past three years, the number of banks providing cash management services, a complex system to develop and market, has grown rapidly. Automated teller machines are a <u>standard</u> facility in retail banking. Electronic check transfer capabilities have improved to a point where "same-day" settlement of accounts between international banks will begin in October, 1981. Again, that involves no innovations in technology but its consequences will be immediate. Currently, settlement is made at 10 a.m. the next day. The new CHIPS (Clearing House International

Payment System) will end the existing 16-hour float which is over
$1 billion. Banks will have to change many of their operations:
weekend arbitrage, overnight Eurodollar deposit rates and loan
agreements are all affected. "European bankers were stunned when
the full implications of the change were explained to them. Most
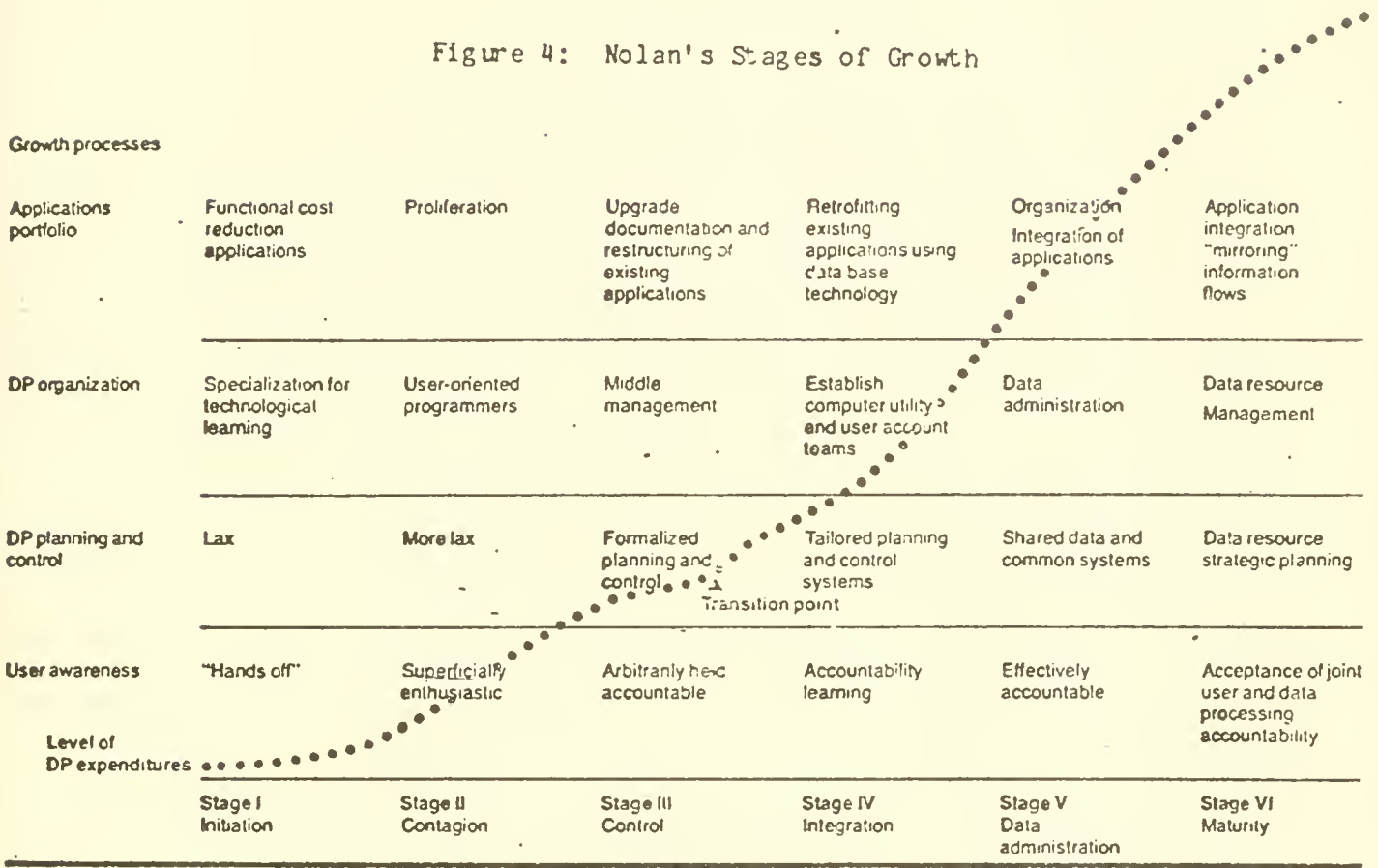are still digesting what it means for their operations."[8]

A key aspect of these developments, and similar ones in other
industries, is that they use a combination of technologies that
have been available for a long time. Videodisks, satellite
communications, facsimile, voice mail, OCR, etc., etc. will only
speed them up and extend their variety and innovativeness.
Communications technology is the infrastructure. It takes — has
taken -- time to put it in place but once it is there its
exploitation is rapid and almost inevitable. This is an important
point. The conservative vision adopted in this paper assumes a
very slow assimilation of the new technologies. The new markets
electronic banking is forming come from a world of 1200 and 9600
bps networks, tried-and-true processors and, often, very staid
software.

The frequent lags between technical and social or
organizational change mentioned at the start of this paper
paradoxically seem to reflect the same process that later results
in very rapid innovations.

Nolan's concept of stages of growth in data processing (Figure
4) is probably the most influential conceptual framework in the
Management Information Systems field.[9] He argues that data
processing moves through an S-shaped growth sequence. Initially he

defined four stages but added two more to reflect a shift from

computer management to data resource management.

Figure 4: Nolan's Stages of Growth

Growth processes	Stage I Initiation	Stage II Contagion	Stage III Control	Stage IV Integration	Stage V Data administration	Stage VI Maturity
Applications portfolio	Functional cost reduction applications	Proliferation	Upgrade documentation and restructuring of existing applications	Retrofitting existing applications using data base technology	Organization Integration of applications	Application integration "mirroring" information flows
DP organization	Specialization for technological learning	User-oriented programmers	Middle management	Establish computer utility and user account teams	Data administration	Data resource Management
DP planning and control	Lax	More lax	Formalized planning and control	Tailored planning and control systems	Shared data and common systems	Data resource strategic planning
User awareness	"Hands off"	Superficially enthusiastic	Arbitrarily held accountable	Accountability learning	Effectively accountable	Acceptance of joint user and data processing accountability

Transition point

Level of DP expenditures

Nolan presents a monolithic view of technology and the
empirical support for his argument is limited. He does not
explicitly include communications. He seems to view it, as do many
data processing managers, as a tactical ancillary to the other
components of the ideal capability, rather than the strategic
integrator that makes those components a new competitive force.
The main insight behind Nolan's framework is that complex
technologies involve a learning curve. Rather than tack new stages
on to the original four he presents, it may be more useful to
assume that at any given point various technologies are at

different stages in the learning curve and that the shape of the S
may vary. For example, personal computing using microcomputers
went through a short, initial germination before it really took
off; it is too early to tell how steep and long growth will be
before it plateaus. Telecommunications, data base management and
. office automation involve long lead times, significant
organizational changes and, often, resistance, or at least cautious
concern. The S-curves for a hypothetical organization may thus be
as shown in Figure 5.

Figure 5: Concurrent Learning Curves for

New Technologies
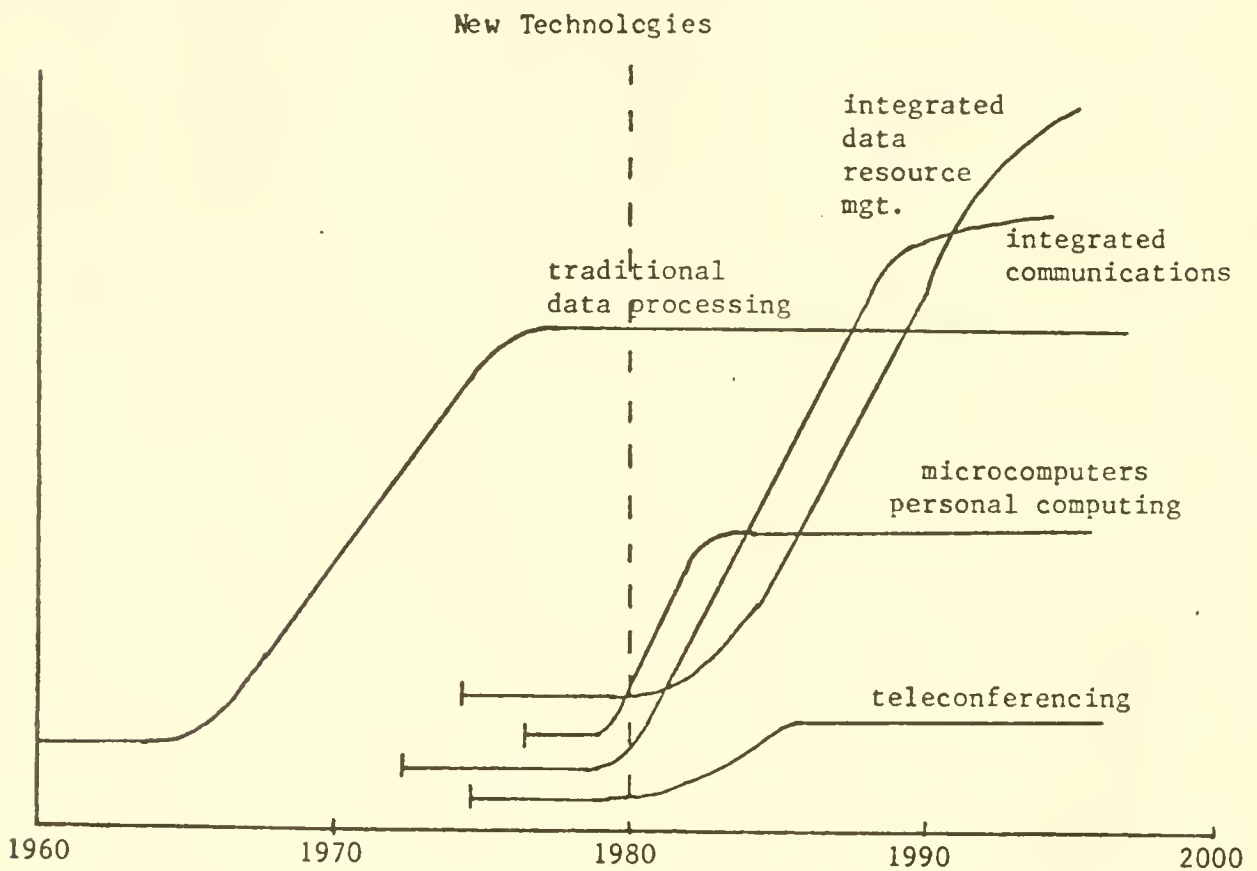
Any technology can be mapped in this way. The key questions are:

    (1) how long is the incubation period;

    (2) how steep is the take-off thereafter.

This writer's guess, shown in Figure 5, is that microcomputers for personal computing have a short incubation and fast take-off, that teleconferencing is just beginning a relatively slow take-off, and that telecommunications has already started a long and fast paced breakout. Whether or not these estimates are correct, several general points are clear:

(1) the longer the incubation period, the more likely it is that gee-whiz predictions will be far too optimistic (office of the future (1977 predictions), cashless society (1975));

(2) when the uses of such a technology do take off, the predictions may err in the other direction and we could be taken badly by surprise.

Telecommunications is often the <u>infrastructure</u> for new applications (office automation, new customer services, electronic banking, network information systems, teleconferencing). It seems always likely to confound prediction.

5.   <u>Who is the "User"?</u>

So long as an organization's use of computer-based technology involves relatively separate components — transaction processing, data management and the configuration of the hardware base for internal purposes — it can be managed through traditional mechanisms. The Data Processing function is responsible for

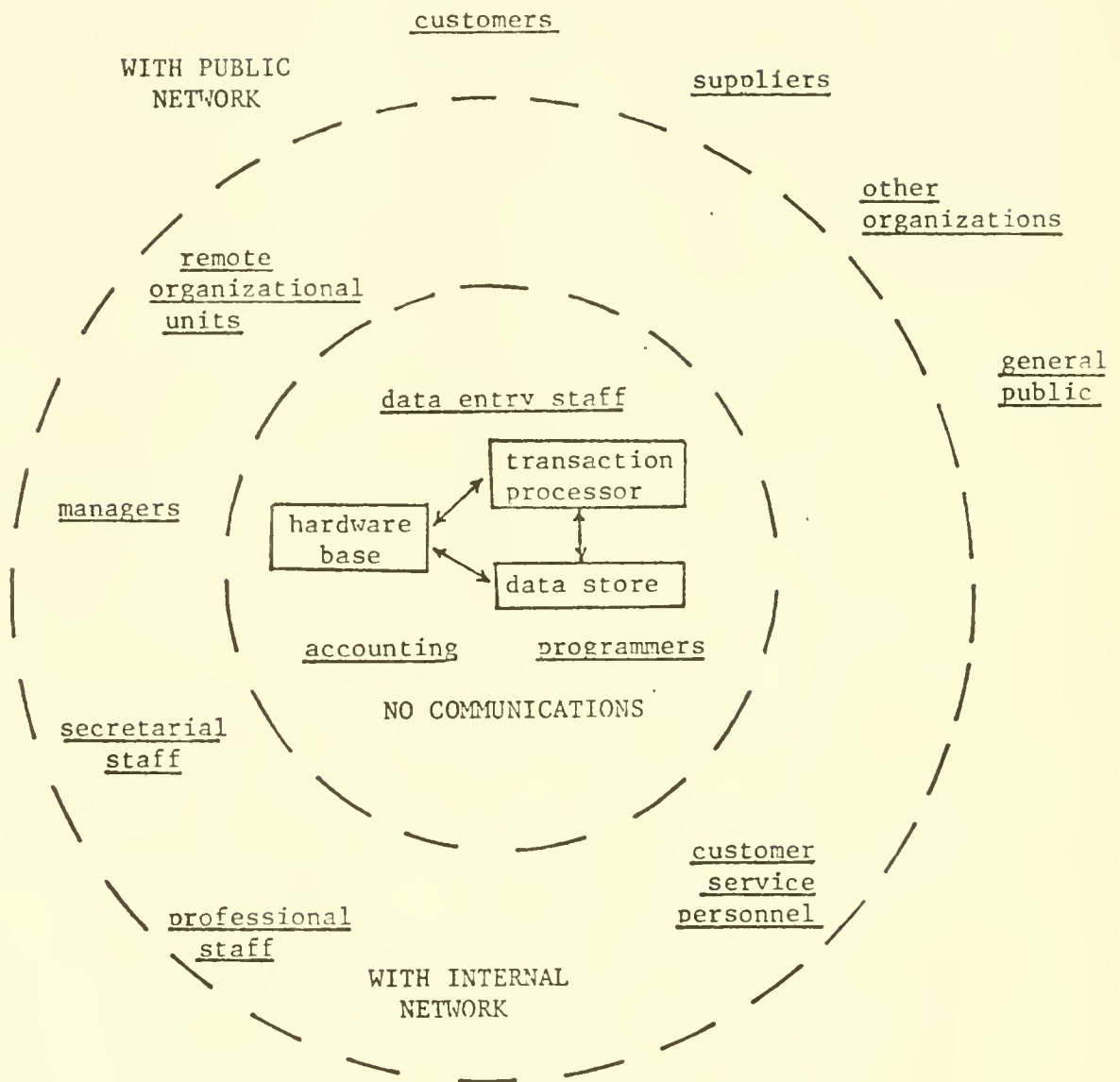meshing the components with the company's activities.

All this changes when a Merrill Lynch introduces a radical challenge to the banks with its Cash Management Account, or Citibank makes an all out drive to capture the consumer market through credit cards. The business plan and technology plan must interact. Top management has to be more proactively involved in issues relating to technology, instead of making go-no go decisions about single projects. The focus on marketing and customer service leads to a looking out from the technology to the environment, instead of a relatively parochial concern with intraorganizational processing.

In the earlier discussion on the ideal capability, one key component was omitted; the users. With batch processing, users have a passive role and if they fill out forms correctly the computer system generates the correct results. In an on line environment, the users are an <u>active</u> component. Their skills, attitudes and initiatives determine the quality of the system.

Up to now, the primary users of computer systems have been clerical or data entry staff. Managers, customers and employees are secondary users; they receive reports, invoices and checks. Communications push the computer into new cultures. With corporate cash management services the customer directly interacts with a bank's processing systems. Electronic message and enquiry systems, text handling tools and network information services involve hands-on, active interaction by nontechnical individuals who have been buffered from the computer.

Figure 6 shows the extent to which the communications

infrastructure adds new classes of users to an existing computing

capability. Primary users interact directly with the computer

resource. Those outside the circle must locate a primary user or

an intermediary. For example, without a public network, customers

must interact with customer service staff; these in turn must go

Figure 6   Communications and the "User"

customers

WITH PUBLIC
NETWORK

suppliers

other
organizations

remote
organizational
units

general
public

data entry staff

transaction
processor

managers

hardware
base

data store

accounting   programmers

NO COMMUNICATIONS

secretarial
staff

customer
service
personnel

professional
staff

WITH INTERNAL
NETWORK

via the accounting group, programmers or data entry function
if there is no internal network. Figure 6 implies a substantial
cultural change and major shifts in organizational and managerial
mechanisms. The tidy closed world of traditional data processing
is being opened up. It seems fair to assume that there will not be
a single functional area or job level that will not be pulled into
a direct relationship with computing. The provision of the
necessary communications infrastructure brings the highways to
their door and it is a matter only of time until the company's
vehicles arrive.

Once again, no prediction will be made here as to when that
happens or the slope of the learning curve. Once it is fully
underway, the organization will be a very different place in which
to work. It will have a far more complex, less physically defined
structure.

6. <u>Telecommunications and Organizational Design</u>

In the late 1960's a multi-national company was concerned
about the need to coordinate its European affiliates. It created a
planning group in the capital city of the most profitable
subsidiary. The affiliates still operate in a decentralized mode.
The planning unit is widely regarded as an evil, even if necessary.
It is seen as intrusive and unresponsive. The local subsidiary
finds it extraordinary that its contacts with the U.S. are fewer
and slower than before. Many of its personnel resent the super-
structure of American managers that now gets between them and the
marketplace.

This is a typical example of how organizational mechanisms rely on physical structures. The only reason for creating the new unit was to speed up and coordinate planning and communication. At a time when no internal telecommunications network was available, this could be done only by putting a new organizational unit in the right location.

It was a clumsy solution. In general, the design of organizations' structures has been based on physical arrangements. Centralization and decentralization are seen as necessarily in conflict. Time and space constrain design. Centralization sacrifices time to gain control; decentralization involves the reverse. Many corporate staff and reporting functions are purely message switching or information pooling devices.

The organizational design implicit in Figure 6 when all three circles are in place makes many of these devices superfluous. The multinational can now use its communications network to coordinate the activities of decentralized units. It may even choose to increase the affiliates' autonomy, because it can monitor their activities and respond to changing situations far faster than before. Daily reporting of a few key figures can replace monthly, more detailed feedback. The organization can have responsiveness and control. Is this an increase in centralization or of decentralization? The dichotomy becomes meaningless.

There is no systematic study of the relationship between telecommunications and organizational design but there is empirical and theoretical support for the view that organizations will increasingly be structured around their communications network.

The empirical evidence is the fact that wherever there are changes in control of data and provision of shared access to planning information the role of the corporate staff shifts rapidly. The link between information and influence has often been noted; data is a political resource and building a data base often a political act.[10] In Figure 6, the "owners" of data are the primary users; others must often go through them to talk to each other. Much of their influence is eroded with changes in the communications infrastructure.

The outer ring in Figure 6 represents an entirely different combination of procedures and authority from the inner ring. More prosaically, common sense indicates that if the outer ring was created to provide new services to customers and to build a competitive advantage, resources and job functions will be shifted to support them. We can expect that the activities critical to effective development and use of the ideal capability of Figure 2 will report at a more senior level than before and be backed up by more professional staff (more in terms of both numbers and sophistication).

This is happening already in many organizations. Information is being seen as a corporate resource and the information function is thus analogous to the corporate financial staff. The data base administrator needs authority, not just technical expertise. The head of Information Systems reports directly to a senior operating manager and frequently to the CEO.

The theoretical issues of telecommunications and organizational design are of interest intellectually and,

pragmatically. Largely because organizations are structured in response to spatial and temporal constraints, we have very simple concepts of them. Most people view them as pyramids, where position is marked by hierarchical status and horizontal function:

Status

Function
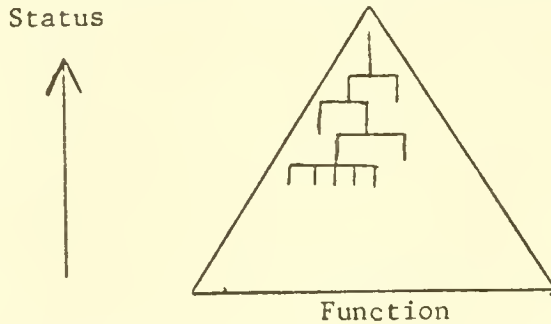
Telecommunications allows us to see organizations more abstractly, as systems for information-processing. They are defined in terms of "centrality" of information and influence, of tight and loose "coupling" and of devices for building vertical and horizontal relationships.

The matrix structures many organizations have adopted try to build more integrated communication linkages than is possible in the simple hierarchical pyramid. The continuous challenge to organizations is to match strategy to structure. The trends in strategy based on the ideal capability discussed earlier imply shifts in structure. Telecommunications will be the cause of and vehicle for major redesign. Already they:

(1) permit centralization-with-decentralization;

(2) shift the influence of central staff;

(3) eliminate spatial constraints on organization;

(4) redistribute data;

(5) create new couplings between previously separate units;

(6) blur the boundaries between units and between the organization and its environment.

That adds up to a radical set of forces for change.

7.   The Impact of Communications cn Work

Zubroff,[11] in an ongoing study, points to the growing abstraction of work that compunications is creating. What was previously concrete -- a form, money, a letter -- is now intangible, even invisible. The CRT comes between the worker and the task. This is not necessarily threatening or harmful to people, but it is certainly different. Zubroff raises many questions about the psychology of computer-mediated work:

(1)   how do you have to act?

(2)   how do you have to think?

(3)   are there particular forms of stress?

(4)   what patterns of social interaction are presupposed?

(5)   how do people make sense of the new work?

(6)   how do they think about their own productivity and the value
      of what they do?

Many of these questions are as yet unanswerable. Zuboff's initial findings reinforce the point that communications technology increases the abstraction of the organization and the job. "Going to work" and "handling paperwork" are concrete. Work is a place and paper an object. Almost every trend in compunications contributes to more abstraction.

We need not make specific forecasts to be sure this will continue. Paper is the avowed enemy and management concepts of productivity rely or defeating it. While there is no deterministic law of

technology that guarantees compunications will replace paper,
clerks and postage, the economic forces alone surely suggest that
more and more of the work done via paper will be handled via
extensions of current word processors, electronic message systems,
facsimile and microfilm. Every manager knows that technology costs
are dropping at a compounded rate and white-collar labor costs
rising (Figure 7).

Figure 7:   Technology versus Labor Cost Trends

Time
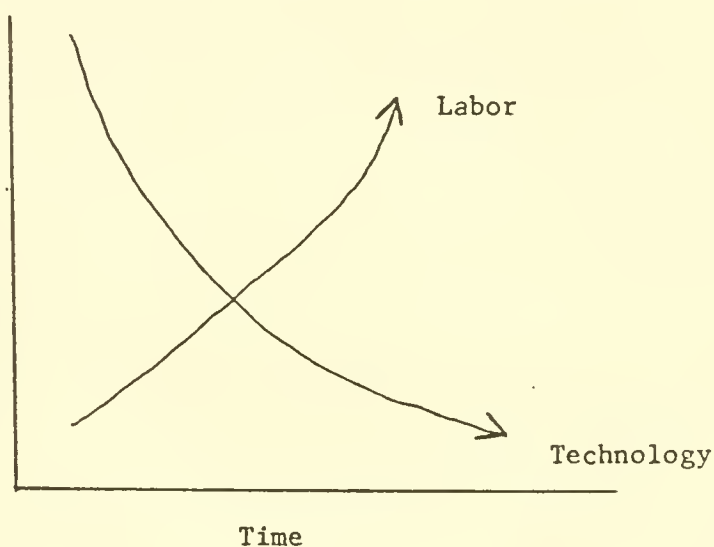
A typical estimate for the decrease in technology costs per
year is 20% and for the increase in labor 10%. That means that
even if computers are now twice as costly as manual procedures for
a given task, the cross-over point is seen as only two years away.
Even if technology is three times as costly and decreases only at
10% a year, the break-even is four years.

King and Kraemer[12] provide an important counter to this
argument. They stress the hidden costs of decentralized computing,
particularly the organizational resources needed to manage an

increasingly complex system which is vulnerable overall to
malfunctions of a single subsystem. They point to previous
failures to anticipate the interdependencies and dependencies new
technologies introduce: energy, automobiles, chemicals, etc.

King and Kraemer's analysis is far far more sophisticated and
cogent than the lyrical visions of many — perhaps most --
proponents of compunications. "The current claims for
decentralization potential and productivity payoffs from
implementation of telecommunications technologies rest on only the
loosest understanding of the social, technical and organizational
dynamics that surround actual technological adoption of
routinization" (page 127).

They are surely right. They also imply that current trends
are effectively unstoppable. U.S. organizations face a period of
economic stress and are comitted to the equations of productivity
indicated by Figure 7. Zuboff, King and Kraemer and many others
suggest this "automation of managerial assumptions" (Zubroff) may
be very costly indeed. It is, though, taking place and its
consequences follow fairly automatically from the development of
the ideal capability as part of a market strategy. We must thus
assume that compunications will lead to the abstraction of the
organization and of work.

Implicitly, such a process will be costly to many workers. It
may be so for managers and supervisors. Much of their authority
and control come from the physical location. New workers are
socialized partly by the physical surroundings and the
organizational climate they create. If the organization becomes

more abstract, so too do many of the traditional tools of
management. The substitution of communication technology for
commuting and travel may or may not involve costs and stress for
workers. They certainly make new demands on supervisors. With
working-at-home or neighborhood work centers where is the
"organization"? How does one motivate, control and evaluate the
distant employee? How does one manage meetings via
teleconferencing?

Work is something people go to. That is changing.
Supervisors manage face-to-face. That is changing. The
organization has a physical identity. That will change.

8. Conclusion: Telecommunications and Business Policy

The implicit question this paper raises is: if we assume a
conservative assimilation of new technologies, will things change
to an extent that the organization and management will be really
different? Surely the answer is yes:

(1) Communications are the key strategic component in the use of
    computers; almost everything else is tactical.

(2) Once the communications infrastructure is in place, it is
    increasingly used to bring the environment to the organization
    and vice versa, especially in industries that rely on service.

(3) Strategy and structure are dynamically related. The same
    infrastructure that brings new services to the market
    eliminates spatial and temporal constraints on organizational
    design.

(4) Communications means centralization plus decentralization.

(5) As more and more of the organization's work is created,

accessed and transmitted through conpunications, work must

become more abstract.

Too often at present, the telecommunications function consists

of engineers and technical specialists reporting in a staff role to

the head of data processing. Telecommunications are seen as an

extension of computers. Their long term impact is stressed in

utopian phrases like the Information Society that ignore the

transitional planning issues implicit in the concept of an S—curve.

Such views are myopic. Current applications of communications

technology force consideration of major choices in market strategy,

organizational design, education and management of the work force.

Failure to plan ahead will be expensive; an inadequate network

constrains innovations in services, and reduces the range of

options for organizational design. As the communications

infrastructure is more and more central to (external and internal)

operations, the business plan will not need merely to drive the

technology plan, but be partly driven by it.

There are relatively few experts in the strategic technical or

regulatory or public policy or economic or organizational aspects

of telecommunications. Expertise in the business policy issues is

almost non-existent, since this involves an organizational and

business and technical perspective. At the very least,

organizations need to recognize that their communications network

is far more than a set of voice and data lines. It is an

abstraction in itself, like the other longer-established, better

understood strategic resources of the organization; money, which is

both "real" and "funny", and centrally allocated and monitored and decentrally used.

Telecommunications and business policy is as important a topic as corporate financial management. the chief financial offices is not a staff bookkeeper isolated from the capital investment cycle. The chief communications planner needs to sit at the same table.

BIBLIOGRAPHY

Ginzberg, Eli and George J. Vojta, "The Service Sector of the U.S. Economy" (Scientific American, March, 1981).

Hahn, Walter A. "The Post-Industrial Boom in Communications," Working in the Twenty-First Century, edited by C. Stewart Sheppard and Donald C. Carroll (Wiley, 1980).

Keen, Peter G.W. "Information Systems and Organizational Change," Communications of the ACM (January 1981).

Keen, Peter G.W. and M.S. Scott Morton, Decision Support Systems (Addison-Wesley Publishing Co., Inc., 1978).

King, John L. and Kenneth L. Kraemer, "Costs as a Social Impact of Information Technology," Telecommunications and Productivity, edited by Mitchell L. Moss (Addison-Wesley Publishing Co., Inc., 1981).

Lloyd, Andrew, "Banks in Europe Demand DP," (Datamation, March, 1980).

Nolan, Richard, "Managing the Crises in Data Processing" (Harvard Business Review, March-April 1979).

Zuboff, Shoshanna, "Psychological and Organizational Implications of Computer-Mediated Work" (Center for Information Systems Research, Sloan School of Management, MIT, Working Paper No. 71, June 1981).