

INCIDENTAL PAPER

**Seminar on Intelligence, Command,
and Control**

**Global Communications Capabilities
for the Banking Industry
Eugene B. Lotochinski**

Guest Presentations, Spring 1991

C. Kenneth Allard; David Y. McManis; John H. Cushman;
Carnes Lord; Charles L. Stiles; John M. Ruddy;
Joseph S. Toma; Duane P. Andrews; Eugene B. Lotochinski;
Paul R. Schwartz

February 1993

Program on Information Resources Policy



Center for Information Policy Research



Harvard University

The Program on Information Resources Policy is jointly sponsored by Harvard University and the Center for Information Policy Research.

Chairman
Anthony G. Oettinger

Managing Director
John C. B. LeGates

Copyright © 1993 by the President and Fellows of Harvard College. Not to be reproduced in any form without written consent from the Program on Information Resources Policy, Harvard University, Maxwell Dworkin 125, 33 Oxford Street, Cambridge MA 02138. (617) 495-4114

E-mail: pirp@deas.harvard.edu URL: <http://www.pirp.harvard.edu>
ISBN 1-879716-03-8 I-93-1

Global Communications Capabilities for the Banking Industry

Eugene B. Lotochinski

As vice president, marketing, for Northern Telecom World Trade, Mr. Lotochinski is responsible for stimulating the development, staffing, and training of customer-oriented marketing organizations in each World Trade market group. He is also responsible for establishing a marketing communications program that embraces the diversity of various World Trade markets and customers, and for coordinating this program with other Northern Telecom subsidiaries. Mr. Lotochinski joined Northern Telecom in 1959 and has held numerous engineering, marketing, and executive positions with the company and its affiliates. Northern Telecom is a supplier of fully digital telecommunications switching systems, providing products and services to telephone operating companies, corporations, governments, universities, and other institutions around the world.

Oettinger: As is our custom, I will not say much about our speaker's biography, since you have had a chance to look at it; I'll just remind you that what I asked him to discuss is from the private sector: his viewpoint on how one gets organized to operate on a larger and larger global scale. And with that, I turn it over to Gene, who has indicated that he is happy to take on questions and arguments as he goes along.

Lotochinski: That's right. I've got a whole bunch of slides here, but it's up to you as to how you would like to run this today. And if I don't get through them, it doesn't really matter since I've given Tony a copy of them.

What I'm going to do today is talk in three separate segments. First of all, I'll look at competition in a global sense. Again, please understand that I'm looking at this from the private sector, not the public or the military sector. I think that our world is in a totally different situation in the private sector than it ever has been with respect to globalization of industries.

Second, I'm going to talk about banking as an example of a global industry that is looking quite differently at the use of information management technology and, in particular, communications, which is what I'm going to focus on. Based on our analysis of banking, I'm going to show you just a

little bit about how we are addressing the needs of banking.

Third, if we have time, I'll show you a little bit about what our own network looks like, because we've got a very sophisticated and extensive network. We do a lot of things in the way of voice mail, E-mail, facsimiles, as well as distributed development projects in which we're transferring big files all around. I think a lot of this will tie in quite closely to what it is that you're looking at.

I'm going to start with a look at this question of global industries, and I'd like to begin with a design question. This question can be applicable to anything; let's take telecommunications. The question in telecommunications used to be, what can you design? As an equipment manufacturer, we were constrained in our designs by what we had in the way of components: relays or switches, cross-bar switches, etc. Well, there are a number of technologies around today involving processors, memories, software, and optical fiber. It's changed telecommunications, and the question is no longer, "What can you design?" but rather, "What do you want me to design?" because there is all this flexibility. So you say, "What does all that have to do with global competitiveness?" The answer is that it's changed the barriers to entry into the telecommunications business. In the past, the barriers to entry were huge. If you didn't have these relays, if you didn't have

these switches, if you didn't have traveling wave tubes, or whatever, you couldn't design the switching or the transmission of the PBX (private branch exchange) products. Today the barriers to entry are quite small. If a company can understand the market, if it's a large company with a reasonable infrastructure in place, it can go into that market very quickly.

So, what's going on in telecommunications? Ten years ago, telecommunications everywhere were essentially regulated monopolies. Telecommunications was an arm of the government, maybe part of the post-telephone and telegraph (PTTs) and so forth. And it was a closed industry in most countries because both the manufacturing and the service were looked at as something being in the national interest, providing employment. The objective was to get universal telephone service to everybody, or close to everybody, and to do this in an economic way. That's the way it was up until 10 years ago.

What have we got now in the United States? We have cheap universal service from a system that is pretty economical.

The whole thing has changed recently because of a number of events including the breakup of the Bell System. What we've got is an open market. The objectives today of most telecommunication companies — whether they are carriers like the Bell companies or MCI or Sprint, or equipment manufacturers like Northern Telecom or Ericsson — are the same. They are innovation and customer responsiveness. The reason for customer responsiveness is because when you get competition, if you're not responsive to your customer, you don't win. This is a totally different picture. The telecommunications industry in the United States has undergone a tremendous wrenching in the past 10 years, and I think to the good. Now there are still the regulatory issues and I say, "Who is in charge?" Because what you've got is the FCC (Federal Communications Commission), the Justice Department, and Judge Greene*, the PUCs (public utility commissions), the federal legislature, and the state legislatures. They're all kind of poking around in this. It's actually a group of lawyers, when you think about it, that are deciding the future of this telecommunications business.

Oettinger: I would disagree with that. They're all hired hands. They're only doing what they're told. I rarely see a lawyer with initiative.

Lotochinski: What's going on elsewhere — and those of you who were here at lunch heard some of my discussion on this — is a lot of other countries are looking into this experiment in the United States, if you call it an experiment. They're saying, "Gee, competition has really benefited the U.S. It's caused new services to be offered, new capabilities. It's caused the price to come down. Let's (in this other country) try to get some of the advantages of competition. But let's not get ourselves all tied up in this regulatory knot that the U.S. has. So let's get the best of it and not the worst of it." You are seeing more competition in countries like Japan, the U.K. (United Kingdom), Australia, Germany, France — a lot of the European countries. In other places, it is still a regulated monopoly.

Oettinger: Let me press you on that. I see less of a difference than I hear you talking about it. I think you are right in describing the U.S. mechanisms, but it seems to me the shenanigans are universal. It's just that in other countries they happen by whatever the local political horse-trading system is.

Lotochinski: No. In the U.K., there is a single regulatory agency — it's OFTEL (Office of Telecommunications), headed by Sir Brian Carsberg. He's it. There is no state regulation and there are no PUCs, there's no Judge Greene.

Oettinger: Yes, but he is ultimately the marionette for the usual old-boy-network.

Lotochinski: Oh yes, but it still comes together at a single point. They have the advantages of competition without the problems that we've got here, and I say that we've got terrible problems, probably even worse than all these other wrinkles. Anyway, this is what's going on. What we're seeing is more competition. In fact, a lot of these countries are saying, "Let's try to get the features and capabilities that have been developed for the U.S. and that turns out to be a good market for us." So we go into a place like Australia and supply and overlay an intelligent network using what we've developed for the U.S. market.

Student: Are you talking about increasing competition and innovation? What I see as most interesting right now is a lot of the innovations occurring at this still regulated level, at the local distribution level — call waiting, teleconferencing just by hanging up and dialing another number.

Lotochinski: Those features were developed on PBXs as a way of differentiating one PBX from

*Judge Harold S. Greene who oversees the AT&T antitrust settlement.

another, and as the features with real utility were identified, they were ported to the central office. They were not developed by the local telephone companies. They were developed as a competitive response.

When you look into real features available before the breakup of the Bell System, you say, "What was there?" You find remarkably few — there was Touch Tone, which took forever.

Student: In places like the U.K., though, doesn't that have more to do with their law than with the industry?

Lotochinski: No, not totally. There used to be the GPO (General Post Office), which used to run the post office and the telephone service; that was a government bureaucracy, and that was lifetime employment. Don't worry about the efficiency, don't worry about the number of employees, you just do your thing in the good old bureaucratic way. What Margaret Thatcher did with a lot of different industries in the U.K. is split them up into segments so that the Post Office is separate from the telephone service — now there's British Telecom — and she privatized it. They're doing that with the water and electricity and a lot of other things — and injected competition. So there's British Telecom saying, "We had better develop competitive responses to these things." What does "competitive responses" mean? Innovation and customer responsiveness and that's got nothing to do with the law. Now, in terms of how you then regulate it, yes, of course they're going to work within their historical situation and, yes, maybe it happens that it all comes together. But it could easily have been split up and dispersed, spread around among the cities and the towns, or counties.

So, what innovations has this brought? There are two different things — products and services. Products, which is our game, are things like terminals (you see lots of different terminals available today), PBX, the switching systems, and cellular and optical systems. That's what manufacturers are innovating.

If you look at telecommunications services, these to me are the things that the telephone companies and the carriers are innovating — rather than things like call-waiting, calling number display (which has a lot of other problems), billing options. I just got a letter from AT&T saying, "Boy, now we've got Call International." It's a different way of billing, which gives me, as a customer of theirs, discounts — in return for my committing to AT&T, I get virtual

networks. Instead of having a dedicated networks company, it's a virtual network. It has the semblance of being dedicated and private, but it really isn't. These are the types of innovations that we're seeing at the carrier level, and of course they reflect back into products so that we, as the manufacturer, need to understand what these carriers are doing and make sure that we're developing products that will allow these things. My conclusion is right here. The future belongs to the innovator — very different from what it was 10 years ago in a monopolistic, regulated environment. You needed a product that was very reliable and a message. Now I need a product that does all these things.

Student: Is reliability getting better as innovation goes on?

Lotochinski: There are two answers to your question. First of all, there have been enough major interruptions, what with the big fire in Chicago and the AT&T network outage that happened a year or so ago, that each individual carrier is paying far more attention to the reliability and survivability of his network than in the past. Number two: Anybody needing critical service is undoubtedly going to buy it from a multitude of suppliers — you'll go for long-distance service from both AT&T and Sprint, or MCI and Sprint, or AT&T and MCI. And for local service, you're probably going to go with some switched local and some bypass; in other words, as an end user you now have options available to you. Our experience says a lot of the larger companies are, in fact, looking at that type of diversity for reliability. You didn't have that before. I mean before you had the telephone company — end of message. And if they did have a problem, you were out of luck. Right now you could have a telephone company go out. You may have some degradation, but you won't be out of service if you have bought diversity.

Oettinger: May I make a suggestion that we resist the temptation to draw Gene excessively into the details of that business or the banking business, because my hope for this session is not to get you guys to become experts in either banking or telecommunications but to get at the essentials of what happens as you go from a local to a global scale in a business. And the details of this business, like the details of the banking business, are relevant to us only in order to provide some concreteness to what happens as you move up.

Lotochinski: So let's come back to what's going on in the world. What I'm saying is that technology is at a stage where you can do anything that you want to do and where innovation is what is important, not simply low-cost production. And now I'm going to expand on that and say, "Who's protected these days from competition — is it manufacturers?" And the answer is, "No." Because what you've got is labor costs in different parts of the world, you've got the ability to do rapid product introductions, and you can see some of my examples of industries — automobiles. Just reading the ad today in *USA Today* for the BMW new eight series. And that to me is a direct response to what the Japanese manufacturers have done with their Infinity and Lexus models and so forth. Global markets are really leaving no manufacturer protected. It doesn't matter what industry you're in.

Why have I shifted to global markets? There are two things that have made it possible to market on a global basis. One is telecommunications in its broadest sense; the second is the good old jet aircraft. You can get anywhere you want in a day (unless you cross the dateline, then you lose a day). Again, you can look back 10 years ago. You couldn't do that. You would need two to three days. So when you've got the ability to do things quickly, when you've got the ability to produce where your costs are low or where your skill levels are high, and you can communicate well, nobody is protected.

What about service providers? Look at the kinds of service providers I'm talking about — banks, credit card data entry. Look at architects — why does an architect have to be in your city? He could be anywhere. You could go on a global basis to select an architect. Enhanced telecommunications and high processing power really leave no service providers protected. Nobody is protected from global competition.

Where is this battlefield — in competition, in manufacturing, or in service provision? The answer is it's everywhere and in order to be an international competitor you've got to succeed at home and abroad and understand the competition.

How do you do these things? Foster excellence in communications internally and with your customers. (This may start to sound like the needs of the military or government.) Here's Northern Telecom, as an example, a sleepy little telecommunications equipment manufacturer producing initially for the Canadian market and extending out to the U.S. market. For us to remain successful, we have to do all this on a global basis. One of the reasons for us

to expand beyond Canada and the United States is that if we're not in Japan, then we could very easily be swamped by the Japanese manufacturers. If we're not in Germany, we'll be swamped by Siemens, and if we're not in Sweden, we'll be swamped by Ericsson, and if we're not operating in China, we could lose a huge marketplace, and if we're not active in Eastern Bloc countries, as they open up, we will lose a huge marketplace.

Oettinger: What Gene has just said is fascinating. Northern Telecom is a stupendous case study because they essentially got a head start on some of this by virtue of the fact that Bell Canada got cut off from the Bell System a decade or two before the Bell System breakup. They've been fending for themselves. They evolved from captive to open market, but in a Canadian environment, to working out globally. The end of the story is who knows where.

Lotochinski: The most important thing we purchase today is time. Time has really become an extremely important competitive leverage. That's what every industry is finding — the faster you can introduce a product to market, the faster you can respond with pricing, the faster you can respond to customers, the faster you can deliver after you get an order — all of those things. How do you do that? Once again, you rely on telecommunications infrastructures.

What I'm going to do now is talk about banking from the perspective of a telephone administration. These are the kinds of topics I'm going to discuss: globalization requirements, objectives, implications, and so forth.

Banking is a very competitive business. I think everybody knows that the 14 largest in the world are Japanese. The U.S. is trying to change its banking laws to allow for the U.S. situation to be more competitive with the Japanese, Canadian, and some of the British banks. They're seeing the potential for growth — that the costs of their services should come down while the quality should go up. And they see far more need to pay attention to their customers and also to their suppliers. All of this says, from a banking perspective, that communications is a vital role. In fact, when I look at banking today, my opinion is that their business is telecommunications. It's not handling of currency — because today you send a message and that effects the transfer of ownership of money. In the old days, you used to have these great big concrete buildings, with carved stone and big bronze doors that lock

shut, that were full of money. Then Bonnie and Clyde would come in and try to steal it. Today, banks are trying to extend what they have been using domestically to the international scene, using facsimile and electronic mail and video conferencing. These are things they have been using here for quite a few years, which were relatively expensive to implement in the past, but are getting much cheaper. Now there's a lot more optical fiber used around the world, laid across the oceans, and this is getting cheaper now on an international basis. Banks are also looking at new applications, such as free dialing from anywhere in the world. What we're finding is a lot more countries are implementing free calling services. Some use 800, some use 008, some use other numbers. Banks are also using global automatic call distribution, which I will talk about a little bit later; this is having, in essence, agents or customer contacts, all over the world, acting as a single answering group.

Now the problem that the banks have is high cost, and the opportunity for the carrier is to price to the value and to offer enhanced services. A lot of the carriers are responding to that and what we're finding, particularly in the industrialized nations, is much more interest in responding to these demands by providing enhanced services. For instance, I talked about Australia where we sold an intelligent network.

The other problem that the banks have is how to find people to do all this network design. In the past, most large companies did it themselves, literally. For private lines, you'd go out and buy multiplexers, use PBXs and all that stuff, and you'd put your network together. A company can do that; the military has to a large extent.

There's opportunity for the carriers to offer reliability, availability, serviceability, and take a lot of the demands off these companies. We're starting to see companies selling their telecommunications systems. Kodak is an example. It implemented all those things, then sold their computing to IBM and sold their network to DEC (Digital Equipment Corporation). So there's an opportunity to offer these kinds of things.

Carriers are going to find that revenue from straight international distance dialing and straight leased lines is going to drop because of competition, regulatory pressure, and so forth. However, if they can offer services to match the requirements of companies like banks or Northern Telecom, it's a revenue opportunity and it allows them to control their accounts and so forth, which produces high margins.

The next point then is: What are the requirements on a global basis of banks, financial institutions, and almost any company operating in a global environment?

Oettinger: Don't the pressures you described earlier about competition apply here as well?

Lotochinski: We have companies like British Telecom, AT&T, and NTT, who have joined together to offer services to large corporate companies; it's like one-stop shopping for all their services. You never would have seen that a few years ago.

Oettinger: But they're essentially competing.

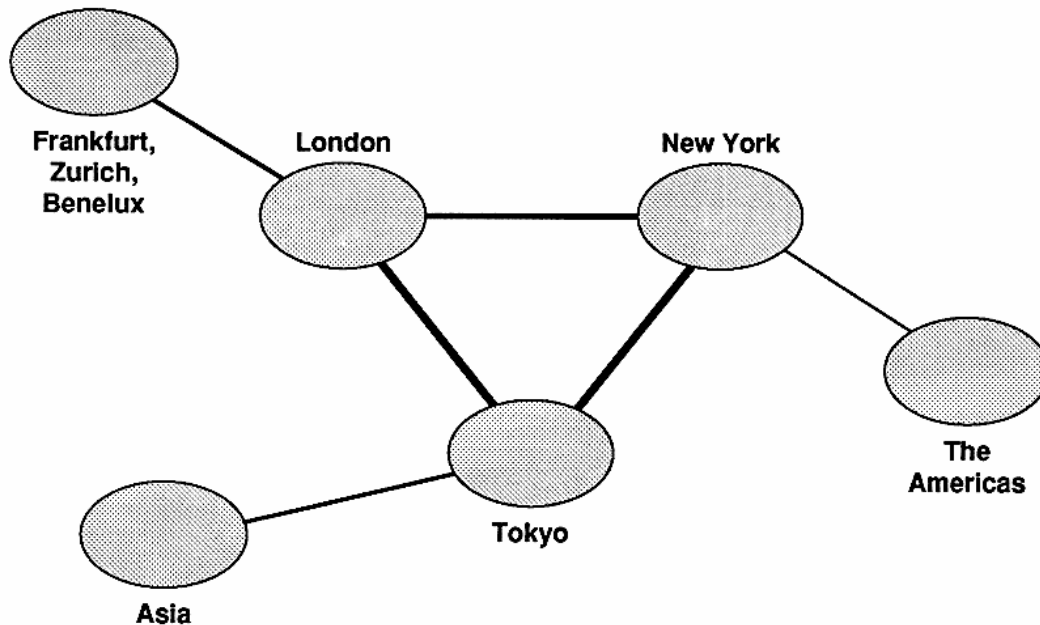
Lotochinski: They're cooperating in that case.

Oettinger: If they're cooperating with one another, they're competing with the local carriers.

Lotochinski: Yes, they're competing with alternate carriers — Mercury, Sprint, Cable & Wireless, MCI, and in the case of Japan, IDC, IJC, and so forth. What companies are trying to do is band together to offer more to these large global customers than their competitors. It's more than local; it's international. My point is couched from the perspective of the carrier. What does this mean from the perspective of the user? What does it mean from the perspective of people in military or government? They're thinking pretty carefully about whether they want to go private anymore or whether they want to take advantage of public networks while still being concerned about security.

Now, global financial institutions typically have triangular networks, typically one from London to Tokyo to New York. (See figure 1.) I'm going to twist the geography here a little bit. I made it go east-west. Typically, what you've got is connections between each of these hubs spreading off into Europe, into Asia, and into the Americas — very typical. That's interesting, because when you're around the world like that you have people on line 24 hours a day. It's great. I'm doing some work on some contracts, and the lawyer who supports me is in Australia. I send him a message here in the daytime and go home and have a few beers while he's working away in Australia; he sends me the answer back, so I can come in in the morning and there's the answer. What we're getting, in essence, is nonstop work, which, of course, is time critical. So we're able to respond to our customers much more rapidly than ever before. Also, by going triangular, you get backup transmission routes. I'll talk a little bit more about the kinds of circuits that

- ▶ Triangular Networks are typical for large city banks and securities firms



- ▶ Effective for transmission of financial transactions with 24 hour activity
- ▶ Allows for back up transmission routes
- ▶ Most circuits are voice grade or medium and high speed data transmission

Common Hub Profile for Corporations, Especially Banking/Finance

Source: Northern Telecom, 1991.

Figure 1
Geographic Segments:
Primary Hubs for Global Financial Institutions

we see — they're usually voice grade or medium high-speed air transmission. Our network is quite similar to that. I'll show you a diagram later.

Bank managers are trying to get several services out of their network: better customer relationships; transaction services — facilitating information transfers so you can get information to those who need it quickly; and getting the costs down, the back room costs. You really want to try to be efficient and effective and do this as inexpensively as possible, so anything that will tackle costs is worthwhile. You want to be more responsive, you want to connect your customer to the right person, whoever

that person is, quickly. So how do you do that? If you can concurrently display a customer record while a telephone call comes in — dynamite! You've got all the information there for your agents to know what's going on.

Other services include global automatic call distribution, global dial-up video, video conferencing. If a customer is trying to borrow six or seven billion dollars to make a major acquisition, it's nice to be able to see him. You might want to do that with video and things like free calling.

In concurrent display of customer records, the calling party makes a call to an agent, the database

picks up the record and displays it for the agent. There's no reason why you can't do that in Europe and Asia and it really doesn't matter where they call from as long as you can get the calling number. Can you do that? Yes, you can do it on a private network. Can you do it on a public network? Yes, if it's got ISDN and signaling system 7 and there are no funny regulatory barriers. Can you do it internationally? We're doing it on our network. What kinds of things can you do? You can have centralized or distributed databases. It's interesting because if these are at relatively high speeds, you may have two databases. If one goes down, you just use the other as a backup. Just use some communications for that. It's quite easy to do.

Computer integrated telephony — that's what we've been doing with companies like DEC and IBM: tying together the computing and the communications. It gives you the calling party profile. What are the advantages? You can respond more quickly to the customer. The customer can be serviced much better and will feel better if the bank knows who he is. You can do it at lower cost and get more revenue.

With automatic call distribution, you can set up agents in different places in the world — North America, Europe, Asia, the Outback — and optimize resources. This is a case where, without overtime, you can have people working normal business days and provide 24-hour service. And you say, "Isn't that going to cost a lot of money?" The answer is no because the costs of these transmission facilities are dropping. Again, you can improve customer service. And you can also do interesting things with language.

Student: Excuse me, what do you mean by that? Do you have a translator on?

Lotochinski: No, say somebody calls in North America and it turns out to be a Japanese person who doesn't speak English very well; you transfer him to an agent in Tokyo. Again, you say, "What's the call setup time?" It can be a fraction of a second these days. Is it possible today? It sure is. We're doing it on our network. Can you do it on the public network yet? We're getting there.

Oettinger: That's very interesting. If I may just add a parenthesis — 10 years ago this talk would have been science fiction. Today I cannot think of anything that Gene has mentioned for which there is not a prototype or more around someplace.

Lotochinski: Here is an example of dial-up video conferencing — from London to Japan. (See figure 2.) Today you can get very good quality using two 56-kilobit channels and it's quite easy, in fact, to get two 56-kilobit channels on a dial-up basis. And what can you do with this? Applications include mergers, account building, credit committee. What are the advantages? Personal contact, short decision time, integrated visuals. Possible? It sure is. We've got a video conferencing network in Northern Telecom. We can dial to Hong Kong. We can dial to the U.K. We've got a whole bunch of locations in North America, and when I say dial, we don't lease lines on a permanent basis. We dial out and get two 56-kilobit lines across the ocean, pay for the hour, or whatever, and drop off. No funny set-up time, no satellite, nothing. What's the quality at 128, or 112 kilobits? Remarkably good.

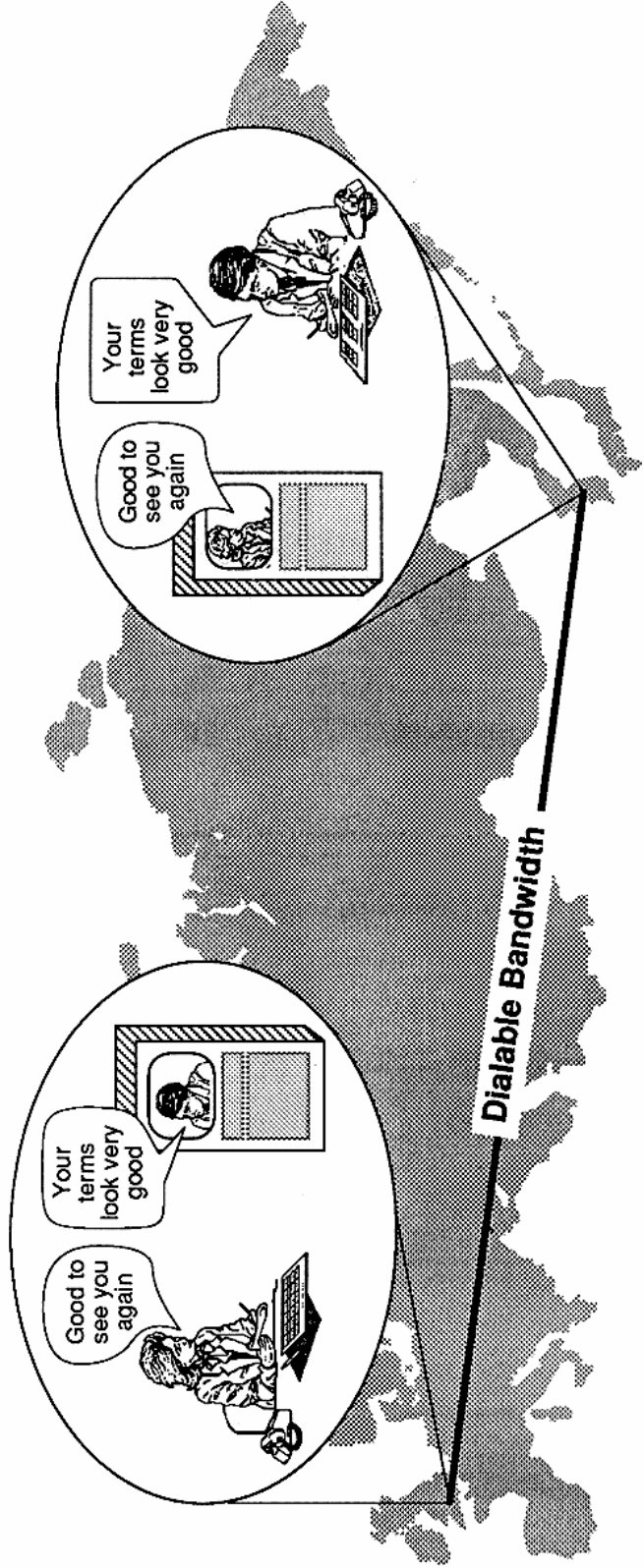
Student: I've never used this system. I was wondering, don't you lose the human dimension?

Lotochinski: This works best if everybody knows everybody well. It works worst if they are new people whom you have never met before that you are trying to meet this way. There are a lot of psychological barriers. The point is that it's better than the telephone.

Student: During the Persian Gulf situation, I saw a lot of companies who were going to this instead of flying people around the world. I don't know, but you might have some figures on this, but my understanding was use of video teleconferences really shot up.

Lotochinski: I remember a few years ago when we wanted a video conference, we used to have to reserve a backup program channel from one of the television networks, one of the communication carriers, with the understanding that if the main channel broke, they were just going to take the backup, and our conference was out of luck. Today you can do it with 64 kilobits. It's not as good as going to two channels, but, quite literally, Sprint, Cable & Wireless, and Hong Kong Telephone have all worked together offering dial-up video services across the Pacific.

Oettinger: Will you just keep on this for the moment. There are some strange measures of that if you look at Richard Beal's account from an earlier seminar, you'll find that was one of the aims of the then White House video conferencing systems —to



Leading Applications:

- ▶ Mergers/acquisitions/consolidations
- ▶ Major account building/maintenance
- ▶ International credit committee
- ▶ New product development, support and rollout
- ▶ Internal operations

Source: Northern Telecom, 1991.

Figure 2
Global Dial-Up Videoconferencing Applications

avoid unnecessary travel by folks coming to meetings, thereby generating attention from the Press.*

Lotochinski: A different kind of wear and tear, right?

Oettinger: Yes, a different kind of wear and tear. So that if you've got a bunch of folks who want to get together quietly, a video conference generates no limousines. It generates no terrorist attention. These things are not necessarily the first things you think of.

Lotochinski: My next slide is transaction services. (See figure 3.) Examples of transactions include: automated teller, electronic funds, charges, and debits, but that's retail banking. With wholesale banking, it's check clearing, etc. You want to decrease response time, reduce error rates, and be innovative. For telephone companies, this means liability, and accuracy of availability. Understand that when the telephone system was first developed, it was an analog system. And as an analog system, it was subject to noise. When data communications started using the telephone system, they were looking at channels that were very expensive, had very low bandwidth, were noisy, and error prone. Everything the data processing industry developed, like statistical multiplexers and all the error checking and correction stuff, was to do two things. It was to pass as much as you could through these expensive low bandwidth channels. And second, it was to compensate for the errors and noise. Today, with optical fibers and digital switching, you've got almost error free, noise immune, low cost, high bandwidth channels. It's been a complete reversal. If you do your design correctly, you can also offer very high reliability and availability. And that, again, is what a lot of the telephone companies are doing with rings, fiber rings, bidirectional transmission, and different access points to their central offices. And then you've got technologies like packet switching, or frame relay. What does this offer for banks? It reduces costs and increases revenues.

Student: May I ask a technical question? When you talk about errors introduced by the system — what kind of errors are you talking about in terms of banking services?

Lotochinski: When you're dealing with financial transactions, you better be error free, but if you're looking at the difference between bit error rates of one in 10^6 and one in 10^{13} , you do your error detection and correction very differently. You can probably go with bigger blocks etc., but you still had better be pretty error free.

I also talked about information distribution and back room costs. A lot of this is speed — time sensitivity. How can you get information in order to make decisions? You use these kinds of services — voice messaging, voice response, fast call setup. We can call from my office to Maidenhead in the U.K. The call setup time is about half a second. When the phone rings, they have my calling number on the screen. It's phenomenal, actually. We have a uniform dialing plan — we use 6 as an access code, three digits for destination, four digits for the line number. So the U.K. is 560. It's their office code. Tokyo is 620. Australia is 641. It's very rapid. We have electronic mail, and so forth.

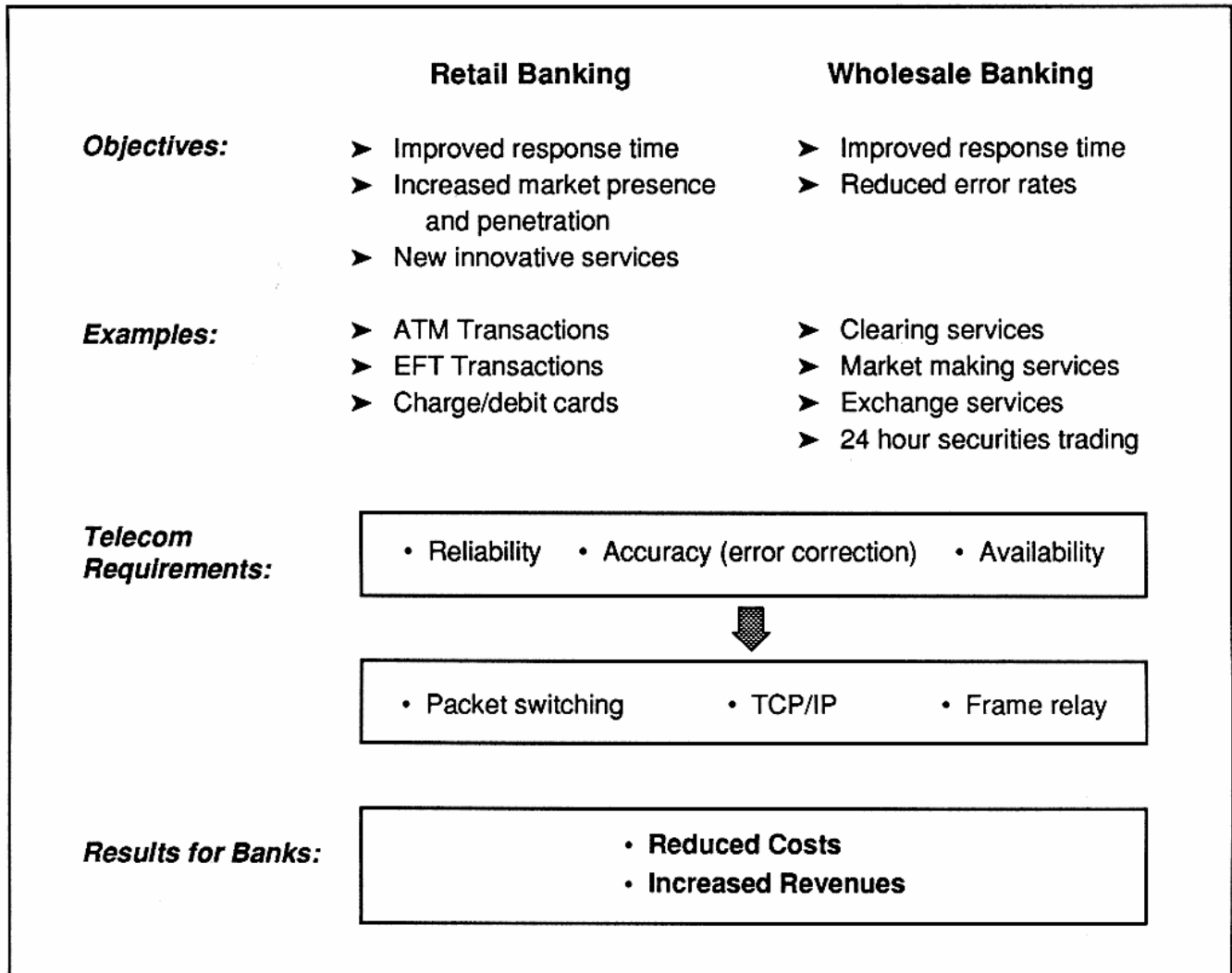
Personal locator services is a very interesting concept. How do you get to a typical person — through a residential phone, cellular phone, office phone, fax at home, fax in the office, electronic mail, voice mail? Why not a database? Then anytime he makes a call, his location is logged in and then when anybody tries to call him, it goes through to him without anybody doing anything — a universal number. That's what some of the carriers are starting to look at offering as a service. It's just phenomenal. The problem, of course, is what do you do if you want to get away? I think the answer is you don't make the call.

Oettinger: Or you borrow a technique from the computer industry and you put in an on/off switch and you turn it off.

Lotochinski: You turn it off. You unplug the phone and turn it off.

What makes all these technologies happen? And, by the way, I do have ISDN (Integrated Services Digital Network) up there. I have been a fan of ISDN for years. The problem with ISDN is that it came to the public attention too early. There are a lot of clouds around what ISDN is. In my opinion, it's a better signaling system. What's the status today? It's going to be implemented more broadly. We're doing it on our own network. And I keep talking about our network because we're using ISDN capabilities on a private basis, and as we convince the carriers to implement Signaling System 7, we sling it over to the public network.

*Richard S. Beal, "Decision Making, Crisis Management, Information and Technology" in *Seminar on Command, Control, Communications and Intelligence, Guest Presentations, Spring 1984*. Program on Information Resources Policy, Harvard University, Cambridge, MA, 1985.



Source: Northern Telecom, 1991.

Figure 3
Exploiting Transaction Services

Oettinger: ISDN is “integrated services digital network,” a combination of voice and data services essentially on a signal facility, plus facilities that are invisible but that may, as Gene points out, afford the ability to do a lot of fast-call setups and things like that.

Lotochinski: The reason for my story on ISDN is if you read the press, you find there’s lots of controversy about ISDN, whether it’s going to succeed or not. My call is it is.

Student: In the other classes we talked about military communications where security has been a main concern. How do you work security into this?

Lotochinski: What you can do with ISDN is distribute keys on a controlled basis. Also, with ISDN, you’ve got calling number display, so you’ve got very good control of where your keys go to. And, in fact, it’s a good way of providing all the security you want for encryption. I’m still assuming that there’s encryption on top of it — individual line encryption or bulk encryption, or both. So, the amount of security that you want to put onto your network is as much or as little as you want. I’ve been very interested in this question of security for years and I’ve been asking commercial customers, including banks, what their view has been on

encryption. The answer, up to three years ago, was, "Yes, we should think about it." The reason for that answer is there was no practical way of doing it. Now that they're getting digital networks in place — with things like end-to-end signaling, which allows good communication across the network — they're saying, "Yes, let's put it in."

Oettinger: And, I might add, where there are measures, countermeasures are not far behind. If you looked at this week's *New York Times*, buried in the middle pages there's an article about a bill tacked onto some appropriation bill that will provide the Attorney General with authority to either prohibit or tap into encryption in certain circumstances. We will have another round in the privacy-versus-law-enforcement battle in the United States over that point. It is arising because some of the things that were hypothetical became practical and portable.

Student: The problem appears particularly in financial services. Keeping certain things proprietary has extraordinary impact and if, in fact, you're using dial-up services on a public network, or dial-up services on a private network that a lot of people use, then time and encryption may have some sort of semidirect relationship.

Lotochinski: But my point is you can do them very quickly and very efficiently today.

Oettinger: It has gone from being a big deal to being hardly anything.

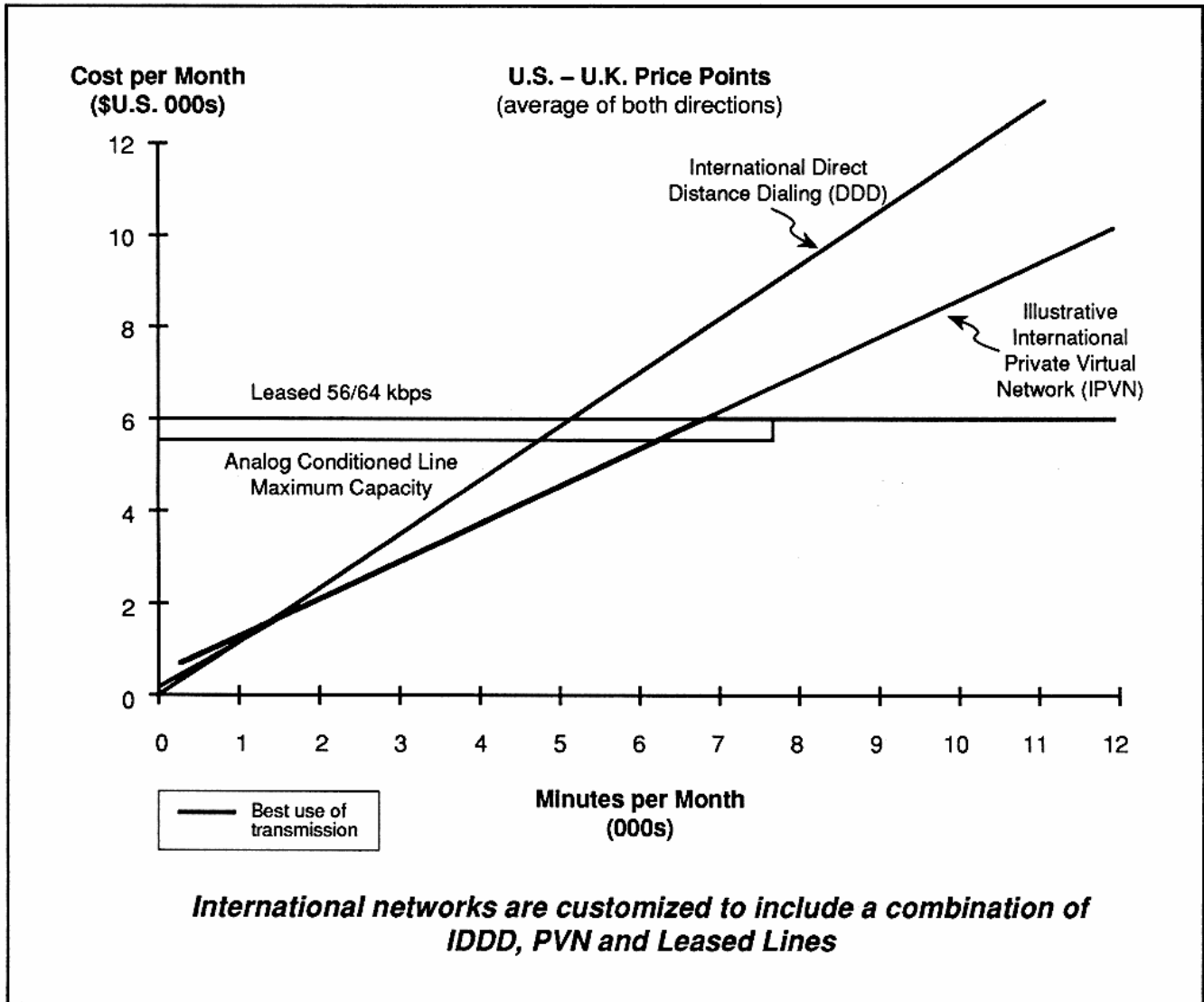
Lotochinski: Yes, it's down to little more than deciding how you transfer a file, quite literally. I absolutely agree with you that there needs to be this delicate balance between availability of information internally for decision-making and so forth, and secrecy of information in a competitive sense. I don't think there's any easy answer to that trade-off. Every organization has got to make some decision in that regard, and I guess we're certainly attributing a lot of the success in Desert Storm to the excellent communications right from the battlefield all the way on up.

Student: There's an awful lot of money lost internationally, with the transfer of huge blocks of money, I'm told by people who are not directly in the business, because somebody was able to stick a small digit in and divert x percent into his own little account.

Lotochinski: At Northern Telecom today, in communications, we will go for speed rather than security. That's our decision today. That doesn't say we will ignore security. I mean, for example, we have prohibitions against faxing private documents. The reason is you're never sure where it goes. You're never absolutely sure. You dial a wrong number and you send it to your competitor. Faxes are remarkably insecure, in fact. The best kind would be a dial-back where you call the fax number, it identifies your number, you hang up and it dials you back, and if you're not an authorized recipient, you don't get the fax or you don't send the fax. Can you do that? You sure can. If you've got the calling name display, the calling number display. These are some of the things you can do in a secure environment that you couldn't before. Some of the computer systems are doing that. You can't just dial up and get the modem tone and keep trying until you log on. It actually has to call you back, recognizing you're an authorized location.

What do these objectives mean to multinational corporate networks? And, again, I'm looking at this from the perspective of the telephone companies or the advanced service providers (ASPs). They match quite closely, because this is what the telephone companies are emphasizing — costs, price, reliability and availability, serviceability, ease of use. It's exactly what these guys are looking for. What companies have to offer is a lot more of this one-stop shopping — that's why we're seeing these strange unholy alliances. Whoever would have thought of the combination of BT, ATT, and NTT? It's about one-stop shopping for the corporation, optimizing the global network, providing rapid response — do it fast, set it up fast, modify it fast, and so forth.

How does a corporation or government implement a global network? (See figure 4.) One of the things everybody does is look at the cost: The cost per month, versus number of minutes per month, for international direct-distance dialing for a sample virtual private network, for an analog conditioned line, and for a leased 64-kilobit line. Our network people at Northern Telecom analyze these costs every month, every channel, for every circuit, every route, and will restructure based on the costs. And what's happening is we're finding that virtual private networks are coming into play more and more until the volume gets big enough and then you go to a leased line. The other advantage of a virtual private network (this is where you don't actually lease the facility on a full-time basis, you use it on



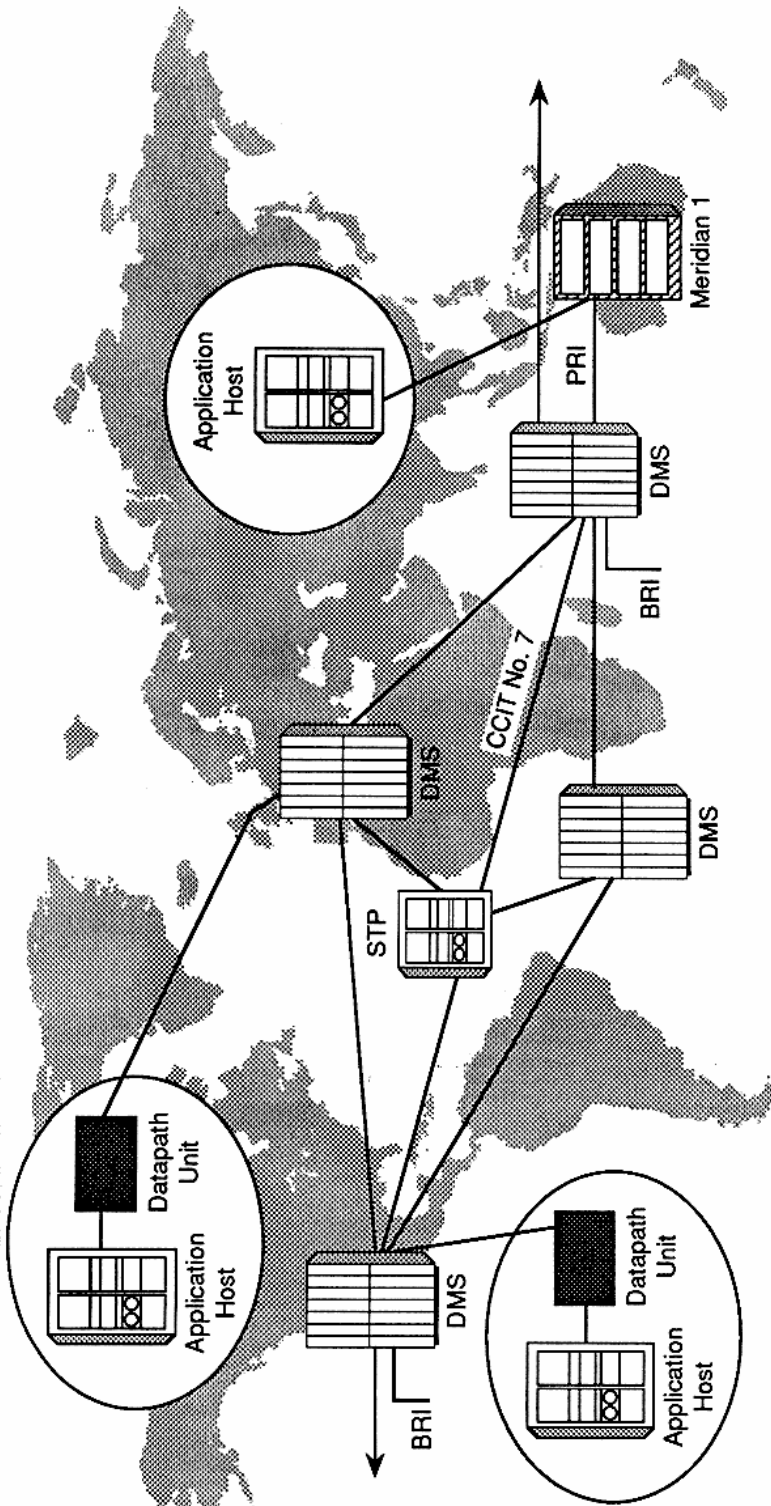
Source: Northern Telecom, 1991.

Figure 4
Transmission Cost: Tariff Analysis

demand) is that it looks like it's dedicated to you but it isn't. However, you can get high bandwidth for short periods of time. So we actually use the combination in our network of international direct-distance dialing, virtual private networks, and leased lines. And that is absolutely typical. It's simply based on cost. Despite all this other stuff I've talked about in terms of improved customer service, when all the dust settles, you want to do it in the most cost-effective way.

The other thing that you can get, and I alluded to this a little earlier, is disaster recovery because you can have data application hosts, which may be databases that can reside in different countries linked with a ring or multiple-type channel network. You can get these types of advantages and benefits. You can have dial-up data backup rather than fixed data backup. (See figure 5.)

This is my one sales pitch type chart. Let me explain it. This is our view of how a public/private



Advantages:

- Dial-up data backup
- Alternate routing
 - Transmission paths
 - Switching centers

Benefits:

- Lower costs
- Higher reliability
 - Less downtime
 - Fewer errors
 - Catastrophe avoidance

Source: Northern Telecom, 1991.

Figure 5
Disaster Recovery

global network could be implemented using Northern Telecom products. And I'll go through them one at a time. (See figure 6.) DMS 300s are gateways — the switches that connect a country to all the different countries and then they connect from that point internally into their local network. We call our switch DMS 300. There are different kinds of gateways made by different companies. Connecting those is a signaling system called CCITT #7, which controls information passed through the switches — what channels are busy, what calls are being made — all this kind of stuff. In North America we sell transit or tandem switches to companies like MCI and Sprint. These are what they use to provide their service. We call them DMS 250. We sell DMS 100s and 200s to the Bell operating companies. That's to provide local service telephone lines. I don't even show a telephone line, but telephone lines, which may include Centrex — a business service provided by the local telephone company — or there could be a PBX. This can provide ISDN. There can be a Packet Handler and there can be a private or public packet network also connected. That's what you can have in North America. In the Pacific Rim, we also sell this sort of equipment. They are equivalent to DMS 250s to companies like NTT, Telecom Australia, Hong Kong Tel, and others. In Europe — Mercury, British Telecomm, Centrex, public PBXs and so forth.

With common channel CCITT #7 signaling, you can have rapid-call setup time. This is where you can get on the public network with a half-second call setup time. Our network is carrying a form of ISDN PBX-to-PBX directly. How are we doing that? We're just taking a bit of a dedicated circuit and using that for signaling.

Oettinger: So you're making the signaling on your own network?

Lotochinski: Right. We're doing it in our own network. As the carriers are offered on the public network, we'll just move it over to them. So I think that's what we're doing now to Hong Kong via Sprint and Cable & Wireless, and Hong King Tel. They've implemented CCITT #7 signaling themselves. What this says is all these folks who are setting up communications look as though they're on a single switch — rapid-call setup time, voice and/or data, whatever bandwidth they happen to need, lots of information about the calling name display is coming.

So we see networks like this (figure 7). I think this is the Army's, between South Korea, Japan,

Guam, and Hawaii, with signaling system 7 and DMS 100s and PBXs functioning today. When this type of global network is implemented, you get advantages such as digital, cost effectiveness, virtual network, mix and match. You can also use a couple of carriers for reliability. You can get time-of-day routing — it might be cheaper to go to Tokyo from here via the Pacific at a particular time of day, rather than via the Atlantic. It just depends. All you have to do is watch what your costs are and put that into your switching algorithms. You can switch data whenever you want, get dial-up video, you just have to associate some channels. That's very easy to do these days. You don't have to worry about what is the code for Melbourne.

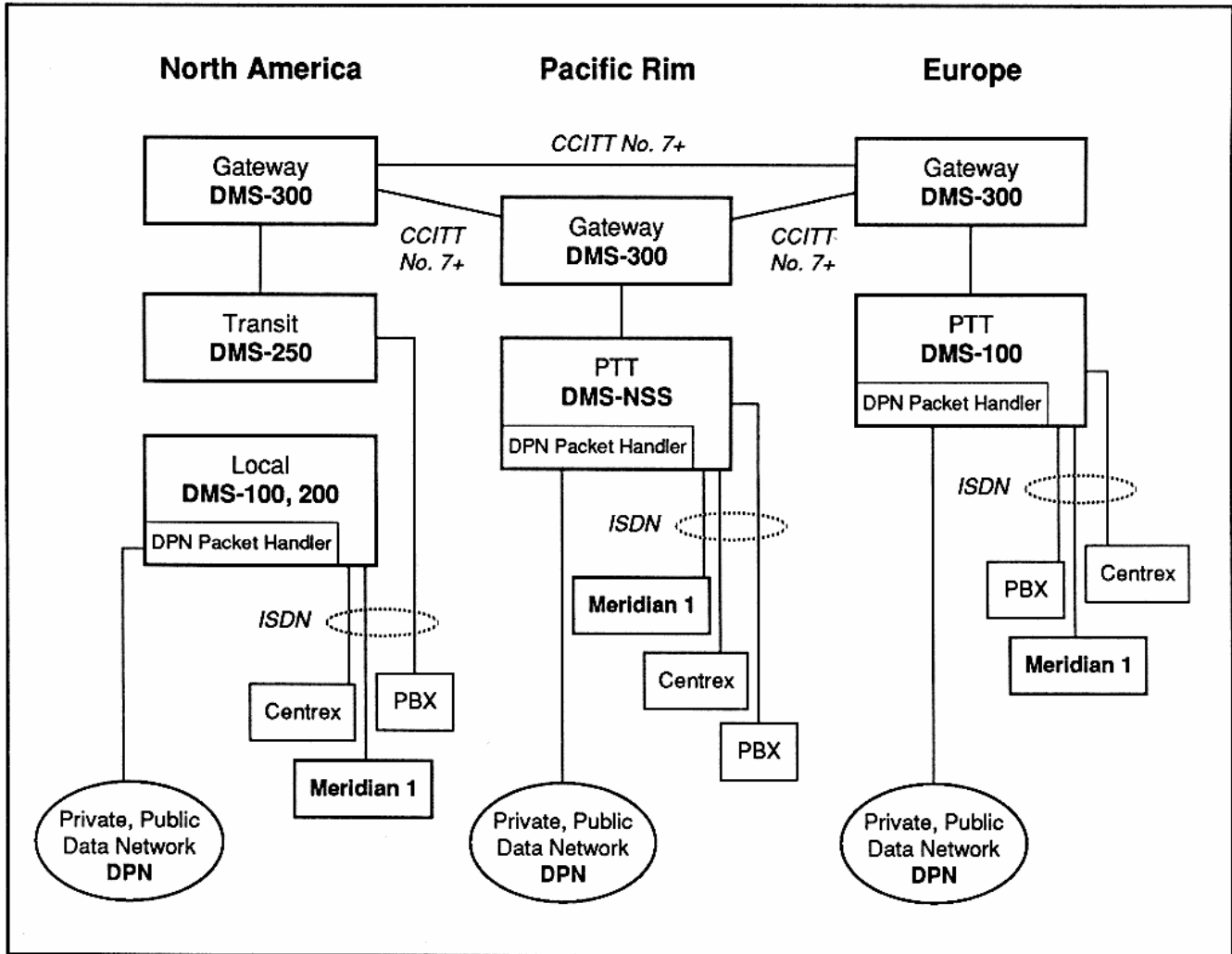
I'll tell you an interesting story. My office (I live in Nashville) is area code 615, office number 734, my phone number is 4123. I was in Tokyo and I wanted to call here. I dialed IDDD but I forgot the "1" for North America. So instead of 1 for North America, I dialed 615734. Well, 61 is Australia, 5 is Melbourne, and 734 is Intercept. What it said was, "You have reached the Melbourne ISDN exchange." I thought "I'm probably one of the very few people who understood what that announcement meant." It was newly installed and under test. It was actually our switch. It was kind of funny.

But instead of worrying about all those things, you do what we do. You just use 6 and then three digits for the location, and four digits for the calling number. It's easy. It doesn't matter where you are — calling from Tokyo, the U.K., Australia, North America — just use that.

If I'm going to go to Tokyo for a while, maybe what I'd do is forward my calls from Nashville to Tokyo. No one even needs to know. If somebody calls me in Tokyo and I'm busy, my phone's busy, it just activates "ring again." When I hang up, the call is placed again automatically. You can do that within a PBX today. I'm talking across the network.

Global 800. If you can get access to your network, why not let your customers call in to your network and have your customer calls go on your own network to wherever they need to get to? So they'd be calling from Japan to New York, from Singapore to Boston, but on your network. It's free calls for them — a customer service. Also for your traveling employees, it's cheaper than using some of the exorbitant rates that you have to pay overseas in a hotel.

This is a presentation that we use to sell to the telephone companies, obviously, right? But the point is that these things are being implemented and



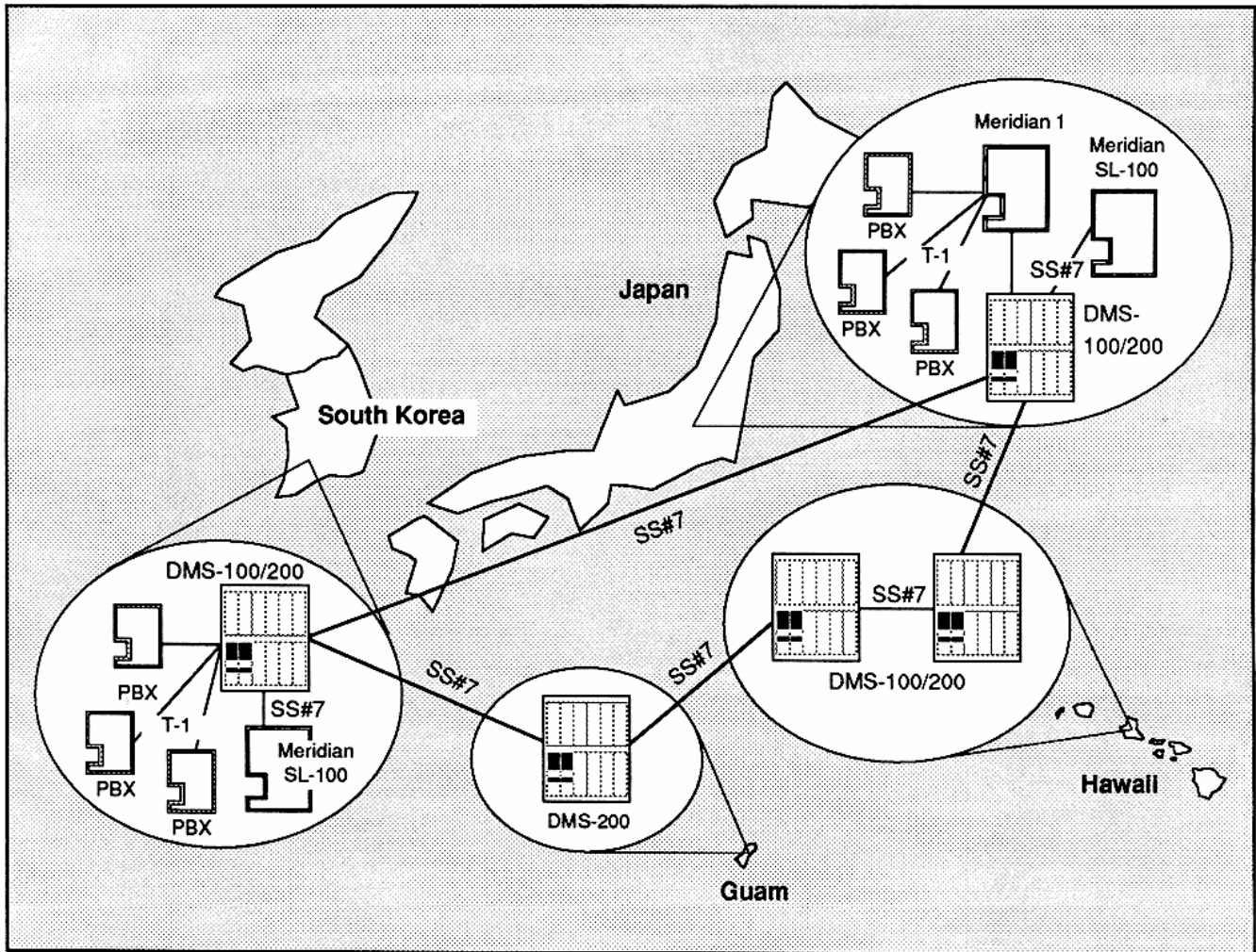
Source: Northern Telecom, 1991.

Figure 6
A Practical Global Network Implementation

they are going to be implemented, and as users, or potential users, you've got to realize these things are out there.

Oettinger: Let me just break in for a moment in the time remaining. What you're establishing here is the basis on which any organization, in the right circumstances, can essentially do business from anywhere on the globe. Since this essentially opens global options, the next question I ask is "What makes you pick particular places to do business in?" And I hope that in the time remaining you might bring us back to that theme.

Lotochinski: What I'm going to come back to now is Northern's network and our plans for 1991. I've not left copies of this slide because it is semi-proprietary. We have a huge network in North America that we're not showing. We've got a hub out into the U.K., we work from Mountain View out toward the Asia-Pacific and so forth, and we work from both Ottawa and Raleigh, Research Triangle Park. Now, to address your question, we do research and development work on our central office switches in Istanbul, in Maidenhead, in Ottawa, in Research Triangle Park, and we do emergency service to different degrees in Australia and Japan,



Source: Northern Telecom, 1991.

Figure 7
An Existing Pacific Network

as well as the other places that I talked about. Those people are in rapid and continuous communication with each other, depending on the type of problem that they encounter. In terms of our private branch exchange, PBXs, we do our research and development in Belleville (which is near Ottawa), Mountain View, Galway, Australia. We also have a bunch of licensees, including Sweden. We do that relying on communications. Now, these are single product streams. These are not multiple product streams and what we're able to do then is take advantage of things like requirements for local content, or availability of skilled labor, or costs of labor, or simply diversity. To a large extent, the constraints that

existed in the past, in terms of where and how you did things, are absolutely gone.

My final chart (not available) shows what we actually have now in terms of channels across the Atlantic and in Europe. We've got three different types of networks — V is our voice network, N is NTELPAC, which is a packet switching network, and CORWAN is our corporate wide area network, used for file transfers. We have 512 kilobits from two different locations to Maidenhead. We split that up. We use 32 bit voice and then we just allocate the rest of the bandwidth to either a packet or corporate-wide area network. You can see we've got some redundancy by going to different places. This is

very typical and in each of these circuits, particularly when it's mixed types of transmission, we do a very careful analysis of traffic requirements, load, cost, and so forth. That's how we allocate and track it. And, as I say, to the best of my understanding we do this kind of thing monthly.

That's the background, now we can sit down and maybe get back to some of our lunch discussions, Tony, or any questions that you might have as to what does it mean.

Student: Do you pack the PC92 with what you are doing? What special provisions are you making if, in fact, you are? Secondly, I'm thinking of the changes throughout Eastern Europe and trying to figure out if maybe you're in on the ground floor with the international banking community in trying to develop some sort of economic program for these countries that are just coming out of the Communist Bloc and how do you see yourself in that?

Lotochinski: Our business is telecommunications equipment manufacturing, so to answer your second question, we're not working with the banks.

Student: I mean as advisors, for example. Do they have their own divisions that know what they want and come to you and say, "Just give us this?"

Lotochinski: We try to work with the major banks like CitiBank, The Bank of America, and so forth, and we really try to pay a lot of attention to those and try to service their global needs to the extent that we can, either by selling equipment that they use in their off-shore locations, or perhaps helping them with our contacts with some of the local carriers. So we do either. You've got to realize that these large banks have very sophisticated staffs. They do a lot themselves anyway. I'd have to say that in the terms of your question, not all that much.

Student: So they don't go in and sit with the host country businessmen and say, "Whoops, we'd better get back in touch with these guys so they can give us some advice on what we need."

Lotochinski: We'd like to think that they do that and we'd like to be there when they do come calling. They don't come calling very often. We've also, by the way, supplied a global packet switching network to the banks. It's called the Swift Network and that's going into a large number of countries. We've also supplied a global packet switching network to the airline industry and that's called the SETA Network and that's going into a bunch of countries.

Oettinger: That, by the way, was so interesting because even before the events in Eastern Europe, in the early version of SETA, the computers were in Atlanta and the Bulgarian Airlines did their reservations essentially out of Atlanta. This is, once again, one of the more mind-boggling consequences of being able to locate whatever you're doing wherever it is most economical, convenient, or whatever.

Lotochinski: Europe, with respect to the EC (European Community) and telecommunications is still very confused. The objectives are to become a single trading block but there is still a tremendous amount of individual national pride and so forth. The European Commission has the power of law, by virtue of these treaties, but a lot of the countries are being dragged in kicking and screaming. Some of the carriers are really trying to rise above that and become the carrier of choice. I think British Telecom is one that has been recognized very early. So from our perspective, we're trying to work as closely as we can with British Telecom, not just for the U.K., but also with respect to their global aspirations.

Oettinger: I would like to add a footnote again to the comment that Gene made earlier about comparing Britain and the single decision making point with the U.S. and its confusion and complexity. When you shift attention to the European Community, the picture begins to look a little bit more like they're trying to go in the direction of the West and for very similar reasons, because while the corporate entities want to do business worldwide, the national governments have their own agendas, and some of the unions have their own agendas, and therefore, the fragmentation and the resistance brings up some of the tensions within the European Community. They're very similar to the tensions between the states and the federal government, and so, while the European Commission has a certain quasi legal decision-making power, you've seen some of the decisions appealed to the European Court of Justice, which in a recent case has sustained some of the Europeanization, but you can bet your bottom dollar that some of the national entities will find other ways of circumventing. Rather than getting rid of some of what you described as diversity, like the U.S. did, the Europeans will go more in that direction by virtue again of the underlying political bonds between folks that like to put sand in the gears versus those who would like to have nice uniform wide-open markets.

Lotochinski: That's a good point, Tony. Within the U.K., it's singular. Within Europe, it's almost going to look like the federal government and the state governments — the federal regulators and the state regulators. And France is kicking and screaming. Germany is starting to come around. What does this mean to a company in terms of where it should locate? You've got to look at where your customers are. You've got to look at what your aspirations are with respect to being a Pan-European force and you're probably going to go where you've got good communications and that's partly, I think, why British Telecom is trying to be so vigorous. That's going to attract more business to the U.K. And if you look at airlines today, probably one of the strongest in terms of its hubbing capability is British Airways. It's stronger than, I think, Air France or Lufthansa, or any of the others. Does this absolutely rule out a particular country for a company? I would have to say no. But all else being equal, or close to equal, I would say a company is going to go where communications and transportation are excellent.

Student: That relates back to an earlier conversation, doesn't it? Because the EC has spent a lot of money in improving telecommunications in Ireland, of all places, and in Greece and elsewhere. Is that a reasonable investment for a company, other than a company that's in the manufacturing business, to try to say, "I've got every advantage in this location — why don't I go in and help build the industries?" Or would that be a governmental decision?

Lotochinski: I'm not aware of very many cases where companies build the infrastructure. The only exception that I know of is places like China where if you're trying to develop a hotel and you need a lot of support services — you need water, power, telephone, and typically you'd put a satellite dish on the roof. When you find a hotel in China, it's excellent in international telephone service and poor in local telephone service because of the satellite. I'm not really aware of companies building the infrastructure. You take a country like Singapore. Now Singapore, as I understand it, has a policy of wanting to be the business center in the Asian region. There's a lot of concern about Hong Kong and what's going to happen when it reverts to China in 1997. Tokyo is too expensive. Australia's a little too far. Singapore is not bad. Singapore has historically been a trading center. So what they want to do now is to become a communications center. The Singapore government is embarking on a very aggressive program of providing excellent commu-

nications at very reasonable prices. I understand, in fact, that there are companies who are backhauling out of Tokyo to Singapore to use the public network out of Singapore because Tokyo had been too expensive. Well, that has changed now with the competition. The prices in Tokyo have dropped. I think those infrastructure decisions are governmental decisions. I think you're going to find countries that are really working it for their own reasons. We like to find those guys and sell them a lot of stuff because that's what our business is — selling a product.

Student: When you say Australia is too far from Singapore, what . . .

Lotochinski: No, it's a little too far from Korea, from Tokyo, from Taiwan, from China, and before you leave Australia, you have to fly five hours before you're out of the territory, whereas from Singapore it's . . .

Student: You aren't talking about the telecommunications system?

Lotochinski: No. I'm talking physical.

Student: What about the holes on the map in the South Pacific region? What's their future in terms of telecommunications? They've had a monopoly on cable and wires.

Lotochinski: Well, the whole nature of the game is changing and governments are really trying to encourage competition, or trying to change this status quo situation.

We'll go after a market where we see an ability to sell a substantial amount of equipment and make a profit. And what we've got to worry about is the cost of making a sale. If there are very small situations with one or two switches, we may not even bid.

Student: Well, I think that's the problem. It's the small countries' low budgets. But they have a tremendous amount of this type of service.

Lotochinski: Why would they have the demand?

Student: Well, because of the long distances between them — something like teleconferencing would save enormously for these people.

Lotochinski: I think that services like Iridium are something that might be useful. Iridium is a Motorola proposal to put a large number of low orbit satellites flying around the Earth that will offer cellular service on a global basis. That's very high

cost, but the interesting thing is you can provide service to anywhere in the world, with no additional infrastructure, and the telephone could be solar powered if you wanted it. In small places like villages in Africa, one telephone would be great. However, I don't know what the cost of that phone might be — \$3,000? I don't know what Motorola might charge for the service.

Student: Thirty-five to seventy dollars per minute is what they told me the last time I asked.

Lotochinski: Yes, but what is that going to be in a few years?

Student: That would be \$1,000 for half an hour. There aren't many people who could justify that kind of expense.

Lotochinski: If you're on an island, it may be difficult or impossible to get any reasonable transmission. You can't put optical fiber in because it would cost too much, and maybe it's too expensive to put good microwave in, so satellite service might be a good service for you.

Student: But \$35 a minute is a great expense.

Oettinger: We're floating once more into the details of the telecommunications business. I would hope that we would exploit Gene more in terms of a manager within a global enterprise. Let's go back to considering factors other than jet airplanes with places to land and lots of communications available as a fact of influencing the choice of where to locate a business. You mentioned, for example, the regard for intellectual property. Could we take you in that direction?

Lotochinski: Well, maybe I'll take a slightly different tack, Tony. There's a lot of writing these days about organic organizations that come together to work a project, and then break up — there's no clear organizational mandate for this to happen, but rather a collection of people who are able to contribute to the project. We do a surprising amount of that in Northern Telecom and I don't think it's really officially recognized. I have been involved in projects where we were preparing bids and we had people from eight different countries involved in the project. Why eight different countries? We got the right experts, with the right knowledge, and the right capabilities. How did we do it? We did it with a combination of all of the stuff I've been talking about, including voice conferencing. We do an awful lot with voice conferencing. I also find that we do a lot more consensus decision-making. In

fact, I think there is a lot more consensus decision-making in all parts of North America than is popularly believed. What I mean is, you read all about the Japanese with their consensus form of decision-making where the issue goes around and everybody gets a chance to contribute. We do that. Then again, the question is, "Well, how do you do it?" The answer is we take advantage of these communications capabilities because it's easy to do. Does this mean that we're operating better than we used to? I think we are, because I think we have the ability to have more input, more consideration and better knowledge in decisions than we might have had before. The other thing that we're doing at Northern Telecom is "delaying."

Student: You've done what?

Lotochinski: Delaying, which is getting rid of management layers. If you read the management theories, the reason for layers of management is to act as filters and funnels — send stuff out and just make sure the important stuff got through. Now what happens is the important stuff goes as high and as fast as it needs to as quickly as it can — instantly. That means you can get by with fewer managers. I've got people reporting to me right now in Singapore, Sidney, Tokyo, Toronto, and Nashville.

Oettinger: The notion of span of control begins to be sort of a non-notion.

Lotochinski: There is still of span of control — how many can you effectively manage — but physical location is almost gone.

Student: Peter Drucker has an excellent article called "The Coming of the New Organization," in which he talks about this elimination. The middle managers were no more than filters for information but since you do use teleconferencing and a lot of times video teleconferencing, it looks to me like there must be some sort of organizational team building training.

Lotochinski: We don't do anything overt. We do a lot of internal team building. We have a lot of training courses and so forth. We do not provide cultural sensitivity training except when we send people overseas. They'll train for the particular country.

Student: As a kid and as an adult having lived in Japan and in the U.K., I'm aware that there is a lot more to actually talking to people than knowing the language.

Lotochinski: Oh yes, we'll provide specific education on a little bit of language but certainly on the cultural aspects. My understanding, by the way, is one of the hardest places to move to is the U.K. because you believe that since the language is the same, you can just fit in, and you can't.

Oettinger: There is an old aphorism that says the United States and the United Kingdom are two cultures separated by a common language.

Lotochinski: That's right, whereas when you're going to a place like Japan or maybe Germany, if you don't speak German, you assume that it's going to be culturally different so you make allowances for it.

Student: Do you do any business within the elements of the news media?

Lotochinski: In what sense?

Student: I'm assuming CNN has its own equipment, but I'm thinking of people who are not in a position to have their own stuff.

Lotochinski: If you're talking television, they've got a whole different set of requirements. They're into these very, very high bandwidths and that's a specialized industry to supply.

Student: No, I'm thinking maybe people communicating with their correspondents. You know, setting up some kind of system to communicate with their correspondents in different countries.

Lotochinski: No, I have to say that's not our business. But we will provide equipment to the telephone carriers who, in turn, will provide that type of service. Now, in the equipment sense, what would a correspondent use — a personal computer or a fax machine? We don't make those. A telephone set, yes, we make those, but they're quite a commodity these days so it may or may not be ours. A switching system, yes, but that's going to be in the central office of the telephone company.

My talk on banking is really applicable to any type of industry that is a global industry. For instance, transportation — we're doing a lot of business these days with the airlines — companies like American Airlines, Qantas, Singapore Airlines, and others. Another industry would be hotels, the entertainment or hospitality field.

Oettinger: We want to thank you very much for taking us down these various tracks.

Lotochinski: Thank you very much. I started in telecommunications in 1959 and it passed its one-hundred year mark quite a few years ago. I would never have thought it would be as exciting as it is today. There's more change going on, more innovations, all the time. There's more opportunity than I ever would have thought. It's a fascinating business, absolutely fascinating. That's my parting comment.



INCSEMINARS1991



ISBN-1-879716-03-8