Journal of Applied Communications

Volume 62 | Issue 3 Article 4

Futures Panel: Telecommunications of the Future

Dean Gillette

Recommended Citation

Gillette, Dean (1979) "Futures Panel: Telecommunications of the Future," *Journal of Applied Communications*: Vol. 62: Iss. 3. https://doi.org/10.4148/1051-0834.1871

Futures Panel: Telecommunications of the Future

Abstract

In organizing the Futures Panel Mason Miller said that communication changes are going to make it more and more possible for us to communicate individually and to communicate more to each individual's needs and interests.

Futures Panel

Telecommunications of the Future

Dean Gillette

In organizing the Futures Panel Mason Miller said that communication changes are going to make it more and more possible for us to communicate individually and to communicate more to each individual's needs and interests. And he said that each of us is going to have much more control over what is presented to us as potentially useful information. We are going to be more able to say exactly what we want and then get it back via some sort of communications channel.

That is what I would like this segment of the ACE program to do. Jar us out of our complacency about the mass media being our solution to the whole problem and to show us exactly what is ahead. That we are going to have to understand, evaluate, use and service, and to be responsive to a whole new exciting array of even better telecommunications channels.

There are several problems about being a prophet. Best guesses have frequently been too optimistic about the near term and far too pessimistic about the longer range. Let me give you a couple of examples: Short-term errors—about 10 years ago you will recall that CATV was going to be the solution to all problems. It was going to be broad band communications into everybody's home. And everybody was going to

---

Dean Gillette is with Bell Telephone Laboratories, Holmdel, New Jersey. His remarks were presented at the National ACE meeting at Newark, Delaware, in July.

have these social-active things, such as seeing Congress on our own television sets. Also, about 15 years ago some said the communications satellites were going to be carrying all the television and telephone communications in the nation in about 10 years. No way.

On the other hand we made some long-term errors simply by not knowing what was coming along. The explosive growth of integrated circuit technology is a good example. When the transistor was invented back in the late 40's, they were made one at a time. Then somebody realized in the early 60's that you could make two and three and four at a time in transistors and all integrated circuits. No one then had the slightest idea except the most wild people (and no one believed them) about what can be done with solid state electronics today.

Now to get some creditability for all of us, I want to run through the current technology to give you an idea of what services are possible. Then I want to point out to you how we are all going to have to get together to make these services come about. I will talk mostly about telephone or telecommunications of the point source. I will also comment about television.

In focusing on our kind of telecommunications, I talk basically about three kinds of techniques: (1) A way of converting sound or numbers or a picture into an electrical signal. (2) I will talk about transmission: that is a way of sending these electrical signals from one place to another, microwave radio relay including the satellites and collaxial cable, which is a handy thing both for communications of telephone and television, are examples. (3) The third basic technique that I worry about is switching. That is simply having a way of avoiding putting a pair of wires between every two telephones in the nation. It gets a little bit cumbersome if you think about it, with something like 150 million telephones. If you tried to run a pair of wires between every one of them the place would get loaded down with copper. So we use switching to solve this particular problem and that leads us into another technique of telecommunications and that is networking. Putting all the switching and transmission together so that connections can be established on call by the individual customers. Now these are the basic techniques.

Some basic technologies and some new ones are coming along that are very important in helping us do different kinds of things with these basic techniques. First, of course, is solid state electronics. The second basic technique, a

https://newprairiepress.org/jac/vol62/iss3/4
DOI: 10.4148/1051-0834.1871

very important one for the future, is computing. The third is large scale systems integration. Look, the telephone network in the United States is really the world's most complex machine, it has several unique characteristics. It is a single machine that is capable of being operated by hundreds of millions of people. It enters nearly every home and business in the United States and certainly enters every government agency I know.

Something like 95 percent of the households in the United States have telephones. The telephone network has a couple of other capabilities too. When it is operated by all of its users, it has been designed so that one person's operations are not really supposed to interfere with another's. As you are making a telephone call you should not be bothered because 10 million other telephone calls are being set up at that particular moment. It is also designed and the extensions are designed so it can be expanded without changing the services that are already available.

There are other projects that require this large scale integration—lunar landing programs, skylab programs, the electric utilities, major aircraft design. But none of these machines or systems are as big or as complex as the telephone network and that is something that we continue to worry about.

Computing, my second technology, is extremely important to the future. It really is a technology even though in computing and computing science, the big problem is writing the software, writing the programs as I expect many of you already know. It is a technology that requires planning, it requires engineering, it requires design, manufacture, installation. And probably you have discovered that computing programs require a great deal of very thorny maintenance. As a technology the most important part of it for communications, is that computing is central to the electronic switching systems in telecommunications. It is critical to the stored program control of the entire network.

The major hardware technology is, of course, solid state electronics. You have seen hand held calculators and wrist watches that would not be possible without what can be done in applying solid state electronics to integrated circuits. But I want to point out that as a technology, solid state electronics is far more flexible - capable of giving us many more things with the basic approach than simply integrated circuits. Let me give you some examples: As a technology, the notion in solid state electronics is simply to build up a

sophisticated layer of things. In an artist's conception, the cross section of the injection laser used for optical communication looks like a fancy club sandwich. It is filled up with different kinds of materials - some of them rather normal you have around the house, like silicon sand, the basic layer. Others you do not find frequently unless you look hard in the poisons like arsenic. Others you do not find in the house at all. But if you pull these exotic things together in carefully controlled layers, you wind up with one of your integrated circuits—or the solid state electronics application. The technology for doing this is well established and there are lots of different applications. For example, I mentioned the injection laser. Lasers for optical communications through optical fibers are not these great big red, glowing neon tubes that you see in the science fiction movies or in James Bond. They are about the size of a grain of sand. A "pinch" of lasers can go through the eye of a standard sewing needle.

A second advantage of the solid state electronic technology is that you can build many of these tiny electronic elements onto a small one-quarter-inch square, let's say a chip of silicon. It becomes a $10 computer that has all the power of the IBM 650 computer of about 1950, which cost over $100,000. Today's technicians can put 100,000 components on a piece of material like that, and laboratory techniques can put on upwards of a million. So this technology will keep on giving us increasing power and capability as time goes on. These are very highly reliable. Your digital watch and your pocket calculator will break eventually, perhaps. But it will probably not be the electronics that break. After the battery fails, the first thing that goes is the pushbuttons on the connection. Another example is an exotic thing - the magnetic bubble. It is another way of storing information.

Those are some basic technologies. What are we using them for? First, in the local switching systems in the telphone plant, electronic switching systems (ESS) could not be done without solid state electronics. About 30 percent of the Bell System lines are now served by ESS. They have additional features other than small size: they are inexpensive to operate; they give custom calling features, such as a signal if a call is coming in and waiting, rather than getting simply a busy tone.

Optical fibers are being used and electronic integrated circuits are being used to reduce the cost of serving rural

https://newprairiepress.org/jac/vol62/iss3/4
DOI: 10.4148/1051-0834.1871

areas. Until the early 1970's, it perhaps cost $3,000 or $4,000 to run a telephone line from the central office off to a farm or home 10 miles away. Those costs are being cut down by factors of five and by 10 by introducing the electronic techniques into the rural communications systems. I expect that is going to allow cost reduction and service improvement throughout all of the rural areas just as it has in the major cities.

Now let's talk about some of these opportunities. First, intelligent terminals, smart telephones. Think of putting one of those computer chips into a telephone. What could you do with it? Well, you could use it for some sort of information handling within the house itself. You might hook up your burgular alarm or several burglar alarms or your fire alarms or your smoke detectors into this and have some sort of a coincidence count and an automatic dialing to the appropriate serving agency. There is a fire, it automatically calls the fire department. You can work it around the other way. That same device could be used to turn on and off your air conditioner, or water, saving energy. Before you got home dial your own telephone, put in the right code, and, depending on the season, the telephone could turn on the air conditioner or the furnace.

Secondly, you could hook up terminals to some sort of a computer. People talk about using telephones to enter information for electronic banking. But the notion is to combine computing automatic routines with communications and to integrate these into new type of services. There are also new opportunities coming up in video. The optical fibers have the capability of sending video signals and that might be awfully useful. A picture phone meeting service is a conferencing phone available now in 10 cities on an experimental basis.

Here is something the British came up with. The British Post Office conceived a thing they called View Data. It works this way: Call a central computer and ask for some information. It comes in over the telephone line, is converted to a video signal for display on your own TV set in just the same way that pictures are presented in most video games. Here are some examples of their displays: a manufacturing industry guide, a specialized telephone book and stockmarket information. You can use it for interactive education. We are hooking up the major electronic switching systems all across the toll network, and some of the local ones, into a "stored program control network." We are taking informa-

tion from a central computer from the electronics office. When the call is started, we bring it into a central computer and manipulate how that call behaves across the country. For example, I mentioned call forwarding in some areas from one house to another. There is no reason you cannot do it nation wide.

The important thing about the new kinds of communications is that there are a host of new kinds of services that are going to be available. It is not the plain old telephone company that is just going to provide these services. We are going to have to have a lot of help from you to decide what they are going to be and how to organize for them. There is a need to join forces for all of you with the users and with others in the way of information providers. Then come around to the communications providers with lots of techniques.

These excerpts came from the responses of Gillette during the question-and-answer period following the panel.

The institutions that put information on computers are varied now and they will be even more varied in the future. We have been talking about the weather information that would initially come through some sort of a process from the federal, local, state governments. That is one source of information to be stored into the computers. Another source of information would be the banking, the economic information by institutions that provide that such as Eric Hope mentioned, now let me also point out that there are people that provide information for hire. A specific example is a system called Lexis that is available to lawyers. Within this sytem the text of law, the text of decisions, the text of legislation, the text of regulation is stored in the computer. It is available to lawyers who pay fees for the terminals and access charges to the provider of this information. That is full text information. There are a host of citation indices. In our New Jersey offices, our library has contracted for access to over 75 citation indices. If I would like citations for what is the most recent method of chrome plating aluminum alloy or something like that, I can get it through citation indices that will tell me where to go look. Most of these are proprietary. You pay a fee to get into, things like View Data which is being provided by the British Post Office, that is just the communications storage channel. The information that is put into the View Data computer is put in by a host of com-

https://newprairiepress.org/jac/vol62/iss3/4
DOI: 10.4148/1051-0834.1871

mercial outfits who charge a page charge every time you look up their information.

Who determines what goes in? As far as actual content, setting aside questions of propriety for moment, commercially it is marketplace decision. An individual decides if he has some text that is going to be of great interest to the local community. He pays the British Post Office so much to store that and he gets money back every time somebody looks it up. If nobody looks it up, he is likely to be an ex View Data supplier.

Can our phone system handle the increase in traffic that might be caused by such as View Data?

Yes, there is one part of it that can handle it very well. That is the connection between your local telephone and central office which is used less than 5 percent of the time right now. Indeed that low usage was recognized by the British Post Office and that was their stimulus for going into something like View Data. But that is not the whole answer. The next thing to consider is where is the capacity of the switching office and what is the capacity of necessary interexchange trunks that can connect the switching office. The technology will allow these to grow. But they are currently designed at somewhat over the local usage level because of economic considerations.

The Teletext C is an entirely different way of distributing information. An alternative way to put text information onto the home television set is obviously to send it over the air, as a broadcast signal. It can be done on a separate channel. Or more interestingly, the text can be sent in some of that transmission time it is not used for pictures, called the flyback time as the line scanner skims back to the preceding line or between frames. The data can be sent in this way, it can be stored in your local equivalent of a Green Thumb Box and then separately displayed as a picture.

Suppose that you would like to send English subtitles for English movies that can be read by deaf people. Deaf people would have an opportunity to comprehend the local movie that they had never been able to hear before. Great! All the people that are tuning in will see that. Alternately if you are thinking about having access to something like 70,000 pages of information, such as View Data has, a little bit of thought will tell you that you cannot have 70,000 subscribers all at one time trying to get their separate information. So there are alternate values of these complementary schemes. The British are going about both simultaneously.

And their new television sets are being designed so they can alternately work with C facts and with View Data.

DOI: 10.4148/1051-0834.1871