communications field the excitement and growth in your profession that the original NPAC did.

As one involved in communications myself, I'm convinced that new information, well-communicated, can substitute for some government program expenditures — thus bringing a cost-effectiveness to information that most managers don't appreciate, or even understand. By that I mean that some of what we are trying to do with government program money can be done better and more economically with better information delivered more effectively. And certainly the effectiveness of government programs is greatly determined by the effectiveness of the information program — which again is all too seldom understood or appreciated by program managers.

I have thrown a lot of questions at you today. I have done it in the spirit of the old saying that "it is better to know some of the questions than all of the answers." So, continuing in that spirit, I offer you three final, challenging ones:

First, who is doing the innovative thinking on communications policy at your institution today — your administrators or you and your staff?

Second, could you be more effective if you wiped out some of your present positions and added some new ones, in such areas as research report editing, public involvement, and mass media contact?

And, finally, "What am I going to do in my job as a result of this meeting that I have not been doing?"

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Broadband Communications Systems for Rural America

Gretchen Kolsrud

The Office of Technology Assessment, better known as OTA, is quite new and quite small. Most simply stated, OTA is a kind of think tank for Congressional committees — for subjects in some way related to technology and its use.

[1] Talk by Dr. Gretchen Kolsrud, Assistant to the Director, New Emerging Technology and Telecommunications, Office of Technology Assessment, U. S. Congress, at the AAACE annual meeting, Logan, Utah, July 11-14, 1977.

OTA was brought into existence by public law in the fall of 1972 but did not begin operations until early 1974. It differs from most of the Washington organizations that are familiar to you, such as the Department of Agriculture or the Department of Transportation, in that those agencies were created to serve the Executive branch and the President. OTA was created to serve the Congress.

OTA was the third Congressional agency established, joining the Library of Congress, which was created in 1800, and the General Accounting Office, which was created in 1921. Since OTA's formation in 1972, one more Congressional Agency has been created, the Congressional Budget Office, which was established in 1974. So, there are four Congressional agencies: the Library, the GAO, the OTA, and the CBO.

OTA was created in recognition of the increasingly important and complex role played by technology within our society.

OTA efforts in the field of communications were initiated in response to a request from Sen. Herman Talmadge, chairman of the Senate Committee on Agriculture and Forestry. Sen. Talmadge expressed his concern for equity of opportunity for rural people and asked that OTA consider undertaking an assessment of the feasibility and value of using broadband communications such as cable TV and satellite to bring services beyond entertainment to rural area. In response to the Senator's request, a preliminary staff evaluation was undertaken. Since there is no clear separation of broad and narrow band, broadband was taken to mean communications systems employing one or more of these technologies: Cable, translator, ground or satellite based microwave relays and fiber optics. Radio and 2-way telephone were considered narrowband and thus outside the scope of the preliminary study.

In looking into this topic, we sought information in three areas. The first area was previous attempts to use telecommunications to deliver a variety of public and commercial services other than entertainment and the reasons for their success or failure. The second area was patterns of rural development including changing migration patterns between urban and rural areas, economic development, and rural needs with particular interest in the probable utility of using communication systems to meet those needs. The third area was Federal policy and its apparent impact on use of communications to provide services in rural areas.

Turning attention first to previous nonentertainment applications for broadband communications, we began by dividing nonentertainment uses into two broad categories. The first was public services which included health, education, law enforcement, and governmental and administrative services. The second category was commercial uses, including security systems, information transmission, data transmission, and pay TV. Experimental applications of communications to provide each of these services have been or are being conducted although there is considerable

variability in the number of applications in each area. For example, there have been many experiments which provided health care or educational services through communications systems. In health, patient acceptance appears to be high, and it has been demonstrated that telemedicine can increase the adequacy of health care by providing access to services which were not available or which were only minimally available without the communications system.

Fewer experiments have been conducted in the field of education, especially in rural areas. However, the *technical* feasibility of meeting many educational needs has been demonstrated. There remains a lack of information on which kinds of hardware and software best support education, as well as on the relative effectiveness of education using broadband communications as compared to the traditional classroom.

The potential for communications in providing for rural needs in law enforcement, security services (such as detection of fire and unlawful entry), provision of information services, and data transmission (such as automatic meter reading) is far less explored.

The most common characteristic of previous applications of broadband communications to meet nonentertainment needs is that the purpose has been to demonstrate *technical* capability; that is, to demonstrate that it is technically possible to provide a service such as medical diagnosis via telecommunications. Considerably less attention has been given to how to develop economically viable systems.

When cost-effectiveness has been considered, it has been limited, by and large, to the use of technology to provide a single service. A system approach to the economics of broadband communications, in which costs are shared and revenues are generated by a combination of public users, commercial users, and subscriber-supported entertainment fees, has not been evaluated adequately despite the fact that such an approach could be the key to an economically viable system able to serve a large rural community.

The second topic we explored in the preliminary evaluation was rural development and the changes underway in rural as compared to urban America. Here, we found the work of Calvin Beale of the Economic Research Service of the Department of Agriculture particularly useful.

Of great potential importance is the fact that the 1970's have seen a reversal of the historic migration of Americans from rural to urban areas, with a net migration of 1.6 million persons to rural areas. This change in migration patterns is unprecedented in the recent history of the United States and cannot be explained solely as movement to the suburbs. True, the largest quantitative increase in net in-migration has occurred in counties adjacent to metropolican areas. But, the sharpest turn-around in migration has developed in the more distant rural countries. In other words, we are for the first time seeing a significant migrational shift to truly rural non-metro areas. If it continues, this shift will be of great significance to

rural-ruban population balance and to the demand for goods and services and less densely settled parts of the country. For example many of the new rural citizens are retirees, often with significant retirement income, good educations and need for health care which may not be readily available but which they may demand. Telecommunications may be the best way to meet this demand.

Although there seem to be major changes afoot in rural America, these have not altered a very important fact which is often overlooked and this is that rural America is not homogeneous but characterized by vast differences with a great variety of needs and conditions.

Pursuing these conditions and the underlying reasons for them further, we found it useful to identify three types of rural areas which differ in their patterns of growth, their adjacency to metro areas, and the degree to which their growth can be attributed to growth in service industries or growth in manufacturing industries. Each of these different kinds of rural areas poses different opportunities for broadband communications and a different economic picture for their use.

However, these opportunities cannot begin to be identified or explored by someone sitting in an office in Washington. The particular public services and commercial uses which will be economically viable in a given rural area will vary in accordance with the characteristics of that rural area. Only the residents of the area itself know those characteristics well enough to identify the opportunities for a broadband system.

The importance of grounding any system in *real* community needs is illustrated by the success of the Deer Isle to mainland micro-wave link for providing health care in rural Maine. The broadband communications link joins a nurse-practitioner in the isolated community of Deer Isle off the coast of Maine with a hospital in Blue Hill on the mainland. The project has proven highly successful and may be compared to previously tried alternatives. One such was installation of an expensive health clinic on Deer Isle in an attempt to attract and retain a doctor for the island community. That effort failed. The successful communications project was originally funded by the Maine regional medical program but has been increasingly supported by the community of Deer Isle itself. The success of this communications approach to health lies in its firm base in the needs of the user community and the lack of viable alternatives. The Deer Isle project is in striking contrast to many other telemedicine experiments which have failed as soon as Federal funds to support the system are withdrawn. In some cases these failures were due to an insufficient economic base, but in others the communications systems approach was simply not adequately attractive given other alternatives.

After examining previous experimental nonentertainment applications of broadband communications and changing patterns of rural development and need, it seemed to us that there is more potential for broadband

services in rural areas than has been realized. Why do we not have multiservice broadband systems? Therefore, we next examined three potential categories of constraints: technology, Federal Communications Commission (FCC) regulations, and cost. While technology does not appear to be limiting, FCC regulations are more complex. Some appear to have operated as direct constraints such as those regulations restricting use of translator rebroadcasting stations. Of course, the intent of the FCC in restricting translators was to foster more effective local programming but the end result has been inequity of rural access to broadcast television.

In addition to direct constraints from FCC regulations, there appear to have been some indirect constraints. For example, the regulation that cable TV should provide channels to carry public services free of charge in rural areas adjacent to metro areas may have eliminated a vital and necessary source of revenue for rural systems. Once again, the intent of the FCC was benevolent; namely, local development of non-entertainment uses of broadband systems like cable television through the free-channel provision. However, the regulation may have had the opposite effect, making it impossible for rural areas to afford either broadband systems or new services.

The third potential barrier, cost, is more fundamental than technology or FCC regulations. However, it is unclear whether this third barrier is real or imagined. Thus, it has been assumed that the low density of the population in rural areas makes use of broadband services such as cable television to provide conventional television entertainment economically unattractive compared to urban areas.

However, the same low density which operates against the economics of entertainment television in rural compared to urban areas could at the same time favor rural areas for public service and institutional uses of broadband communication systems. Now, if these non-entertainment uses of broadband communication systems have value — in other words, if providing help in education by a communications system is valuable — it seems appropriate to charge fees for these services and these fees should help support the broadband system. The combination of fees from entertainment and non-entertainment uses could produce an economically viable system which would bring many different services to the community it served. However, this approach appears not to have been adequately explored.

It's important to note that the fact that private industry has not yet moved into this is not a reliable indication of profitability. Managers of investment capital seek the *most* profitable. Many rural applications may produce a modest return but not maximize investment and so be bypassed by private industry. However, they may be entirely feasible for co-ops, who have different objectives.

Taking into account all that we found out on the three topics of providing public and commercial services via broadband communications, emerging

patterns of rural development, and constraints to communications systems in rural areas, it seems to us that our present knowledge on the feasibility and value of broadband systems in rural areas is deficient. Especially needed is an evaluation of multi-service communications systems meeting a variety of public service, commercial and entertainment needs with economic revenues derived from all these sources. The question to be answered is whether such a combination of services can be economically viable and under what conditions.

This multi-service system approach is illustrated by a county-wide system which the residents of Trempealeau County, Wisconsin are attempting to implement. The system combines cable with microwave links and is planned to be available to all residents of the county. It will provide subscriber-supported network TV entertainment to county residents and the schools will use the system through closed circuit sharing of teachers among eight district schools. The intent is to reduce teacher costs, improve educational quality and save funds now spent to transport pupils from school to school to get access to teachers not available at their own school.

It is important to note that an early feasibility study of the system showed that a conventional subscriber-supported entertainment cable TV system would not be economically feasible but that the addition of revenues from the school users, which amounts to $9,000 per year from each of eight schools, would sufficiently improve the financial outlook to make the system economically viable.

The Trempealeau County project begins to illustrate what we mean by a multi-service system providing area-wide coverage. However, it only approximates the concept because entertainment uses have been supplemented by only one other user, the school system. At present, no full-service system of the kind hypothesized here exists in the United States. Hence, it is impossible to evaluate the feasibility and value of such systems or to decide whether their wider deployment is justified.

As a result of these considerations, our report proposed that the next logical step is a series of system demonstrations in which a set of services designed to meet specific needs would be tailored to the requirements of individual rural communities and the economic viability and cost-effectiveness of the communications system would be evaluated compared to noncommunications alternatives. In other words, system demonstrations would provide data on what works, where, and under what conditions.

The report, published in April of 1976, ended with a consideration of how system demonstrations might be implemented including what Federal agencies might administer the program, how funds might be provided, and how potential demonstrations sites might be identified. We also considered the implications of three different policy alternatives; namely, continuing the status quo; funding a limited number of systems demonstrations pro-

jects; and, creating a Federal mechanism to facilitate wide dissemination of broadband services to rural areas.

To make long story long, our report in due course reached the desk of the Chairman of the Senate Agriculture Committee, Senator Talmadge, whose request had started the project. The Senator looked at the report and pondered it, especially the parts saying that multi-service broadband systems might be an economically viable way to provide many different services in rural areas but that to adequately test this concept, a government-sponsored demonstration program might be required. The report had already been reviewed by an outside panel. Perhaps, the Senator suggested, we should submit these ideas to a little more scrutiny from outside subject matter experts.

Editor's Note: Ms. Kolsrud concluded with a summary of developments since. She said they followed Senator Talmadge's suggestion and invited a total of 74 experts to examine critically their report. The senate commerce and agriculture committees both supported the conference. The National Rural Center and the Aspen Institute for Humanistic Studies joined the OTA in sponsoring the conference, Nov. 15-17, 1976.

In April of this year, hearings were held on the topic of rural telecommunications by the Subcommittee on Communications under Senator Ernest Hollings. Other steps have followed, including the formation of an executive branch task force under the auspices of the Office of Telecommunications Policy in the Executive Office of the President. The task force considered the system demonstration concept and how it might be implemented as well as barriers which have limited broader use of telecommunications systems in rural areas.

A report on the April 6 Oversight Hearings on Rural Telecommunications referred to above can be obtained by writing to the Subcommittee on Communications of the U.S. Senate Committee on Commerce, Science and Transportation. A report on the conference held in November is also being printed. Ms. Kolsrud will try to see that intersted AAACE members receive a copy of that report if they write to her: Gretchen Kolsrud, Office of Technology Assessment, U.S. Congress, Washington, D.C., 20510.

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