Paper Eight

THE APPLICATION OF CABLE TO CONTINUING MEDICAL EDUCATION

Rudy Bretz
SUMMARY

This paper discusses the potential role of cable for Continuing Medical Education (CME) in the Dayton Miami Valley region.

The total number of physicians who would be located in the area served by cable communications might be between 800 and 1000 by 1980. Medical students in local hospitals who could be served by medical-school courses would probably be between 200 and 300.

At the most, CME courses would utilize 60 hours a week on one channel and might also require 15 hours a week on a second. Since there are about 100 hours a week between 7:30 a.m. and 11:00 p.m. daily, this constitutes about three-quarters of a channel, or one channel used to 75 percent efficiency.

The transmission of CME programs is potentially one of the most valuable public-service functions that a cable system can provide. In the Dayton area, where there is a relative shortage of physicians, CME is more important to the welfare of the community than in most metropolitan areas. A multiple-channel cable TV system can provide a more convenient and hence more useful service than a single-channel system because of the opportunity to repeat programs several times at various hours. It can transmit more useful programs than "radiovision" (a system currently used in the Dayton area) because the element of motion, with its added realism, is included.
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I. INTRODUCTION

Important to the welfare of any community is the quality of health care afforded its citizens. In the Dayton area, the ratio of physicians to general population is quite low, and local opportunities for continuing medical education in the form of courses, seminars, clinics, and the like, are fairly limited. Thus, Continuing Medical Education (CME) may be especially important to Dayton. This paper discusses some of the promising ways in which cable can be used for CME. Among the basic questions are: What would be the potential benefit to the community of providing such instruction via cable television? How many physicians could be served? How extensive would the service eventually become?

The area that the metropolitan cable system would serve around Dayton would include portions of Montgomery County and Greene County. Based on the data in Paper One, it is estimated that the population in Montgomery County will rise to 764,000 by 1980, with about 720,000 persons living within the metropolitan cable area.* Adding one-fourth of the population of Greene County (42,000) in order to include the communities of Fairborn and portions of Beaver Creek Township would increase the number to around 762,000. Including the five-county Miami Valley regional system described in Paper Three, the total population in the cable area would be approximately 800,000.

In December 1969, the Dayton area was reported to have 95 practicing physicians per 100,000 population. This ratio is very low -- only about 70 percent of the national average (134 per 100,000) and less than 60 percent of "the recommended standard" (160 per 100,000). If the ratio does not rise appreciably, the number of physicians in the area to be served by the metropolitan cable system will be roughly 800 by 1980. If the ratio rises to the national average, there will be about 1000.**

* Paper One, Table 1-4. The populations of Clay, Jackson, Jefferson, and Perry townships are excluded because these townships are outside the metropolitan area.

** As of May 28, 1971, the American Medical Association reports a total of 849 non-Federal physicians in the Dayton "standard metropolitan statistical area." This area includes Miami and Preble Counties as well as Montgomery and Greene Counties.
II. POSSIBILITIES FOR CONTINUING MEDICAL EDUCATION COURSES IN THE DAYTON AREA

CANDIDATES FOR CME

In estimating how many doctors would be interested in taking advantage of televised in-service CME courses, two factors should be taken into consideration:

1. The program of courses offered must be based on a thorough knowledge of the needs and desires of the physicians. The designers of the program should be sensitive to local attitudes and should take these into account.

2. There should be a well-thought-out program for informing physicians about the service and for motivating them to use it. This would probably tie in with or depend on the requirements set up by the state government for CME. It would also depend on a well-budgeted, on-going promotion and publicity program.

A cable system with a large number of channels available can make CME convenient and accessible in the home, the hospital, or the office. Lectures, seminars, and entire courses can, in most cases, be presented as effectively on TV as they can in a lecture room, especially if audio response is possible. As shown by Table 8-1, some groups of physicians might not be interested in full CME courses. It is assumed that they would find short seminars and lectures of some value. Only 80 percent can be considered candidates for full courses. If the ratio of physicians to population remains at 1 to 1000, there may be 640 candidates for CME courses in the Dayton metropolitan area by 1980.

CURRENT AND EXPECTED PHYSICIAN REGISTRATION IN CONVENTIONAL CME

A report by the American Medical Association in 1967 listed the number of registrations in CME courses nationwide for the preceding year. Of those physicians taking CME courses, it can be assumed that many take more than one a year. A formula such as number of physicians
Table 8-1
PERCENTAGE OF PHYSICIANS NOT INTERESTED IN FULL CME COURSES, BY GROUP

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<tr>
<th>Physician Group</th>
<th>Nationwide a</th>
<th>Dayton Area b (estimated)</th>
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<tr>
<td>All research physicians</td>
<td>1.4</td>
<td>1.4</td>
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<tr>
<td>All administrators with M.D.s</td>
<td>1.3</td>
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<tr>
<td>All medical-school faculty members</td>
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<tr>
<td>All interns</td>
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<td>Physicians with opportunity to keep informed</td>
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<tr>
<td>An estimated one-half of residents and fellows</td>
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<td>in the larger hospitals</td>
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<tr>
<td>All physicians in private practice who have</td>
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<td>daily contacts with large medical centers</td>
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<tr>
<td>An estimated one-half of full-time hospital</td>
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<td>staff physicians</td>
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<td>All inactive physicians</td>
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<td>TOTAL</td>
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</table>

a Calculated from Distribution of Physicians, Hospitals and Hospital Beds in the U.S., American Medical Association, Chicago, 1968, p. 21.

b Estimates based on limited data; subject to revision.

C Includes the proposed faculty for the Wright State University Doctor of Medicine program.

taking courses is equal to 63 percent of total registration seems to be a reasonable basis for estimate. Interpreting 1966 registration figures in this light, it appears that approximately 30 percent actually did take at least one CME course during that year. The number of CME courses being offered nationwide has been growing at an average of around 9 percent a year (the current offerings are 15 percent greater than those of last year), but this reflects, in part, a general increase in population and a consequent increase in the number of physicians, and not simply a strong trend toward more participation in CME. Using the conservative figure of 30 percent of 800 physicians, then, there will be some 240 physicians desiring to enroll in CME courses during 1980. The higher figure of 640 given above might obtain with the greater convenience and flexibility offered by televised instruction on cable.
CME COURSES CURRENTLY AVAILABLE IN THE DAYTON AREA

In areas that have a shortage of physicians, such as Dayton, local doctors are overworked and the problem of keeping up to date in the health field is thus compounded. Since there is no medical school in the Dayton area, there are no CME courses available (except by radio, as discussed below). Courses are also lacking for paramedical personnel, such as nurses and pharmacists.

In order to attend a CME course, the physician must leave his practice for at least a day or two and travel to Columbus or Cincinnati to one of the universities or medical institutions. Although half of the courses are condensed into 1-day sessions, the rest may take from 2 days to a week or more. Table 8-2 lists CME courses offered in Columbus and Cincinnati from September 1970 through August 1971. This table, which describes each course in terms of the instructional methods it employs, lists a predominant number of presentation methods that can be used in TV programming, such as lectures with audiovisual materials and panel discussions. All the Columbus and Cincinnati courses use audiovisual materials, 92 percent employ the lecture method, and 88 percent include both, plus panel discussions. The importance of being able to interrogate an instructor or an expert panel is indicated by the fact that 90 percent of these CME courses include open question periods.

Of course, not all CME courses can be administered via television. Laboratory and clinic courses, for example, require that the learner use special facilities and equipment. Even these courses, however, will have some component such as verbal or illustrated lectures, panel discussion, patient demonstration, and various seminar, conference, and other interactive methods that can be as effective on television as in the classroom. At least 80 percent of the CME courses now being offered in Columbus and Cincinnati require no instructional methods beyond those that can be administered by interactive television.

The Ohio State University (OSU), through its Center for CME, has already developed an active program to bring CME to physicians in isolated areas of the state via radio. Using the facilities of the Ohio
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AV = audiovisual aids; Lec = Lecture; O = Open question periods; Pan = Panel discussion; Sem = Seminar; Cln = Clinical conference; FD = Patient demonstration; TF = Television; PI = Programmed Instruction; OP = Enrollee observes procedure; FP = Enrrolee performs procedure; R = Radio or telephone; BR = bedside rounds; LC = Live clinic; Lab = Laboratory work; Surg = Operative human surgery.

bOSU = Ohio State University College of Medicine, 410 West 10th Avenue, Columbus; U of CIN = University of Cincinnati College of Medicine, Eden Avenue, Cincinnati; OAGP = Ohio Academy of General Practice, 4075 North High Street, Columbus; MCH = Mount Carmel Hospital, 793 West State Street, Columbus; ECA = Environmental Control Administration, 1014 Broadway, Cincinnati.

cG = General Practitioners; S = Specialists; B = Both.

dAlso includes nurses.
State educational radio stations, an audio service has been offered since 1962. Annually, during a 22-week period from October to April, a weekly half-hour program for general practitioners is broadcast at noon. Groups of about a dozen listeners gather at Saint Elizabeth, Miami Valley, Grandview, and Kettering hospitals in the Dayton area.* Once a month, a program is provided for nurses, and similar programs are being developed for pharmacists and dentists. Nursing groups of 25 to 30 meet monthly at each of the following hospitals: Kettering, Grandview, and Miami Valley. (Table 8-3 lists the local hospitals.)

Following each program, a half-hour open question period is held in which groups all over the state interrogate the instructor via telephone. Both questions and answers are heard over the radio broadcast.

Visual support for the audio service is provided by the preparation and distribution of slide sets to all listening groups in advance of the broadcast date. Each group has a "moderator," who is responsible for running the slides during the program portion of the broadcast and for relaying questions to the instructor during the second half-hour. Thus, we have here a "radiovision" medium,** or, more exactly, a multimedia system.

Until recently, Medical Education Network fees were $30 per program for each receiving location. However, now that dataphone equipment is being used for the audio response rather than regular phone lines, the cost has been reduced to the range of $14 to $18, depending on the size of the hospital. A Dayton cable system will undoubtedly be capable of picking up the OSU station, WOSU-FM, directly, further reducing the cost of the programs.

*These radio programs are broadcast locally in Dayton over FM station WVUD, fed by a leased line from Columbus.

**Radiovision is currently being used for CME courses at the University of Wisconsin medical extension courses and the Albany College of Medicine, as well as in the French Ministry of Education, and in several developing nations in Africa, where it is used for general educational purposes in the schools.
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<tr>
<th>Hospital</th>
<th>Number of Beds</th>
<th>Users of the Ohio Medical Network</th>
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<tr>
<td><strong>Large hospitals</strong></td>
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<tr>
<td>Miami Valley Hospital</td>
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<td>Saint Elizabeth Hospital</td>
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<td>V.A. Hospital</td>
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<td>1788</td>
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<td><strong>Smaller hospitals</strong></td>
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<td>Charles F. Kettering Hospital</td>
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<td>Good Samaritan Hospital</td>
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<td>Children's Medical Center</td>
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<td><strong>Total</strong></td>
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<td><strong>Research institutions</strong></td>
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<td>Charles F. Kettering Research Laboratory</td>
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<td>Aero-Space Medical Research Labs (W-P AFB)</td>
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<tr>
<td><strong>Other hospitals</strong></td>
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<td>Grandview (Osteopathic)</td>
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<tr>
<td>Dayton Children's Psychiatric</td>
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<tr>
<td>Detmer Hospital, Troy, Ohio (approximately 22 miles north of Dayton)</td>
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III. SOME SUGGESTIONS FOR CME VIA CABLE TELEVISION

PRESENTATION TECHNIQUES

If the medical teaching institutions in Columbus and Cincinnati, plus the future faculty of the proposed Wright State University Doctor of Medicine program, wish to undertake the production of CME courses in the film, video-tape, or live television media, a metropolitan or Miami Valley regional cable system will be an ideal means of dissemination. The full realization of the potential for the origination of CME television courses in Ohio will depend to some extent on the development of improved dissemination facilities in other parts of the state. Where cable TV systems are slow to develop, it is possible that a TV-cassette type of video-tape service can be used.

If basically the same presentation techniques are used in the TV production of CME courses as are now used in the classroom, adaptation to the medium will not entail excessive new costs. In other words, the production of CME need not cause its originators to invest in a complicated, expensive TV or film studio. Moreover, the increased enrollment as a result of cable (and other) mass distribution methods will soon decrease the cost of CME to the doctor and increase fees for the originating institution.

The fact that cable TV will be used instead of broadcasting, video cassettes, or some other medium of dissemination, will make two-way, interactive instruction possible. When the number of receiving locations is limited, live audio response can be very valuable in CME. In CME broadcasting, instructors often deliberately omit certain major points from their presentation or merely touch upon them, leaving it to the audience to bring them up in the live interactive question-and-answer period that follows. Experience has shown that the most effective teaching often takes place in an informal conversational give-and-take discussion rather than in a formal lecture presentation.

Of course, when the viewing audience becomes too large, audio response becomes unwieldy. Digital feedback, however, is still highly practical. If it is assumed that each receiving station, whether it be hospital, office, or home, is equipped with some sort of "touch-tone"
response device, the entire audience can be polled or questioned, and the results, in percentages or actual numbers of responses, can be instantly displayed before the TV instructor. For the individual physician, this can constitute an even greater involvement and opportunity for participation than he might experience if he were a member of a conventional viewing group with the possibility of group audio response.

Moreover, the radiovision programs described above could be translated directly into television and fed out via cable. The coordination of slides would not be as practical for the individual physician as for the hospital group with a moderator in charge, and might become too expensive. However, radiovision programs as they now are packaged and delivered from Columbus could certainly be run at a central program-origination point in Dayton and distributed throughout the area by TV cable, thus expanding a single hospital group into a metropolitan or regional audience requiring only one moderator at the origination point. Live audio feedback would be more difficult to arrange in such a case, but not impossible.

Perhaps participation in live audio questioning should be restricted to a few hospital groups, as it is now, and digital feedback used to permit selected responses from homes or offices. Not only would this enable the audience to choose from a set of possible questions (or answers, if student response is desired), but it would also make it possible, because of the immediacy of machine manipulation of the data, to poll the entire audience with questions such as, "Is this point clear now?" "Do you want further discussion on any of the points listed on the screen?" And if the percentage of response is great enough, "Which ones?" When a question is asked, the audience -- virtually all the listening physicians in the area -- can be quickly polled by the instructor, who might say, "You heard the question from Miami Valley Hospital. It seems to me that I covered that pretty well, but maybe I wasn't too clear about it. How many want me to go over that point again?"

If 90 percent* of the CME instructional hours listed in Table 8-2

*Eighty percent of the courses listed in Table 8-2 can be considered totally appropriate to the use of TV and nearly all of the remaining courses could be offered in part.
were made available via cable TV, they would constitute about 677 hours of programming, or an average of 13.5 hours per week over the 50 weeks covered. If it is assumed that each program will be repeated a number of times in order to make its reception more convenient, the number of hours would be several times greater.

If real-time interaction with the program's instructor or expert panel members is included, the number of times a program may be repeated is greatly reduced. However, if interaction with someone other than the instructor is acceptable for the question-and-answer period, more repeats are possible.

If all but the first one or two repeats do not involve direct feedback and instructor response, there would be no problem of instructor availability, and hence no limit to the number of repeats that would be theoretically possible. Digital response could still be possible, and would probably be of value at least in determining the number of viewers. Question-and-answer sessions could still form an important part of each telecast, however; they could be recorded along with the original program, perhaps edited, and then retransmitted along with the program on each repeat.

SCHEDULING PROGRAMS

A survey of medical broadcasting made by The Rand Corporation in the spring of 1969 showed that "7:30 a.m., 12:00 noon, 6:00 p.m., 8:00 p.m., and 10:00 p.m. seem to be the preferred times, with 10:00 p.m. being the optimum time. Almost as much medical programming is broadcast at 10:00 p.m. as during all of the other four peak periods combined."* (See Fig. 8-1.) These may not be the "best" times for CME -- at the time of the survey they were only the most used times. It should be noted, however, that none of them conflict with regular school hours, so that the same channels that are used by schools in the daytime may also be used for CME programs at the "preferred times" listed. If 30 percent of the physicians register in at least one CME course annually, as

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Fig. 8-1 — Hour-of-the-day distribution of CME television broadcasts

Reference: See Bratz, "Survey Report."
mentioned earlier, some 240 in the cable area can be expected to take at least one course. Since the listed courses average 14 hours in length, we can expect to translate the demand into 240 x 14 = 3360 physician-hours.

We have no data at present on how many physicians in the Dayton area travel to Columbus or Cincinnati to take courses. Information on the Ohio Medical Education Network indicates that 10 physicians, on the average, attend each noon broadcast in each of four Dayton hospitals. If there is one program every week, this would mean 22 programs over the 22-week period (880 physician-hours per year). The total of these hours would indicate that the average annual demand of 3360 physician-hours is only about one-quarter filled today.

However, 14 hours of CME for each physician (in the 30 percent group) is only a crude estimate of current local demand. The American Medical Association has under consideration a program requiring up to 50 hours per year of CME for each practicing physician. In the Dayton area to be served by cable TV, this would amount to approximately 32,000 physician-hours (estimated by multiplying by 50 the 640 candidates mentioned previously). If this requirement is imposed, there will be a need for an additional 31,120 physician-hours annually in the Dayton area. State governments may also impose requirements for CME, especially if the AMA does not. Under these circumstances, the noon-hour broadcasts would not be sufficient unless many more doctors could meet during this period than is now the case. Some CME courses would undoubtedly be telecast for rural physicians via the state ETV stations, but these would necessarily include a limited selection of topics and there might be a large number of physicians from surrounding counties going to Dayton hospitals or other reception points where they could receive CME programs by cable. Eventually, a video-cassette service for physicians in isolated areas might prove practical.

* St. Elizabeth, Miami Valley, Grandview, and Kettering.
** That is, 22 weeks x 4 hospitals x 10 physicians = 880 physician-hours annually.
If the full variety of CME courses that are now offered in Columbus and Cincinnati were to be made available by cable in the Dayton area (with the exception of the 10 percent that require special facilities and must be held in laboratory or clinic), there would be some 700 different hours of CME instruction annually. We may further assume that each of these programs would be repeated at least four times at four different hours for the added convenience and benefit of doctors who were unable to be present at the original telecast. The total of CME programming would then amount to 3500 hours annually, or 70 hours a week. Table 8-4 suggests how these programs might be distributed throughout the week in order to make them available at times when doctors could most easily find time to view them, at home, office, or in the hospital.

This suggested schedule would use the first CME channel 60 hours a week and a second channel 15 hours a week during most weeks. Assuming that 50 percent of CME enrollees would view the original telecast, in which question-and-answer interaction with the instructor is possible, there would be about 23 physicians viewing the telecast at each of these hours.* Viewing by the other 50 percent would be spaced out over the four repeat periods, making an average audience of 4 or 5 physicians at each period.

Whereas an audience of 4 or 5 persons could hardly justify the use of a channel for entertainment or advertising purposes, it must be remembered that physicians are particularly important to the welfare of society. One physician may diagnose and prescribe for the health of over 1000 persons in the community, and an audience of 5 physicians, each of whom achieves some added knowledge during a year's time, may substantially affect the physical well-being of any of 5000 persons. Viewed in this light, and considering that the cost is very low, the use of a channel for CME telecasting could be of considerable value to society.**

---

*Estimated by taking 50 percent of the 640 candidates, and multiplying by 50 hours per year to obtain 16,000 physician-hours. Dividing 16,000 by the 700 course hours estimated in Table 8-4 gives us about 23.

**In Paper Nine, "preferential" lease charge for a metropolitan-wide cable channel is given as about $36,500 for full-time use.
Table 8-4
POSSIBLE DISTRIBUTION OF 700 HOURS OF CHE PROGRAMMING
(Hour includes live question-and-answer sessions with the instructor)

<table>
<thead>
<tr>
<th>Telecast</th>
<th>No. of Annual Hours</th>
<th>Time</th>
<th>Days of Week</th>
<th>Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original transmission</td>
<td>250</td>
<td>12:00-1:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>10:00-11:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>8:00-9:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First repeat</td>
<td>250</td>
<td>7:30-8:30 a.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>6:00-7:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>9:00-10:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second repeat</td>
<td>250</td>
<td>6:30-7:30 a.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>10:00-11:00 p.m.</td>
<td>Saturday and Sunday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>12:00-1:00 p.m.</td>
<td>Saturday and Sunday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>8:00-9:00 p.m.</td>
<td>Saturday and Sunday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>7:30-8:30 a.m.</td>
<td>Saturday and Sunday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>9:00-10:00 p.m.</td>
<td>Saturday and Sunday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third repeat</td>
<td>250</td>
<td>1:00-2:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>2:00-3:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>4:00-5:00 p.m.</td>
<td>Monday through Friday</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fourth repeat</td>
<td>250</td>
<td>12:00-1:00 p.m.</td>
<td>Monday through Friday</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10:00-11:00 p.m.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>10:00-11:00 p.m.</td>
<td>Monday through Friday</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8:00-9:00 p.m.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>8:00-9:00 p.m.</td>
<td>Monday through Friday</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>(12:00-1:00 p.m.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Total number of workday noon hours in a 50-week year.

\(^b\) Times in parentheses indicate times at which programs were originally offered.
However, since the actual number of enrollees is small, statistical variation may be such that at some times the attendance for a course could be zero. If there is a high probability that zero attendance would occur, it might be desirable to schedule at least some of the repeat telecasts according to the time-preferences expressed by individual physicians.

In calculating the expected physician audience for CME telecasts, at least the following variables should be considered:

\[\begin{align*}
    a &= \text{the number of different CME hours annually}, \\
    b &= \text{the number of CME candidates}, \\
    c &= \text{the number of CME hours in which each candidate enrolls annually}, \\
    d &= \text{the fraction of enrollees that attend the first telecast}, \text{ and} \\
    e &= \text{the total number of repeat transmissions}. 
\end{align*}\]

A rough method for estimating the approximate audience for CME telecasts is as follows:

1. Average number of physicians viewing each original telecast = \(\frac{b \times c \times d}{a}\).

2. Average number of physicians viewing each repeat telecast = \(\frac{b \times c \times 1 - d}{e}\).

The means for feeding into the Dayton area cable system the 382 hours of programs that now originate each year in Columbus are already available and might be inexpensive. For the last 8 years, the OSU's Graduate School of Engineering has leased a Columbus-Dayton television transmission channel from Ohio Bell Telephone for about $31,200 a year. This channel connects OSU with the Air Force Institute of Technology at Wright-Patterson Air Force Base, through downtown Dayton. The OSU's 16,000 physician-hours, this amounts to little more than $2.00 per physician-hour. Moreover, the total of 75 hours of transmission per week would much less than fill a single channel. By sharing the channel and the cost with schools and other users, the cost per physician-hour can be reduced to an even lower level. Of course, to this must be added the cost of the instruction itself. But this cost will have to be incurred with or without cable if the proposed AMA requirements are to be met, and without the economies of scale offered by the use of a communication medium, the cost would undoubtedly amount to a much higher figure.
contract with the telephone company provides 24-hour service, yet at present the system is being used only during class hours, that is, 10:00 a.m. to 12:00 noon and 1:00 p.m. through 6:30 p.m. Possibly, it could also be used for OSU medical-education purposes for early morning, noontime, or evening transmission on some sort of shared-cost basis. Conflicts in time-sharing among these users could be resolved by recording programs in Columbus at time of origination and then transmitting them during nighttime or early morning hours to Dayton, where they would be recorded and played back from a central origination point as often as required. Live question-and-answer sessions could be held by telephone following the first scheduled telecast; it would only be necessary for the instructor in Columbus to be available. If he needed to review the tape, he could keep a copy and play it on his own machine at the time of the scheduled Dayton telecast.

Because it would bring a variety of courses to the medical community* at a number of different times and places, cable TV would make a real contribution to CME in Dayton. More doctors would undoubtedly take more courses because of this added convenience.

MEDICAL SCHOOL SERVICES

The proposed new Doctor of Medicine program to be offered by Wright State University in association with several local hospitals will probably make very good use of a cable TV system, since it will enable them to provide medical education without having to build the traditional medical school with its attendant high costs and long construction time.** While lectures and basic science lab work will take place on campus, clinics and internships will be at the various hospitals. Unless the two kinds of activities can be satisfactorily separated in time, however, it will be necessary for the student to do a lot of commuting between campus and hospitals during his last 3 years in the program.

*Provided, of course, that OSU, UC, and the other teaching agencies were interested in producing them.

**A Proposal to the Ohio Board of Regents for a Program Leading to the Doctor of Medicine (Summary), Wright State University, September 1970.
The University of California medical schools, both in San Francisco and Los Angeles, have considerably lessened the commuting problem by using television. The UCLA medical school maintains a microwave link with Harbor Hospital in Torrance, some 17 miles distant. Third- and fourth-year students engaged in clinical and clerkship activities are provided with lecture courses for which, before the use of TV, they had to shuttle back and forth between Harbor Hospital and the UCLA campus. At San Francisco, a similar link, using an ITFS* channel instead of microwave, connects the UC medical center with several outlying hospitals. Some of the hospitals record programs on video-tape at the time they are transmitted and then schedule later playbacks at their own convenience. Both medical schools use the same tie-up for postgraduate courses, CME, and courses for paramedical personnel such as nurses, orderlies, etc.

The presence of a college of medicine in the Dayton area would also have a stimulating effect on increasing the number of CME courses available to the local area. Some of the courses now offered only in Columbus or Cincinnati might be taught by local instructors, thus saving the cost of transmission; or the range of subjects might be extended, with laboratory and clinical subjects being offered locally for the first time.

The existence of a cable network, joining all hospitals in the Dayton area, would make medical education more efficient, and CME more convenient, less expensive, and more accessible, thus increasing the probability that professional and semiprofessional personnel will maintain a higher standard of competence.

THE QUESTION OF PRIVACY

One of the issues in medical broadcasting is the question of privacy. Most broadcasters would like to encourage the largest possible audience, and would welcome viewers from the general public to even the

*Instructional Television Fixed Service.
most technical program in the hope of spreading an appreciation for the depth of medical knowledge or perhaps of broadening the understanding of health problems among the laymen of the community.

Medical organizations, on the other hand, as well as some broadcasters, are sensitive to the risk of incurring the public's displeasure by presenting clinical scenes in the private home. There is a fear of exceeding the boundaries of good taste, and, in many cases, doctors are reluctant to breach the demonstration patient's right to privacy.

One method of achieving a degree of privacy is to broadcast the medical program at an unscheduled time, known only to its specific intended audience. One medical series, for example, was aired on an ETV station after the last program of the evening, following several additional minutes of dead air. Any general-public viewers would thus have tuned in only by accident and would have had no cause to complain that program material in bad taste had been deliberately offered to the public.

A more common method, and more positive, is to scramble the transmission in such a manner that the picture, or both picture and sound, are unintelligible on an ordinary receiver. Only those sets with descrambling equipment are able to receive telecasts. This method has been in use in California in connection with the programs of the Medical Television Network, but it is expensive for the viewer because descramblers cost about $400 apiece. Consequently, receiving locations are generally limited to hospitals.

In the Rand study performed in 1969,* educational broadcasters of medical programs were questioned as to whether any of their programs had been scrambled, and if so, if scrambling had been considered unnecessary. Only 7.4 percent of the reported programs had been scrambled, and in almost all of them both sound and picture had been scrambled. No one stated that scrambling had been considered unnecessary. Also, a like percentage of programs were reported not to have been scrambled.

*See Bretz, "Survey Report."
but in the opinion of the respondent should have been. Thus, the consensus is that 15 percent of the programs reported either were scrambled or should have been.

On the other hand, in personal conversation, Dr. William Steis, of the Center for Continuing Medical Education at OSU and administrator of the Ohio medical TV network, indicated that he does not believe the problem to be very great. Table 8-2 lists only nine courses that include patient demonstrations, so the infringement of the patients' rights to privacy would apply to only 16 percent of this programming. In a cable TV system, the problem may be resolved by merely having one or more channels reserved for limited distribution and thus not available through the channel converters provided to other subscribers.
Paper Nine

ISSUES OF FRANCHISING

Leland L. Johnson
SUMMARY

This paper focuses on some of the major policy questions that will confront the Miami Valley Council of Governments in franchising one or more cable systems. Although it cannot supply clear answers to all major policy questions, it does delineate and discuss many of the alternative courses of action to aid the decisionmaking process. The following issues are discussed:

**Duration of Franchise.** We suggest that 10 years would be an appropriate figure for the duration of the franchise. Some observers maintain that the franchise should be based on the lifetime of the cable distribution plant. This criterion is inadequate, because there is no single point in time at which the entire plant wears out or becomes obsolete. A more satisfactory criterion is based on the amount of time required for the cable operator to accumulate a useful body of experience that can serve as a basis for reviewing and renegotiating the terms of the franchise.

**Exclusive versus Nonexclusive Franchises.** In general, nonexclusive franchises are superior to exclusive ones because they leave the door open to the entry of new competitive cable operators if the original operator performs poorly. As a practical matter, the outcome under either form probably would be the same, but the nonexclusive approach may give the cable operator more incentive to maintain good performance.

**Geographical Coverage.** It must be kept in mind that high costs incurred by the cable operator in serving certain subscribers must necessarily be borne by others; the Council of Governments must determine where to draw the line. The cable operator probably should not serve areas where the number of homes per mile of cable falls below about 59 to 72 (depending on the required return on capital). And within the delineated franchise boundaries it might be preferable, in the early years at least, to require the operator to install cable passing, say, only 90 or 95 percent of the homes rather than 100 percent.

**Serving Low-Income Areas.** Although much concern has been expressed in the past about the potential difficulties of encouraging cable operators
to serve low-income areas, this problem is alleviated, at least in
the city of Dayton, because the greater housing density per square
mile in low-income areas reduces the cost of serving each household.

**Single versus Multiple Ownership.** In principle, each of the six
districts of the metropolitan area discussed in Paper One could be
owned and operated by a separate entity. However, unlike the case of
single ownership, serious problems of coordination would arise, probably
with long time delays. If the areas are separately franchised, the
franchises should carefully delineate the locations of headends required
for interconnection, and specify comparable channel capacity in each of
the six districts.

**Allocation of Channels to Public Agencies.** One approach to allo-
cating channels to public agencies -- such as schools and government --
would be to provide large blocks of channels for their use free of
charge. However, not only is it difficult to determine how large these
blocks should be, but this approach would lead to a wasteful use of
channel space and might not meet particular public needs as they evolve
over time. Another approach is to charge a lease fee for each channel,
at least to cover the additional cost involved, and to make available
whatever capacity is required to meet the demands at those lease rates.
This strategy -- similar to strategy in the telephone industry today --
would contribute to flexibility and efficiency in channel use.

**Common Carrier Status.** We conclude that common carrier status
would be feasible if the cable operator has flexibility in setting
lease rates for the various kinds of services. Common carrier status
would be desirable in maintaining competition among various equipment
suppliers and packagers of services, even though the cable distribution
plant itself remains a natural monopoly.

**Public Regulation of Rates and Profits.** In time, as more channels
are leased to outsiders, increasing public control will be necessary --
perhaps a loose form of public utility regulation at the state or local
level. Despite the many problems encountered in public utility regula-
tion, it is difficult to visualize the cable operator supplying channels
for vital public services without some form of outside control to ensure that his profits are not grossly excessive, and that channels are made available under reasonable and nondiscriminatory terms.

Public Access and Local Program Origination. Public access to cable channels should not be much of a problem where channel capacity is concerned. Also, the problems of libel and obscenity may turn out to be less serious than many people fear. A more difficult problem is determining how local programming is to be financed and how local groups are to be organized to make effective use of that financing. The Council of Governments should consider whether the cable operator should be required to contribute some portion of his gross revenues -- say, 2 to 5 percent -- for funding programs produced by local community groups.

Technical Standards. Technical standards should be specified in the franchise agreement; they are as important as rates charged to subscribers or as other elements of performance. The Federal Communications Commission (FCC) proposes to establish a set of minimum technical standards. Until those standards are established, perhaps within the next few months, we cannot say whether the Council of Governments should go beyond those minimums.

Local Franchise Fees. The Council of Governments should be concerned less with how much money cable operations may add to municipal revenues, and more with the kinds of services that cable may provide in the public interest. Franchise fees lower than the ceilings proposed by the FCC may be justified to promote the growth of cable and its services, at least in the initial stages.

Television Set Leasing by Cable Operators. We suggest that the cable operator have the option of leasing television receivers along with cable hook-ups to provide an integrated package of service. Preliminary analysis does not indicate that he would have a strong advantage over retailers and repair shops by providing a package service, including receivers specially designed for cable; however, there is nothing to be lost and perhaps something to be gained by giving him the opportunity to provide integrated service.
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I. DURATION OF FRANCHISE

Today, franchises for cable television systems vary greatly in length. Some specify 10, 20, or 30 years; some have no limits. New York City, for example, specifies a 20-year franchise, but in Connecticut, where cable has been placed under public utility regulation at the state level, no expiration date for franchise certificates is specified.

On the one hand, the franchise should not be so short that it injects serious uncertainty into the cable operator's planning and service during the early years. On the other hand, there is some point in time where renegotiation or renewal of the franchise may be vital to protect the public interest. Unfortunately, there are few objective criteria that help in determining the appropriate length of franchise. Some observers have suggested that the duration be roughly equal to the lifetime of a plant when, presumably, the plant will in any event have to be replaced. However, this is an unsatisfactory criterion; there is no unique specified time at which the plant wears out. In fact, various components of the plant wear out or become obsolete at various times and are replaced accordingly. The coaxial cable itself may last 10 years or more (perhaps as long as 20 years in underground ducts), but amplifiers may need to be replaced within 8 to 10 years; headend equipment, in 5 to 7 years; and set-top converters, in 4 or 5 years. At any point in time, the plant consists of a mixture of components, including both new installations and items needing replacement. Similarly, the telephone industry has evolved from its earliest technology through a continuous process of replacement, renewal, and expansion. Thus, equipment lifetime is a poor criterion to use for determining when the franchise should be renewed.

Cable operators frequently argue that only by having long franchises (say, 20 years) can they get the most favorable interest rates. They assert that banks and other lenders are likely to make credit available on easier terms if they know the cable operator is free of the risk that he will lose the franchise. This argument is valid insofar as any
business enterprise with low risk will generally obtain funds under more favorable terms if it does not face the full pressure of competition. But the importance of this argument is easy to exaggerate. The Council of Governments should not be under the illusion that the franchise renewal process is likely to lead to a change in ownership. In a franchise proceeding, the existing holder has an advantage over challengers. In this respect, we should recall that although broadcast licenses are subject to renewal every 3 years, it is a rare occurrence when the existing owner loses his license. Even if the existing cable owner was forced out, he would be paid some "fair" market value determined perhaps by an arbitration board. If the cable operator had performed badly, this fair market value might not cover all debt claims with a reasonable return to equity. However, in the case of loss, the underlying difficulty is not that the franchise is written for, say, only 10 rather than 20 years, but that the cable operator has not done well in designing or operating the system or that the market is simply not sufficient to permit him to cover costs under any circumstances.

If it is true that a forced change of ownership is not likely, then why have a franchise renewal process at all? The renewal process is useful in at least two ways: (1) It provides a formal process for reviewing the performance of the operator, and (2) it facilitates renegotiating basic features of the franchise in accordance with the experience accumulated by the cable operator during the preceding period. The process of review assures that the level and nature of consumer complaints, growth of the system during the previous period, rates charged to subscribers and to other channel users, technical standards of service, and other elements can be examined in a more formal way than is likely to take place during the franchise period itself. Comparisons between the performance of the cable operator and that of operators in other cities would be useful. Although some review will (or should) be conducted continuously during the operation of the system, the renewal procedure provides a convenient formal review during which all interested parties can come together.
The renewal process also affords the possibility of substantially changing the conditions of franchise on the basis of past experience — for example, a new set of technical standards based on technological advances that took place during the earlier franchise period, a modified or new set of fees to be paid to the city, revised procedures by which channels are to be made available to various classes of users, or modification in geographical boundaries of service.

In sum, the duration of a franchise should be long enough to permit the operator to accumulate a substantial body of experience that can be compared with the experience of operators in other cities and that, in turn, can provide a useful basis for review and renegotiation. We would suggest 10 years as an appropriate amount of time. According to our financial and market projections in Paper Two, after 10 years the operator will have built his basic plant; the number of ordinary home subscribers and magnitude of costs of operation will have leveled off; and the operator will be making a profit (if the system is ever going to be profitable) that should offset the losses that necessarily will occur in the early years. Also, by the end of 10 years there will be a substantial body of experience accumulated in other cities for comparisons. To be sure, some might argue in favor of perhaps 8 or 12 years to accomplish the same objectives. We can only conclude that the selection of the precise number of years is one of the many decisions the Council of Governments will have to make, based on its own evaluation of the pros and cons discussed here and elsewhere.
II. EXCLUSIVE VERSUS NONEXCLUSIVE FRANCHISES

Exclusive franchises specify that the cable operator has the sole right to serve a given geographical area. During the term of the franchise he is assured that no other competing applicant will be certificated. The nonexclusive franchise makes possible the certification of other applicants in the same geographical area.

As a practical matter, there is not a great deal of difference between the two types of franchises. In the former case, the operator has a de jure monopoly. In the latter case, once he builds a plant he will have a substantial advantage over potential competitors, which gives him a de facto monopoly. Our cost analysis does not suggest that it would be economical to have two or more operators with their own lines competing on a house-to-house basis. As in the case of telephone and other public utilities, the construction of duplicate facilities along public rights-of-way would seem wasteful, at least at this stage of cable development. Indeed, it remains an open question whether even a single operator can make a profit in large cities having extensively developed over-the-air broadcasting service.

All in all, there is nothing to lose and perhaps something to gain by writing only nonexclusive franchises. If the operator is doing a good job, the threat of additional competition would be inconsequential, and the two types of franchises would have the same effect; but the potential threat of competition under a nonexclusive franchise would provide additional stimulus for the existing operator to perform well. If worst comes to worst and he does a poor job, then competition would serve as a safety valve to protect the public interest.
III. GEOGRAPHICAL COVERAGE

It is important that both incorporated and unincorporated areas be included in whatever franchise area is to be served by a single operator or by a consortium of cable operators. But this raises two other questions: (1) How far should the geographical area of service be extended into areas of progressively lower population density? And (2) what percentage of homes should the cable operator stand ready to serve within the franchise area delineated under (1) above?

Concerning the first question, our financial analysis suggests that at a cable penetration of 40 percent assumed in Paper Two, the operator should not be required to wire areas where the number of homes per mile of cable falls below 59 or 72, unless he can charge higher rates (such as $10 per month) without a commensurate reduction in the number of subscribers as a percentage of homes passed. To require him to serve areas of lower population density would substantially raise the costs that would have to be borne by other subscribers -- including low-income groups in the more densely populated parts of the franchise area.

The figure of 59 to 72 is derived by considering how many subscribers are required to cover the cost of additional cable and house drops operating within an existing cable system. Taking the headends, microwave interconnection, local program origination, and other elements whose costs do not vary with the number of additional subscribers, we are concerned here with the incremental revenue and the incremental cost of moving into progressively more sparsely populated areas. Assuming an interest rate of 10 percent on additional cable investment, and considering the costs that do vary with the number of subscribers (such as house drops and operating expenses), we estimate that the minimum density would have to be about 59 homes per mile to break even at a 40-percent cable penetration. If we take 14 percent as the composite return to debt and equity capital, as was computed in Paper Two for the entire metropolitan area, then the
minimum density would increase to about 72 homes per mile.* The calculations underlying these numbers are shown in Addendum 9-A to this paper. If penetration were to increase above 40 percent, the operator could move into less densely populated areas.

All of these figures, however, are based on the constraint of remaining within an approximate 5-mile radius of the headend. Otherwise, the substantial cost of supertrunk or microwave interconnection would be added to incremental costs, as described in Paper Three, so that minimum densities in outlying areas would increase.

In regard to the second question, one school of thought is that the cable operator should be required to stand ready to serve all of the homes in his franchise area: that is, he should build a plant passing 100 percent of the homes so that anyone who chooses to do so can have the cable easily connected to his home. However, here as elsewhere, one must consider the cost of fulfilling whatever conditions are written into a franchise; for this cost must be borne by users of the system, in one way or another.

The major problem with insisting on literally 100-percent coverage is that in nearly any large franchise area a few homes will be extraordinarily expensive to wire because of geographical locations that require additional expensive trunk and feeder lines to maintain good signal quality. Other expenses are incurred where there is a sudden fall-off in population density in a small subarea; this generates a very high cost for those few additional homes passed by the cable. Our financial projections for the Dayton area suggest that the average cost of cable plant per home passed is about $120. For a few homes, however, this cost could run to two or three times as much (the precise figure cannot be determined until a detailed street-by-street engineering blueprint is drawn -- a task normally done by the cable operator shortly before he commences installing cable in a given subarea of his franchise).

* A summary of breakeven densities is given in Table 9-6.
A major policy question is whether other subscribers should bear the cost burden of the abnormal difficulty of wiring these few homes. This problem is especially worrisome since it is likely that the homes that are the least difficult to wire will be located in the densely populated low-income areas, while the few homes with geographical wiring problems are likely to be in the high-income suburbs.

Of course, one could immediately suggest that these few subscribers be charged higher rates or in some other manner bear some of the extra expense of service. But such a differentiated rate structure would not be easy to design for small subareas. It may be feasible to specify that cities in the Dayton area should each have separate rates, but in this instance we are talking about a few homes scattered within a larger area. To charge these subscribers a much higher rate would certainly generate ill-will and assertions of discrimination and unfairness, however unfounded these assertions may be. *

One possibility, then, is not to insist on the franchise of 100- percent coverage, but rather to permit some lower level such as 90 to 95 percent. That is, the cable operator would have the option of refusing service to a few homes in particularly unfavorable locations. Aside from avoiding a cost burden to other subscribers, it is notable that this approach would be consistent with current practice even in such vital services as telephone and electric power. There are still a few homes in remote rural locations that are not served by telephone or electric utilities, but few officials would insist that utility companies take on the large additional expense of wiring these few homes.

In conclusion, the Council of Governments faces a problem with regard to rate averaging over a large geographical area. Cable, in

*The state of Nevada, which imposes public utility regulation on cable, is attempting to implement provisions for cable in remotely located homes under special cost-sharing arrangements. However, it is questionable whether these provisions will be workable. See Michael R. Mitchell, State Regulation of Cable, The Rand Corporation, R-783-MF, October 1971.
addition to telephone and other utility services, requires a degree of rate averaging since no two homes involve exactly the same cost to serve, although each would pay the same rate. The process of rate averaging necessarily means that some will pay more than others relative to the true cost of service. But how far should this process be carried? Should the cable operator be required to install cable for the last 5 percent of the homes in his area even if the cost amounts to, say, 10 or 20 percent of the total cost of serving his entire franchise area? Or should he be relieved of that responsibility for the benefit of his other subscribers?

We suggest that in the original franchise the cable operator be required to install cable passing no more than perhaps 95 percent of the homes, rather than 100 percent. After the cable operator has had extensive experience in the area, and the potential of cable to serve social needs is better known, then this provision of the franchise might be renegotiated — to include a larger percentage or even 100 percent of the homes. This item of renegotiation would be one of the many accompanying the renewal of the franchise at the time it expires.
IV. SERVING LOW-INCOME GROUPS

The problem of serving low-income groups in the metropolitan area is one of the most important in delineating the conditions of a franchise. Low-income groups are less likely to subscribe to cable than high-income groups; yet, many of the benefits of cable are presumably to be directed to low-income groups. How then is the cable operator to be induced to wire and to serve low-income areas? The problem is particularly troubling in black low-income areas that might, many fear, lose out on whatever potential benefits cable has to offer.

Fortunately, in the Dayton area this problem is likely to be less severe than is generally supposed. As previous Rand analysis suggests, willingness to subscribe depends on income; in an area where family income is double that in another area, cable penetration is also likely to be twice as great, providing the monthly subscriber fee is the same in both areas.* However, an important countervailing element arises from the fact that the number of dwellings per mile of cable in low-income areas also tends to be greater than in high-income areas as a consequence of greater housing density per square mile. Therefore, the cost per home passed by cable in low-income areas is reduced. By charging a reduced subscriber fee in these areas, reflecting the lower cost, the cable operator may be able to do about as well in terms of cable penetration in low-income areas as elsewhere.** Alternatively, the monthly rate might be maintained at the higher level, but special services provided to low-income groups, such as locally originated programming, might have a favorable effect on penetration.

To examine these relationships, we have selected the census tracts in the city of Dayton in which, according to the 1970 census, more than 75 percent of the population is nonwhite. These consist of census

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**One difficulty, however, is that the rate of cable disconnects and losses due to bad debts may be greater in low-income areas.
tracts 18-34 (excluding tract 24) in the western portion of Dayton shown in Paper Four, Fig. 4-8.

We estimate that a mile of cable would pass about 160 to 170 dwellings within these tracts, as compared with about 150 for the city as a whole, and with about 110 for the overall Dayton metropolitan area. Thus, the cable investment costs of serving the western portion of Dayton would be about 30 or 40 percent less than that of the metropolitan area as a whole. Of course, cable investment is only a portion of total cost. The maintenance, billing and collections, and installation of house-drop lines involve costs reflecting the number, not the density, of subscribers.

With these expense and capital items taken into account, the city of Dayton as a whole appears to be an attractive cable market as described in Paper Two. Although the lower-income areas, with lower cable penetration, may not bear as large a share of overhead costs as would the higher income areas within the city, still it appears that they would be able to bear considerably more than the incremental cost incurred in serving them: With the headend and interconnection network to be built in any event, the additional revenues from serving the low-income areas would exceed the additional costs.

At this writing, the Census Bureau has not yet released 1970 income data for these tracts. However, 1960 census data indicate a median family income for nonwhites in the city of Dayton of $4663, compared with a median family income for all of Dayton of $6266 and $6821 for Montgomery County. According to the analysis of cable penetration in Paper Two, we estimate that as a result of these differences in incomes, a penetration of 40 percent in Montgomery County would be accompanied by a 37-percent penetration in Dayton as a whole and by a 28-percent penetration in Dayton's black community.

Addendum 9-A to this paper shows that at a cable penetration of 28 percent and on an incremental cost basis, a minimum of 84 dwellings

per mile would be required to generate sufficient revenue (at the $6 per month figure used in Paper Two), in order that costs be covered with a 10-percent interest on capital. At a 14-percent return on capital, the minimum figure would be 103 dwellings per mile. The actual density in the black community of 160 to 170 dwellings per mile far exceeds these minimums.*

One possibility for stimulating penetration beyond the 28-percent figure estimated above is to specify in the franchise that, within a given census tract, monthly subscriber rates are to be reduced by a specified amount if the number of dwellings per mile of cable exceeds a certain figure. For example, the overall rate might be set at $6 per month but with the stipulation that the rate would be reduced to only $4 or $5 per month in census tracts where there are more than 150 dwellings per mile of cable.

Another possibility is to maintain the rate uniformity at $6, but to direct many of the services to low-income groups as an alternative to stimulate subscriber sign-ups.

*One heavily black-populated census tract, number 27 in Fig. 4-8 of Paper Four, is a geographically large area (but with a small population of 4619) that has a density of only 85 dwellings per mile of cable. However, even this tract has a high enough density to cover incremental costs on the basis of a 10-percent interest rate.
V. SINGLE VERSUS MULTIPLE OWNERSHIP

The metropolitan system design described in Paper One and Paper Two embraces six cable districts, each served by a separate headend. Does it make much difference whether the six districts are under common ownership or whether each is owned and operated separately? This question will be treated with respect to the following major factors:

- Technical capability and interconnection
- Division of geographical coverage
- Sharing of program origination facilities
- Economies of scale
- Local control
- Yardsticks for comparing performance
- Investment requirements and construction schedules

TECHNICAL COMPATIBILITY AND INTERCONNECTION

One potential problem of multiple ownership is the difficulty of maintaining compatibility and adequate interconnection among the six districts. With six separate owners -- some of which might be private, municipal, or community nonprofit organizations -- attaining these goals will not be easy. Some cable operators may prefer to install only one cable with converters in each home to provide 20 to 24 channels. Others may opt for a dual-cable system with a converter to provide 40 or so channels. Yet the benefits to the community of a large number of channels in one district will depend on what is offered in the other districts. A 40-channel capacity in one district will be of limited value if the other systems have only 20. For example, colleges and universities may seek perhaps 5 channels for providing instruction to home viewers. Yet sufficient capacity may exist only in the districts that have 40 channels. The benefits of televised instruction would be reduced to the extent that students living in other districts with only 20 channels could not be reached. A special medical channel may be economically feasible only if the entire metropolitan area can be covered, but sufficient capacity may exist only in the districts that
have 40 channels. In other words, for services that depend on broad metropolitan coverage, the "chain" of cable systems is only as strong as its weakest "link."

However, if this interrelation exists, would not the separate owners join together in a voluntary agreement to ensure capability and interconnection? Not necessarily. For one thing, there may be honest disagreements among cable operators about how much capacity is needed and what specific technology is most effective to attain that capacity. One operator may conclude that the 20 channels are enough since this would meet the currently proposed minimum channel requirement of the Federal Communications Commission (FCC).* Others may be more optimistic about the future of new and expanded services and favor 40 channels. These disagreements are apt to be particularly severe if the type of ownership -- public versus private -- varies from one district to another. This is not to say that the cable industry in the United States should be limited to one cable technology and one level of channel capacity. Clearly, diverse technologies (single cable versus dual cable, use of converters in some places but not in others, and experiments with switched systems as mentioned in Paper One) need to be pursued in various parts of the country. Yet within any one metropolitan area, common technical characteristics are essential if services are to be developed where broad metropolitan coverage is required. Diversity is best achieved among, not within, single metropolitan areas.

The problem of obtaining voluntary agreement is exacerbated to the extent that cable operators are primarily interested in retransmitting broadcasting signals -- an interest predominating in the industry today. For this use, 20 channels are more than adequate. Moreover, the cable operator may reason that in any event additional channels will be leased at no more or little more than the additional cost of installing the channels (so that additional profits will be zero or very low as a consequence of additional capacity). Thus, he may conclude that

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*This proposal is contained in a letter dated August 5, 1971, from Dean Birch, Chairman of the FCC, to the Chairmen of the Senate Communications Subcommittee and the House Communications and Power Subcommittee, p. 28. Hereafter this will be cited as the FCC Letter.
he should install 20 channels rather than 40. Other operators, concerned about the longer-term social value of additional channel capacity, may disagree. However, their attempts to provide large capacities may lead to frustration because the additional channels can be used for services that cover only their own districts and not the others.

Moreover, unless a carefully devised and enforced plan for interconnection is drawn up, each operator may tend to design his system to be suboptimized to cover only his own district: For example, he may locate his headend at a point convenient to serve his own district, but one that has no clear line-of-sight path required for microwave interconnection to other headends. This possibility becomes all the more real if separately operated systems follow various time schedules of construction. One operator may have his headend completed and much of his plant built before another neighboring operator has even decided where his headend is to be located. Again, in principle, cable operators could arrive at a voluntary agreement to coordinate construction schedules and to undertake interconnection. But this is a difficult task. Those cable operators primarily interested in retransmitting broadcast signals may conclude that these signals can be picked up off the air or brought in by microwave links from distant cities such as Indianapolis and Chicago and hence not need interconnection. They may reason that interconnection among the districts would be important only for educational, governmental, and other uses that, in any event, would be priced at rates that would cover only incremental, additional costs and would not provide much in the way of additional profits.

To be sure, these problems are not insurmountable. If the franchises in all six districts are written to provide common technical standards, construction schedules, and other conditions essential for coordination among the separate districts, then the outcome could be the same as that under common ownership. But it is doubtful if this would happen. As a practical matter, it will not be easy to enforce common standards against the number of separate cable operators—especially if they represent a variety of ownership forms and interests.
DIVISION OF GEOGRAPHICAL COVERAGE

Another problem of divided ownership is determining the geographical boundaries of each district. One can easily visualize disputes among cable operators over serving particular subareas in the metropolitan region. Some cable operators, seeking to enlarge their potential subscriber base, may encroach on the territories of other operators. Thus, with separate ownership serious difficulties may arise in dividing up the map among the separate districts.*

One potential solution to coping with geographical boundaries is not to define them at all: That is, franchise several cable operators to serve whichever portions of the metropolitan area they choose. Each would serve that portion of the area where he could build a plant more quickly than the other operators. This would have the added advantage of encouraging cable operators to construct a plant quickly to serve as large an area as possible. This would be an attractive approach if all we were concerned about was the retransmission of broadcast signals characteristic of today's cable industry. However, more advanced services may require that cable systems be designed with regard to the boundaries of school districts and the geographical size and location of the particular communities of interest (such as along ethnic, industrial, governmental, or commercial lines).

Again, the problem of geographical division is not insuperable, but it is likely to lead to extended debate and disagreement before final decisions are reached -- a process that could be avoided through single ownership.

*An example of this problem arose in the franchising of Las Vegas, where the division of the city between two franchise holders was accomplished by voluntary bargaining between the two. After a long period of argument and debate they finally agreed simply to split the city along the Strip. See Mitchell, State Regulation of Cable Television.
ECONOMIES OF SCALE

Substantial economies of scale exist for cable systems that offer advanced services requiring central computers, local origination facilities, and microwave interconnection. However, each of the six cable districts would encompass enough dwellings to exploit most of the economies of scale.* But a satisfactory agreement would also be required among the separate owners to share the cost of central computers and origination facilities serving the entire metropolitan area. So far as maintenance and other operating costs are concerned, there would be little difference between separate and single ownership, although crossing of boundaries by maintenance crews would be easier under common ownership than under separate ownership. This advantage is likely to be of small consequence for districts as large as those contemplated for the Dayton area.

SHARING OF FACILITIES FOR LOCAL PROGRAM ORIGINATION

In our financial projections we assume that some program origination facilities would exist at each cable headend, but that a single, better-equipped studio facility would exist in one location for high-quality programming to be distributed to the entire metropolitan area. With the metropolitan area split into six separately owned districts, problems could arise as to how the cost of a common facility should be shared. Some operators might argue that it should simply be split equally six ways. Others might argue that their share of the cost should depend on the extent to which they themselves carry programming originating at the central facility. Yet others might maintain that costs should be divided in proportion to the number of subscribers served by each district.

Again, this is not an insuperable problem, but it is one more of the many elements that could seriously delay design and construction of the metropolitan cable system.

*See Paper One, p. 29.
LOCAL CONTROL

One frequently mentioned potential advantage of separate ownership is in providing a greater degree of local control over channel use and in setting monthly rates to subscribers. If each district is designed to be economically self-sufficient, then rates from district to district would vary in accordance with underlying costs of service. These costs are determined by the investment and operating expenditures required in each district divided by the number of users served. Generally, the greater the density of population, the lower the cost per home passed by cable; the higher the level of cable penetration the lower the cost per subscriber. With rates reflecting these costs there would be no cross-subsidization among the districts. Thus some subscribers would be better off, others worse off, as a consequence of separate rates for the separate districts.

As a practical matter, for most of the districts the differences in rates would not be great; the various districts would (or should) cover incorporated and unincorporated areas with a mixture of population densities in each. It is true that the district serving the city of Dayton would encompass a low-income area concentrated in the western part of the city. However, as discussed earlier, the higher population density would at least partially offset the relatively low penetration levels expected in low-income areas. Thus, a cable district serving the city of Dayton may not be severely handicapped by virtue of the fact that a larger portion of the district consists of low-income residents than is true in the outlying suburbs. Indeed, as shown in Paper Two, Dayton does better than outlying areas in terms of cable profitability.

At the same time, single ownership for the entire area does not foreclose a possibility of having some rate variation among the six districts. The franchise could specify separate rates for the various geographical areas, depending on which cable headend serves the area in question.
In short, the single-ownership approach has flexibility insofar as it leaves open the option of having either a single rate reflecting overall average costs for the whole area or a series of rates for the separate districts and subdistricts. The separate-ownership approach automatically locks the system into separate rates to the extent that subscriber costs vary among the districts, and each district is required to be economically self-sufficient.

Were the Council of Governments to move to a uniform rate structure for the whole metropolitan area, some districts might not be economically self-sufficient, but would require subsidization from the others. The process of transferring funds from one district to another would be much more difficult with separate ownership than with single ownership.

Another aspect of local control is access to local cable channels. Some groups feel that with local ownership they may have access to channels under more favorable terms than would be the case with a single metropolitan-wide system. That is, they can more easily influence a locally owned district than would otherwise be the case. They may be right. A powerful local community organization may indeed have greater leverage in gaining channel access to a relatively small locally owned system than it would were the local system part of a larger metropolitan system "run" by a large organization in another part of town. Yet, a serious question arises as to whether access to cable channels ought to depend on the power and influence that particular community groups can wield. It may be more important to provide enough channel capacity so that all groups can have equal and nondiscriminatory access to channels regardless of the particular pressure (political and otherwise) that they are able to exert.

YARDSTICKS FOR COMPARING PERFORMANCE

One clear advantage of the separate-ownership approach is in providing comparisons of performance among cable operators. If one cable operator is doing poorly, the situation is more clearly evident if a neighboring cable operator is doing well than would be the case if the
first operator controlled the whole system. These comparisons of performance may be especially useful in deleting, modifying, and adding conditions and provisions to franchises when they come up for renewal.

**INVESTMENT REQUIREMENTS AND CONSTRUCTION SCHEDULES**

Another advantage of separate ownership is in reducing substantially the investment requirement for individual operators. We estimate that the overall metropolitan system would involve an investment of about $22.5 million as discussed in Paper Two. In today's cable industry this is a large amount of money for a single operator to raise. However, the merger movement that is proceeding apace in the cable industry will make funding of this magnitude progressively easier.

More important than the total amount of money required is the question of whether the market for cable services is large enough in the Dayton area to make the enterprise economically viable. If it is, then the funding would probably be forthcoming either under single or multiple ownership.

Related to the question of capital requirements is the matter of construction timetables. With each district owned separately it is probable that construction could be completed sooner in each district than would be true with single ownership. Again, much depends on whether the single owner could obtain total funding as easily as could the separate operators in each of the districts. To the extent that individual operators could obtain funds more quickly, they could also complete the detailed engineering planning, purchase materials, and hire construction crews more quickly than could a single operator.
VI. ALLOCATION OF CHANNELS TO PUBLIC AGENCIES

Aside from leasing channels to commercial users for such things as pay movies and pay sports, a major question in franchising relates to criteria for allocating channels among alternative public uses, especially as the demand for particular services increases and as new services develop. To provide assurance of access for certain public uses free of charge, the Federal Communications Commission has recently proposed that cable systems in large metropolitan markets (including Dayton) provide a minimum of one channel for public access, one for government uses, and one for education.* Taking the FCC's minimum channel allocation as given, the Council of Governments faces the question of how to allocate the many other channels that would be available in a metropolitan system. In addition to retransmission of broadcast signals, perhaps 10 to 15 channels would be available for schools, 5 for higher education, and 2 or so for government, 2 for local program origination, plus additional bandwidth for facsimile mail, information storage and retrieval, and other commercial services.

BLOCK ALLOCATIONS WITH FREE CHANNEL USE

One approach would involve spelling out in the franchise the number of channels allocated to various public users free of charge. This approach -- which we shall call the "no-charge block-allocation strategy" -- would have the advantage of giving certain public users guaranteed access to the system under very favorable terms.

However, this approach has serious disadvantages. First, it is impossible to foresee the needs of particular users at the time the franchise is signed. Although we might say that perhaps 10 to 15 channels could be available to the schools, no one knows at this point in time whether the schools will be able to employ anything like that number within the foreseeable future. Much depends on the willingness of

*FCC Letter, p. 28. The channels for educational and government uses are to be made available free of charge only for the first 5 years.
schools to integrate television into their curricula and to redeploy teachers along the lines described in Paper Seven. As another example, two channels might be allocated to government, but the requirements for government use in closed-circuit teleconferencing, training, and other uses could far exceed, or fall short of, this channel capacity, depending on the nature of future developments in terminal gear and the interest that governments have in employing channels for a variety of purposes.

Moreover, even if it were possible to foresee the overall needs for a general category of users, it would be difficult to allocate channels to specific users within each category. For example, perhaps ten channels would be appropriate for elementary and secondary schools. But who is to decide how to allocate between elementary and secondary schools or among schools in separate school districts covered by a single cable system? Or if, somehow, we could determine that two channels ought to go to government, what criteria should be used to divide the channels among police, fire, administrative offices, and other government functions? In other words, while the no-charge block-allocation strategy provides guaranteed access, it does not mean that particular users will have as many channels as they may eventually need.

Another disadvantage of this approach is the difficulty of re-allocating channels from one use to another as needs change over time. Even if a particular user employs his channel wastefully, let us say for only a few hours a week, he would be reluctant to give it up. Since he gets it free of charge he has every incentive to hold on to it. To those who claim that he is using the channel wastefully and ought to release it, he can emphasize that his particular needs are "vital" to the public interest, or that he has plans for expanding his use of the channel that would be thwarted were a reallocation to occur.

These problems are well illustrated by the long and painful experience of the FCC in allocating the radio spectrum among competing users. Similar to the situation outlined above, the FCC has allocated blocks of radio frequencies free of charge for mobile radio, television, commercial and noncommercial radio broadcasting, marine and aeronautical
uses of radio, and so forth. Once these allocations were made, it became very difficult to reallocate in accordance with changing needs of various users. In particular, mobile radio uses have increased rapidly in recent years in a manner that the FCC simply could not have foreseen 10 or 20 years ago. Some users in the mobile band have experienced extreme congestion, while other channels have remained underutilized. Notably, in 1952 the FCC allocated part of the radio spectrum -- 70 television channels -- to UHF broadcasting in the hope that the development of UHF would add substantially to program diversity available to television viewers. Despite the fact that UHF has not developed in the manner that the FCC had hoped, strong vested interests have made a reallocation of some of the UHF spectrum space to mobile radio very difficult.*

With channels available free of charge, users have little incentive to employ them efficiently and the "needs" they claim for channel use can easily be exaggerated. A case in point is the FCC proposal that one channel be set aside for education in each metropolitan cable system. It is notable that many educators claim this simply is not enough and that even more channels should be set aside free of charge. According to one news account, an educator has observed: "More channels are definitely needed for instructional television to realize its full potential and for it to try the innovative techniques that people are talking about." He warned that unless

... cable TV is used in innovative ways, educational institutions will end up using the one channel in the same way they had used broadcast TV with no great gains. He realized, he said, that other channels would be available to educators on a lease basis, but cost would be the drawback to such use, as will be the sharing of such channels with other users presenting an availability problem.**


** ETV Newsletter, August 23, 1967, p. 2. (Emphasis added.)
Thus, with many channels available free of charge to public users, the home subscriber and the commercial user of the system would be paying the entire bill. Perhaps this subsidy to public uses is justified, but it is questionable whether cable subscribers or other cable users ought to bear the burden rather than the general taxpayer, since it is the nation as a whole that would presumably benefit from "the innovative techniques that people are talking about." Or to express it differently, if it is agreed that the cable subscriber ought to subsidize education, one could argue that the telephone system should also make telephone circuits available free of charge to educational establishments, with the burden borne by other telephone users.

BLOCK ALLOCATIONS WITH LEASE PAYMENTS

An alternative involves allocating channels to specific public purposes, but on a pay basis rather than simply making the channels available free of charge. For example, ten channels might be reserved for schools, but whatever channel time is used would be paid for in accordance with tariffs published by the cable operator in a manner similar to that of the telephone company. This approach would have the advantages of generating some additional revenue to the benefit of other users, including home subscribers, and of promoting efficiency in channel use by encouraging users to give up, transfer, share, or subdivide among themselves channel time that otherwise would be wasted, if no payment were made. It would also offer the possibility of greater flexibility in transferring channels from one block to another: If two of the ten channels remain unused for a specified length of time they might be transferred to some other public use, say, to government agencies willing to bear the lease charges. The allocations would also guarantee that public users would have access to a specified number of channels as long as they are willing to pay the lease charges.

DEMAND-ACCESS LEASE

Another possibility that should be considered by the Council of Governments would involve making all channels available on a "demand-access
lease" basis, with no reservations made ahead of time for any specific purpose except for the few free channels required in the proposed FCC regulations for public access, education, and government. This procedure would be similar to that of the telephone industry where no specific reservations are made for channel use when cable is installed. That is, the Bell System is not told that of 500 telephone channels to be installed, say, between Chicago and New York, 100 are to be reserved for schools, 200 for private industry, and 200 for government. Although Bell may have some idea of the kinds of demands for various users when it decides to build a plant of a given capacity, it is not committed to dedicate particular channels to particular users in the absence of their willingness to pay in accordance with published tariffs. If more total channel use is demanded under the tariffs than is available, then (probably after some time lag) either capacity is increased or the lease fees are increased.

This approach is attractive in providing the greatest flexibility in channel use as various demands for service increase or evolve over time. Unlike the preceding approaches, it avoids the problem of trying to determine channel use in advance. This approach would also generate additional revenues to reduce the burden on other subscribers (including low-income groups). With sufficient lease revenues, it may be possible eventually to reduce the monthly rate to household subscribers to a very low level, if not to zero.

CRITERIA FOR SETTING LEASE FEES

However, questions immediately arise about the criteria under which lease fees are to be set. The question of setting lease rates is indeed difficult because of the problem of deciding how to allocate costs among services that jointly benefit from those expenditures.

Among the many examples of this situation, a separate cable serving only schools could be installed at a relatively low cost, if the cable were installed at the same time that other cable was installed for use by home viewers and other subscribers. Thus, if these other users pay the full cost of the "basic" cable, schools could piggyback at a small
incremental cost. But note that the argument could be turned around: The cost of the basic cable system would be less if it were installed at the same time that a separate cable was installed for the schools. If the schools pay the full costs of installing their cable, the basic cable could piggyback at a lower additional cost to its users than if its cable were installed alone. Are the schools to pay only the additional cost of the separate cable, or are they to pay the full costs, with other users permitted to piggyback? Or is there an acceptable way to split the difference?

Another example is the telephone pole on which broadband cable is strung. One can argue that the pole would have to be installed and maintained regardless of whether it is used for a cable and therefore that the cable operator should be required to pay only the small additional cost involved in stringing cable on the pole. But one could also argue just the reverse: Cable operators ought to pay the full cost of installing and maintaining the pole, with the telephone company getting a "free ride." More likely, some acceptable compromise would be reached through which both parties would share some portion of the cost of installing and maintaining poles. Again, we have the case where once a particular facility (the pole) is installed, the additional cost of serving various users is small. The critical question is how they are to share the cost of the facility as an "overhead" expense that, one way or another, has to be borne by one or more groups of users.

In leasing cable channels, one useful criterion is to set the lease rate high enough so that any user pays at least the additional cost that he imposes on the system. For those users who pay only this additional cost (as in the case of schools, where they are the users who piggyback) we can regard them as being served at a "preferential" rate. Other users such as those subscribing to pay-movie channels or to pay-sports channels, maybe expected to bear substantially higher rates to cover a larger portion or perhaps all of the overhead expense. Although these other users paying relatively high rates might appear disadvantaged, they are not harmed by virtue of the fact that preferential users are being served; for these preferential users pay the additional costs they impose on the system and perhaps cover a portion of the overhead as well.
This is analogous to the structure of long distance telephone rates. Low rates are offered to nighttime users, since the additional cost is small for the telephone plant that otherwise would remain largely idle. Daytime users paying higher rates are not disadvantaged because the nighttime users pay their own additional costs of using the underutilized system. Moreover, daytime users are benefited to the extent that revenues from nighttime service are sufficient to offset some of the overhead that daytime users would have had to bear.

With this approach applied to cable, channels for community origination and for educational purposes might be set at very low rate levels -- reflecting nothing more than the additional costs they generate. Channels for government use might be set at somewhat higher rates to cover some of the overhead, and channels for commercial purposes such as pay movies, facsimile mail, and data information storage and retrieval might be set at still higher levels to cover a large portion of overhead. In addition, a minimum number of channels would be made available free of charge in accordance with criteria the FCC is proposing to establish.

There are three questions that immediately arise concerning this approach: (1) What would be the likely minimum level of lease charges in the Dayton metropolitan area? (2) How can we be assured that channel capacity would be available for the various uses described elsewhere in this Report? (3) How can we be assured that, in this entire process, the cable operator does not make an enormous profit at the expense of the public? The first two questions will be treated immediately below; the third, which raises basic questions of regulatory policy, will be covered in Sec. VIII.

THE LEVEL OF LEASE RATES

The level of incremental costs of adding channel capacity depends on the underlying assumptions about how capacity is to be increased. In Paper One we estimated that the cost of increasing capacity from 12 channels to about 20 channels amounts to about $500 per mile of cable. Using this cost relationship in estimating incremental cost
is satisfactory as long as we consider a range of capacity within the limits of a single cable. In Paper One we also noted the possibility of adding additional 20-channel cables to the plant at the time it is built for an additional cost of approximately $2000 per cable per mile. This is a satisfactory basis for estimating incremental cost if we are considering expansion in capacity that requires two or more cables. In addition to both of these cost figures, it is necessary to include the cost of added signal processing equipment to feed the extra channels and the cost of maintenance and other operating items. In Table 9-1, both the lower limit and upper limit are shown for estimating incremental costs per channel. In the former we consider the $500 per mile figure to upgrade cable plant from 12 to 20 channels. With a cable life of 10 years and an interest rate of 10 percent, the cost estimate of one channel per year is $26,000.

As an upper limit, with installation of a second cable at $2000 per mile, the incremental cost rises to $39,700. As an illustrative example of how revenues based on incremental cost can affect the economic viability of the metropolitan cable system, Paper Two uses the rounded figure of $35,000 as an estimate of the channel cost that might be paid by educational institutions covering all six districts.* On a single district-wide basis the rate would be on the average about 1/6 of that or about $6000. Thus, an elementary school channel covering a single district might be leased at $6000 per year, or even less on a part-time basis where the channel is shared, say, with adult evening education.**

*Paper Two, p. 10. The figure of $35,000 is set substantially higher than the lower bound in order to cover the costs of a low data rate feedback for digital response from subscribers as described in earlier papers. This digital feedback would require only a small fraction (perhaps 1/30) of the equivalent bandwidth of a return video channel. In the illustrative case shown in the Summary Report of 5000 students taking two-way instruction, if each student were interrogated as rapidly as every 5 sec, he would require approximately 46 Hz of bandwidth. For 5000 students this would amount to 200,000 Hz or only about 1/30 of a 6-MHz video channel.

**In addition to these cable distribution costs, the schools themselves would have to be wired. We estimate the drop-line cost to individual schools to be in the range of $100 to $200; the cost of wiring each classroom would be about $20.
**Table 9-1**

AN ESTIMATE OF INCREMENTAL CABLE DISTRIBUTION COSTS PER TELEVISION CHANNEL

<table>
<thead>
<tr>
<th>LOWER LIMIT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Additional cable of 1,750 mi. @ $500 per mi.</td>
<td>$ 875,000</td>
</tr>
<tr>
<td>Signal processors, 48 @ $2,000</td>
<td>$ 96,000</td>
</tr>
<tr>
<td><strong>Total Equipment Cost</strong></td>
<td>$ 971,000</td>
</tr>
<tr>
<td>Interest, 10 percent for 10 years</td>
<td>$ 569,400</td>
</tr>
<tr>
<td>8 channels, 10 years</td>
<td>$1,540,400</td>
</tr>
<tr>
<td>8 channels per year</td>
<td>154,000</td>
</tr>
<tr>
<td>1 channel per year</td>
<td>$19,300</td>
</tr>
<tr>
<td><strong>Annual Operating Cost</strong></td>
<td></td>
</tr>
<tr>
<td>5 percent of additional cable cost</td>
<td>43,800</td>
</tr>
<tr>
<td>10 percent of signal processor cost</td>
<td>9,600</td>
</tr>
<tr>
<td>8 channels per year</td>
<td>53,400</td>
</tr>
<tr>
<td>1 channel per year</td>
<td>6,700</td>
</tr>
<tr>
<td><strong>TOTAL COST, 1 CHANNEL PER YEAR</strong></td>
<td>$26,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UPPER LIMIT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Additional cable of 1,750 mi. @ $2,000 per mi.</td>
<td>3,500,000</td>
</tr>
<tr>
<td>Signal processors, 120 @ $2,000</td>
<td>240,000</td>
</tr>
<tr>
<td><strong>Total Equipment Cost</strong></td>
<td>3,740,000</td>
</tr>
<tr>
<td>Interest, 10 percent for 10 years</td>
<td>2,193,000</td>
</tr>
<tr>
<td>20 channels, 10 years</td>
<td>5,933,000</td>
</tr>
<tr>
<td>20 channels per year</td>
<td>593,300</td>
</tr>
<tr>
<td>1 channel per year</td>
<td>29,700</td>
</tr>
<tr>
<td><strong>Annual Operating Cost</strong></td>
<td></td>
</tr>
<tr>
<td>5 percent of additional cable cost</td>
<td>175,000</td>
</tr>
<tr>
<td>10 percent of signal processor cost</td>
<td>24,000</td>
</tr>
<tr>
<td>20 channels per year</td>
<td>199,000</td>
</tr>
<tr>
<td>1 channel per year</td>
<td>10,000</td>
</tr>
<tr>
<td><strong>TOTAL COST, 1 CHANNEL PER YEAR</strong></td>
<td>$39,700</td>
</tr>
</tbody>
</table>

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*a Costs rounded to nearest hundred.

*b Based on 8 signal processors per district, 6 districts.

*c Based on 20 signal processors per district, 6 districts.
A pay-movie channel covering all six districts might be priced at, say, 10 times the figure of $35,000 or roughly $350,000 per year to cover a large portion of overhead. If 30,000 subscribers (comprising about 15 percent of the homes in the six districts) pay for the movie channel, this would amount to about $12 per year per subscriber -- a small amount relative to the basic annual fee of $72 or so for cable. (Of course, the total charges to movie subscribers would include not only channel time but also special home terminal equipment, movie copyrights, costs of running the film, selling and promotional expenses, collection expenses, and so on.) As shown in Paper Two, this additional lease revenue can have a substantial effect on the viability of the system and on the prospects of reducing rates to other users.*

The incremental cost of microwave interconnection is shown in Table 9-2 under similar assumptions. The cost for one channel to interconnect the six districts would run to about $10,300, and the cost for an inbound channel from the five surrounding districts to a central district would run to about $11,700.

ENSURING ADEQUATE CHANNEL CAPACITY

The basic provision for ensuring adequate channel capacity lies in building a cable plant at the outset that has a capacity in excess of that required to retransmit broadcasting signals. Nevertheless, if the demand for cable service were to grow under the above rate structures to fill all 40 or so channels available, then lease rates might be increased to reduce the demand for service or the cable operator would be required to increase his capacity. Whether lease charges are increased or capacity is increased would depend on the profits earned by the cable operator: If, with all channels filled, he is still not doing well financially (measured as a rate of return on his investment), then he would be permitted to raise lease rates, in the manner that public utilities are permitted to do. However, according to our financial projections, the outcome of poor financial performance, with all channels

*See Paper Two, p. 10.
Table 9-2

AN ESTIMATE OF INCREMENTAL MICROWAVE INTERCONNECTION COSTS PER TELEVISION CHANNEL

COST PER OUTBOUND CHANNEL

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment Cost</td>
<td></td>
</tr>
<tr>
<td>5 paths, 7 outbound channels, 1 inbound channel</td>
<td>$1,196,000</td>
</tr>
<tr>
<td>Less 5 paths, 4 outbound channels, 1 inbound channel</td>
<td>1,076,000</td>
</tr>
<tr>
<td>Additional investment cost, 3 outbound channels</td>
<td>120,000</td>
</tr>
<tr>
<td>Interest, 10 percent for 10 years</td>
<td>70,400</td>
</tr>
<tr>
<td>3 channels, 10 years</td>
<td>$190,400</td>
</tr>
<tr>
<td>3 channels per year</td>
<td>$19,000</td>
</tr>
<tr>
<td>1 channel per year</td>
<td>$6,300</td>
</tr>
</tbody>
</table>

Annual Operating Cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 channels per year</td>
<td>12,000</td>
</tr>
<tr>
<td>1 channel per year</td>
<td>4,000</td>
</tr>
</tbody>
</table>

TOTAL COST, 1 CHANNEL PER YEAR | $10,300

COST PER INBOUND CHANNEL

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment Cost</td>
<td></td>
</tr>
<tr>
<td>5 paths, 7 outbound channels, 2 inbound channels</td>
<td>$1,241,000</td>
</tr>
<tr>
<td>Less 5 paths, 7 outbound channels, 1 inbound channel</td>
<td>1,196,000</td>
</tr>
<tr>
<td>Additional investment cost, 1 inbound channel</td>
<td>45,000</td>
</tr>
<tr>
<td>Interest, 10 percent for 10 years</td>
<td>26,400</td>
</tr>
<tr>
<td>1 inbound channel, 10 years</td>
<td>$71,400</td>
</tr>
<tr>
<td>1 inbound channel per year</td>
<td>7,200</td>
</tr>
</tbody>
</table>

Annual Operating Cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 channel per year</td>
<td>$4,500</td>
</tr>
</tbody>
</table>

TOTAL COST, 1 CHANNEL PER YEAR | $11,700

\[a\] Costs rounded to nearest hundred. Figures taken from Paper One, p. 30.

\[b\] Ten percent of additional investment.
filled, is not very likely. If the cable operator succeeds in leasing all 20 additional channels in the dual-cable system at even the annual preferential rate of $35,000 per channel and a movie channel at $350,000, the additional total annual income of $1,050,000, combined with fees from home subscribers, would substantially strengthen the financial basis of the system. This, in turn, would encourage an expansion of capacity -- to 60 or 80 channels or whatever is needed to satisfy users willing to pay lease fees. These lease fees will cover at least the additional costs of the extra capacity, while also permitting reductions in monthly fees to home subscribers.

CONCLUSIONS

There is no completely satisfactory solution to the problem of allocating and pricing cable channels. To allocate large blocks of channels free of charge to educational and other public users would promote inefficiency in channel use and inflexibility in shifting channels from one use to another as public needs change over time. It also would place the full cost burden on home subscribers and commercial lessees of channels. The lease approach, similar to that of the telephone system, would encourage flexibility and efficiency and would tend to spread the cost burden more equitably over all users. It does, however, raise difficult questions of how lease charges are to be computed and how protection is to be accorded against excessive profits.
VII. COMMON CARRIER STATUS

There has been much discussion about whether cable operators should serve as common carriers — that is, cable operators having no control over the content of programming (perhaps except for automated services such as time and weather reports), but being required to make channels available to outsiders on a nondiscriminatory basis in accordance with published lease rates. The strongest argument in favor of common carrier status is that it would eliminate the danger of undesirable monopoly on the part of the cable operator. For example, if he were to provide his own programming on a particular channel — let us say a pay-movie channel — he might have an incentive to degrade the quality of signals on other channels or to restrict access to other entrepreneurs desiring to use channels for pay-movie packages to increase profits to himself. Or he might develop an integrated alarm system using cable and special terminal equipment and prohibit other equipment manufacturers and suppliers from attaching their competing equipment to his cable plant.

Those who argue against common carrier status emphasize that the cable operator might be handicapped in earning reasonable profits in the early years. If he has no control over the content of his channels, his ability to offer new and improved services might be compromised. The most recent expression of this view comes from a report of the Sloan Commission on Cable Communications:

Common carrier status may, indeed, be the way cable should and will go as it achieves maximum penetration and overtakes or supplants over-the-air broadcasting. At this point in time, however, the Commission believes that imposition of common carrier status would be unrealistic and an impediment to the desirable growth of cable. We do not believe that investors would be willing to undertake the substantial capital expenditures of laying cable if they had no control over the use of
the channels in the formative years and so were powerless to control the financial destiny of the system.*

A critical element in determining the profitability of cable operations, however, has less to do with the control that cable operators have over the content of particular channels, but more to do with their freedom to set lease rates that outsiders would pay for access to the system. As long as the cable operator can set lease rates (perhaps relatively high rates for some services and low rates for others, as we have discussed previously), the chances are good that the system would be profitable; at the same time, there would be maximum competition among program packagers desiring access to cable channels and competition among terminal equipment manufacturers for residential and commercial markets. While the cable distribution system itself has elements of natural monopoly, competition could be maintained in terms of inputs and outputs of the system.

In view of the above, the Council of Governments should consider seriously the possibility of requiring the cable system to operate as a common carrier. Not only would this operation be desirable in itself, but it would provide a yardstick for comparison with cable systems in other parts of the country that do not operate as common carriers, and would serve as a pioneering experiment to determine the feasibility of common carrier status in cable's early formative years. In moving in this direction, however, it is important to distinguish between common carrier regulation and public utility regulation, the latter of which does have serious implications for the profitability of the cable industry. We now turn to the question of public utility regulation.

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VIII. PUBLIC REGULATION OF RATES AND PROFITS

The preceding discussion raises a number of questions about who should decide, and what criteria should be used, if the cable operator is in fact earning a substantial profit that would justify changes in lease rates and expansion of capacity. One possibility is to place cable television under the purview of a state or local public utility regulatory commission, as in the case of telephone, electric, or gas utilities. The cable operator would provide data, probably on an annual basis, so that a rate of return on investment could be computed. If the rate of return is too high, suggesting excessive profits, then rates would be reduced (perhaps to home subscribers as well as to those leasing channels). If the rates are too low, then monthly rates to subscribers and others could be increased. If the demand for channel time exceeds capacity, then capacity would be increased, as discussed earlier.

Unfortunately, this would work out less smoothly in practice than in theory. There has been extensive discussion of the pros and cons of placing cable television under public utility regulation. One of the most serious concerns is that public utility regulation would place limitations on the cable system and thus retard its growth. In a cable system's early years, when the risks are high and large amounts of capital are needed, profit levels may be required that would seem quite excessive in comparison with well-established and mature industries such as telephone and electric power.*

One solution that should be seriously considered by the Council of Governments is to apply a loose form of public utility regulation to provide extensive latitude for the cable operator to earn profits or incur losses in accordance with the underlying risks. As mentioned before, the franchise could be written to permit the cable operator over the first 6 years or so to introduce and adjust lease rates on an experimental basis to test the market. His overall rate of return would

be free of regulation so that he could generate substantial revenues to offset the risks and attract capital. After this period of time, his profit level would be subject to regulatory review but still on a loose basis. A rather wide range would be established for rate of return varying perhaps from 8 to 15 percent to reflect the relatively high risk involved in this enterprise. (In comparison, a return in the neighborhood of 8 percent is generally judged by the FCC to be reasonable for the interstate services of the Bell Telephone System.)

Unfortunately, the complications of rate-of-return regulation are far greater than suggested in this example. Much of the literature has been devoted to major problems of rate regulation, including the problems of establishing adequate criteria for (1) judging costs that should be allowed and disallowed in the computation of profits, (2) computing the value of investment or the "rate base," and (3) judging what constitutes a reasonable rate of return. Moreover, much criticism has been directed at rate-base regulation on grounds that it may lead the regulated firm to overinvest in physical facilities, that it may discourage innovation, and that it operates only with long delays and at great expense because of the extensive hearings and examination process typically required. Despite these problems, it would be difficult to visualize a cable operator leasing dozens of channels for vital public services without having some form of public control, to provide assurance that profits do not become excessive and that services are offered under reasonable terms and conditions.

With respect to which agency should undertake the task of regulation, perhaps a regional regulatory commission could be established for the Dayton area or the task could be accomplished by the State Public Utilities Commission. The pros and cons of state control are discussed in another Rand Report.*

*Mitchell, State Regulation of Cable Television.
IX. PUBLIC ACCESS AND LOCAL PROGRAM ORIGINATION

One of the most important aspects of cable television development involves the problem of ensuring public access and funding of local program origination. In Paper Five we have discussed types of neighborhood and regional local programming that are not feasible through conventional over-the-air broadcasts. But to exploit the flexibility of coverage offered by cable television, the Council of Governments faces three major issues:

1. How can adequate public access to cable channels be ensured?
2. How are problems of obscenity and libel to be handled?
3. How is programming to be funded?

PUBLIC ACCESS TO CABLE CHANNELS

With respect to adequate channel access, the solution is relatively straightforward insofar as channel availability is concerned. The cable systems described in Paper One and Paper Two contain ample channel capacity for local origination of quantities reasonably foreseeable over the next 5 to 10 years. Either with a dual-cable system or a single cable with a set-top converter in the home, both metropolitan and local community channels could be made available full-time to home viewers. Moreover, because signals brought in from the three Cincinnati network affiliates will duplicate Dayton Stations during times of the day -- especially during evening prime time -- the Cincinnati slots would be available for local origination during those times. Indeed, to protect local stations the FCC requires cable operators to black out signals from outside stations that duplicate within the same day the programming of local stations.

The FCC has already proposed that one channel be made available on a first-come, first-serve basis for public use, for access on a "free, dedicated, noncommercial, . . . and nondiscriminatory" basis.*

As further assurance of public access, the franchise could state

*FCC Letter, p. 28.
that any person or group that desires to originate a local program and which does not have access to the free channel required by the FCC would, under certain conditions, be given access to another cable channel. A time limit could also be stipulated such as one week after notification to the cable operator and for a time slot of one hour before or after the hour selected by the person or group for the presentation. The cable operator would be required to meet this demand by (1) deleting, for that time slot, the signal of a distant independent station and inserting the local program, (2) deleting the signal of a Cincinnati network affiliate and inserting the local program, or (3) avoiding the risks by building a large system so that ample channel capacity would be available simultaneously for all such uses. The conditions of access could also include the following:

- The local program would be defined as a live telecast or a delayed videotape from within the Miami Valley region (that is, the origination could not be simply an old movie or syndicated program).
- Channel space would be made available for a limited number of repeats (say, three).
- The program originator would pay all costs of programming production; however, some funding might be made available by the cable operator, as discussed below.
- The program originator would pay a lease fee for the use of the channel in accordance with the fee structure discussed in Sec. VI of this paper.

**PROBLEMS OF OBSCENITY AND LIBEL**

One of the most troubling aspects of local origination relates to safeguards that may be required to protect against obscenity and libel and at the same time permit a wide expression of views without censorship. The problem of obscenity is especially worrisome to some observers since the television set is so easily available to children in the home -- a level of accessibility not characteristic of printed media where some restrictions on geographical locations and methods of sale can be enforced.
Similarly, there are problems relating to public taste -- for example, what would happen if someone were to propose to televise Tijuana bullfights over the metropolitan cable system? Since this would not be a local program, it would (or should) be covered by federal rather than local standards. Under the FCC's proposed rule, cable systems may import foreign-language stations. In implementing this rule, the FCC will have to clarify the extent to which the content is to be regulated for U.S. consumption.

Fortunately, the chances are good that these problems will not be serious. Much of the local programming of a controversial nature will be of interest to only small groups who, by their very nature, would not be offended by the "street talk" that they might be exposed to on television. As far as children are concerned, it is unlikely that they would watch the programs which would be competing with cartoons and other children's programming. And even if the child did occasionally have some exposure to these programs (probably while changing from one channel to another), it is unlikely that he would be affected adversely, in the light of all the violence and questionable language to which he is already exposed in movie theaters, newspapers, and magazines.

With respect to libel, it has been urged widely in past discussions that program originators rather than cable operators should be held responsible for program content. The pressing problem here arises from the fact that with wide public access to cable systems, many program originators would be impecunious. Even if sued successfully, they would not be able to pay. Perhaps some protection could be established by using a tactic already employed by some cable operators: Require that the program originator sign a statement that he will not speak in a manner that would likely give rise to a libel suit. This is no perfect solution, to be sure, but perhaps it would serve some useful psychological purpose.

In sum, we suggest that the franchise be written in a manner that

* See, for example, the Sloan Commission Report, On the Cable, p. 178.
would permit experimentation with a wide variety of local programming, without censorship. If problems of obscenity, poor taste, and libel do become real, then controls may eventually have to be instituted. The franchise should initially be nonrestrictive, but with provision that controls may be required at some future time on the basis of demonstrated (not theoretical) harm to the community.

FUNDING LOCAL PROGRAMMING

Much more serious than the preceding problems is that of funding local programming. It has been pointed out frequently that television programming is expensive. Although relatively crude local programming is far less expensive than the programming that meets commercial standards, funding can nevertheless be a problem for many local groups strapped for money and talent.*

One difficulty that the Council of Governments must face is the way in which the cable operator should support local programming -- either by doing it directly or by supporting the efforts of others. Currently, FCC regulations require that cable operators with large systems originate local programs "to a significant extent," although this rule is being contested in the courts.** The problem with the FCC approach is that the cable operator is not likely to know what is of most relevance to the local community. Cable operators are more concerned with retransmitting broadcast signals than with originating their own local programs. Rather than requiring the cable operator to originate programming, a more promising approach is to require him to purchase and maintain studio equipment for use of local community groups to do their own programming. Moreover, the franchise might require the operator to turn over some portion of his gross revenues


** See Mitchell, State Regulation of Cable Television, p. 33.
(say, 2 to 5 percent) to help defray the direct expenses incurred by these community groups. We would hope that the FCC would approve this approach and accept a waiver relieving the cable operator of originating programs under the condition that he provide studio equipment and perhaps funding to outside groups, as stipulated by the franchise.

Perhaps the most serious problem with this approach is to determine who gets the money. We can expect various community groups representing a variety of interests to compete for the limited funding. Difficult questions will arise in deciding which community groups best represent what interests and how much each should receive from the cable operator. To take one example from Paper Six, our questionnaire survey conducted in the Dayton area on attitudes toward television suggests that the black community has substantially different interests and needs from the rest of the Dayton area. Certainly its needs should be met to the feasible extent by local programming on cable. But which organizations would best represent the black community for purposes of receiving funds from the cable operator for local program origination? Also, in Paper Five a number of possibilities for "public interest" programming are mentioned. But how are priorities to be assigned and funds allocated among them? These are among the most difficult questions that will have to be answered if local programming is to become an important social, political, and economic force in the Miami Valley region.
X. CONSTRUCTION TIMETABLE AND TECHNICAL STANDARDS

An important aspect of the franchise is the specification of a performance schedule for construction of the cable system. This would ensure that the successful applicant for the franchise is not merely a speculator who regards the franchise as a valuable piece of paper to be sold or exercised as conditions warrant. Again, the FCC recognizes this problem in proposing,

... that the franchise require that the cable system have an operable headend within one year after this Commission grants a certificate of compliance, and that thereafter it meets substantial percentage figures for extension of energized trunk cable, such figures to be set by the local authority. ... We believe, in general, that the cable franchisee should be required to extend energized trunk cable to 20% of the franchise area per year, for its first five years of operation, with the extension to begin within one year after the Commission issues its certificate of compliance. But we will not lay this down as an inflexible rule, recognizing that particular local circumstances may vary.*

As far as overall national requirements are concerned, the FCC proposal to extend cable to 20 percent of the franchise area per year appears to be a reasonable minimum. However, for purposes of accelerating the use of cable television in the Dayton area, the construction per year might very well be raised to 25 or 30 percent so that the entire metropolitan area could have service within 3 or 4 years.

Of course, technical standards are as important as price in terms of regulatory control. As observed by Professor Alfred Kahn,

One purpose of regulation is to protect buyers from monopolistic exploitation -- but buyers can be exploited just as effectively by giving them poor or unsafe service as by charging them excessive prices. ... Price really has no meaning except in terms of an assumed quality of service; price is a ratio, with money in the numerator and some physical unit of given or assumed

*FCC Letter, p. 47.
quality and quantity in the denominator. Price regulation alone is economically meaningless.

Fortunately, as in the case of construction timetables, the FCC is well aware of this problem. In its proposed set of rules it is planning to establish a set of minimum technical standards. According to the FCC proposal,

While appropriate standards for these services and other technical aspects of cable are under study, it will be necessary to call on the various technical industries for advice and consultation, and we plan soon to announce the formation of a task force of experts to advise us in designated areas.

Until the FCC has made its final decisions, officials in the Miami Valley region will not be able to determine if their own standards should go beyond whatever minimum standards the FCC establishes. Addendum 9-B of this paper presents a discussion of some of the technical considerations the Council of Governments should take into account.

**FCC Letter, p. 40.
XI. THE QUESTION OF LOCAL FRANCHISE FEES

Because of the pressures on municipalities today to raise revenues, many local government officials view the growth of cable television as a new and convenient source of additional funds. Consequently, they favor the requirement that cable operators, as a condition of obtaining franchises, pay some percentage of gross revenues to the city, generally with a guaranteed minimum. When selecting from among applicants who are competing for a local franchise, officials frequently weigh heavily the relative attractiveness of the proposed payments to the city. As a consequence, in many cases cable operators are paying substantial fees (6 or 7 percent of gross); in other cases, substantial lump-sum payments are offered as part of the competitive bidding process.

There has been great concern, in Dayton and elsewhere, that if municipalities tax cable operators heavily, the growth of systems will be stunted or discouraged altogether, and that funds otherwise available for new programming and new kinds of services will be siphoned off in directions perhaps less useful to the public.

Notably, the FCC also has been concerned. In its proposed rules it states:

Though most fees seem to run about 5 percent, some have been known to run as high as 36 percent. The ultimate effect of any revenue-raising fee is to levy an indirect and regressive tax on cable subscribers. . . . [We propose] that when the fee is in excess of 3 percent (including all forms of consideration, such as initial lump sum payments), the franchising authority shall submit a showing of the appropriateness of the fees specified, particularly in light of the planned local regulatory program.*

EFFECTS ON CABLE OPERATIONS

Clearly, the franchise is a potentially profitable right given to the cable operator. Even if the franchise is granted on a nonexclusive

basis, once the operator has the franchise and builds his plant, he has a powerful advantage over other potential cable competitors who might entertain notions of entering his franchise territory. As in the case of telephone and other public utilities, it seems unrealistic to expect numerous cable operators to compete in the same area for business: There would either be a costly duplication of plant, or (more likely) the competing groups would eventually merge to form a single entity. In either case, we could not depend on competition among cable operators to maintain low prices and good service to the consumer.

A basic question of monopoly in cable service involves the social benefit of whatever uses are made of additional profits by cable operators, in comparison with the social benefit of the additional tax revenues to the city. If the past experience of other high-technical industries is a useful guide, we would expect some profits to be put back into the business to build larger future markets, rather than be divided among stockholders. In the case of cable television, we would expect some of these funds to go into hardware research and development, local program origination, experimental projects involving new kinds of programming, exploration of new nontelevision uses for cable such as facsimile mail and so forth. Although this process is not automatic, it is one that can be widely observed in other industries. Moreover, if cable television were operated on a nonprofit basis -- a form of organization being seriously considered in some areas -- we would have greater assurance that what would otherwise be excess revenues to a profit entrepreneur would indeed be put back into more and better services. Or, if the franchise agreement were to specify in detail the kinds of services and experimental developments the cable operator should promote, perhaps he would use his revenues for more socially beneficial purposes.

More specifically, a high tax on gross revenue may discourage a cable operator from performing certain services such as reaching low-income or sparsely populated areas. Even if serving certain portions of the city were highly profitable, it is the additional cost and the additional expected revenue that are of prime importance to a cable operator trying to decide whether to serve some other portion of the
city. For example, in a particular section of the city that is to be wired, the cable operator may calculate that a new minimum of $6.00 per month per subscriber is required to break even. A tax of 60 cents or 10 percent of the gross would require that the fee to the subscriber be increased to $6.60 to break even. Although the city could, as a condition of franchise, require the operator to wire the less attractive portions of the city at the $6.00 rate and absorb the additional 60 cents from profits earned elsewhere, past experience suggests that cable operators, like other business entrepreneurs, will balk at doing things that are not in their own economic self-interest. Despite all the conditions that might be written into a franchise, when the time comes (perhaps years later) to wire certain portions of the city, the cable operator may offer various excuses as to why he cannot proceed as originally envisioned.

Using an example discussed earlier, the cable operator may offer cable channels to schools and public agencies at rates to cover incremental cost -- rates far below those ordinarily required to meet total overhead and other business expenses. He would reason that as long as these additional users cover the added small burden of supplying the extra channels and other users cover the overhead and extra expenses, then offering low preferential rates is a sensible course of action. However, if a high tax were placed on the revenues of the system, preferential charges to other users might have to be raised to compensate for the reduction in revenue. Or, to carry the analogy a bit further, if a heavy tax were placed on the revenues of the telephone company, it is likely that the nighttime preferential rates discussed earlier would have to be increased so that the total costs of the company could be covered.

As a more general example, many observers mistakenly conclude that large franchise fees are a drain only on profits, and can be collected without affecting subscriber rates. However, we would expect a cable operator to pass at least a portion of the fee on to subscribers, even if he is making a surplus profit before the tax is levied. It can be demonstrated with the use of economic theory that the operator would
seek to pass a portion of the fee back to the subscriber, depending on the sensitivity of the demand for cable service to rates. Only if subscribers were willing to pay a certain maximum fee (a very high price elasticity of demand) would the operator be unable to pass back a portion of the fee.* Seeking to avoid this outcome, the municipality might establish a ceiling on subscriber rates at the same time that it imposes a high franchise fee. But this runs the danger of placing the cable operator in an untenable cost squeeze. If the municipality knew the exact profit-and-loss position of the cable operator, it might be able to play this squeeze strategy without discouraging the cable operator from moving forward; at the same time, it might collect revenues that otherwise would be devoted to less socially desirable purposes. But this is a dangerous game. For one thing, even though a particular subscriber rate may be appropriate in the early years, continuing inflation in the economy would contribute to an increasing squeeze. Although, in theory, regulatory devices could be set up to adjust rates quickly, past experience suggests that time lags of years are not uncommon in rate adjustments, given the requirements for public hearings, appeals, and other delays. Of course, with or without a tax, the problem of lags in rate adjustments would arise. A municipal agency trying to balance low subscriber rates with high franchise fees would exacerbate the problem.

THE PROBLEM OF AUCTIONING FRANCHISES TO THE HIGHEST BIDDER

As mentioned earlier, many municipalities place great weight on the relative amount of money offered to the city by competing franchise applicants. One way to facilitate the decisionmaking process, often mentioned in past discussions, is simply to auction off the franchise to the highest bidder -- where the amounts paid to the city would be an important part of the bid. If all things were equal, this would

seem to be a sensible guideline for decisionmaking. But generally other things are not equal — a point that cities are likely to neglect in their concern about obtaining additional revenue. One cable operator may offer, say, $100,000 annually plus 3 percent of his gross for a 20-channel system and a subscriber rate of $5 per month. Another operator may offer $200,000 annually plus 5 percent of his gross for a 12-channel system and a rate of $6 per month. Still another bidder may offer very little to the city directly but may propose to build a plant with experimental features that extend beyond today's technology and may develop plans to experiment with hardware and programming which, if successful, would contribute greatly to the public interest. In this case, it would not be wise for the city to take a narrow view focused predominantly on incoming revenues.

Perhaps the basic problem with the bidding approach is that unless the city takes adequate account of the full range of factors in the bid, it may become essentially a partner of the cable operator in the extraction of monopoly profits from the public. By itself, the auctioning of franchises to the highest bidder does nothing to ensure low rates to subscribers, the exploration and development of new and potentially useful services, the development of new kinds of programming, or other possibilities that would expand the use of cable.*

**TAXING NEW TECHNOLOGY**

Throughout this discussion, a basic issue is the social utility of additional revenues to the city in comparison with the uses that the cable operator would otherwise make of these revenues. In other words, are the roads, schools, and welfare programs (and perhaps some bureaucratic waste) to which the city would devote additional tax revenues more valuable than the uses to which the cable operator himself would put the funds? Again, if the alternative in the latter case is simply larger dividends to stockholders, then the answer is fairly clear-cut. But the situation is much more complex. Cable revenues

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*This argument is developed at greater length by Posner, *Cable Television: The Problem of Natural Monopoly*, pp. 14-15.*
can be used in many ways that are in the public interest. As mentioned above, this is more likely to be the case if the system is operated on a nonprofit basis, or if other special arrangements are made to ensure that revenues do not simply become excessive stockholder dividends. For one thing, cable television may contribute substantially to expanding the access to education and reducing its cost, especially for disadvantaged or minority groups. If revenues are employed to develop new kinds of educational programming, and if ombudsman services and local community services dealing with pressing local issues are carried on cable, they may contribute importantly to the welfare of the city's inhabitants. In the longer term, the development of facsimile mail, data information storage and retrieval, burglar and fire alarm systems, and other uses of broadband cable channels could contribute importantly to the city's goals. All in all, the longer-term potential of cable may do more toward coping with the city's problems than would direct, shorter-term expenditures of additional tax funds extracted from the cable industry.

This is not to say that municipalities should not tax the cable system at all. Certainly, the disruptions and inconveniences caused by installing underground cable through city streets should be compensated. Nor does it suggest that a substantial city tax would render wholly infeasible all of the above welfare services. It is a question of degree: the larger the city tax, the less likely the development and expanded use of these services -- especially the risky, longer-term ones.

Where, then, does one draw the line? One might conclude that the FCC proposal of 3-percent maximum is reasonable enough to compensate for the use of city streets.* To go beyond this would have progressively inhibiting effects that, although increasing short-term municipal revenues, could entail a long-term social cost. This danger is particularly worrisome in view of the fact that since cable is still a small industry, it does not have a strong constituency to resist large municipal levies. In this connection, a question arises as to why franchise

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*Perhaps it would be advisable to waive the fee entirely in return for a commitment by the cable operator to devote a specified substantial portion of gross revenues to local programming and to other services.
fees and other local taxes do not seem to be much of a problem for the telephone industry, in contrast to the serious concern being expressed today by cable operators. The answer lies in the fact that strong resistance would be expressed by millions of telephone users if municipalities were to impose taxes of, say, 10 to 15 percent of gross revenues.

More generally, in many cases new technologies have a large but unquantifiable potential benefit to society. Without strong constituencies, however, there is a danger of overtaxing them to meet the near-term, pressing goal of balancing government budgets. As a matter of public policy it would seem wise for the Council of Governments to favor cable and other technologies that show promise in coping with the problems the cities themselves face. (Of course, for technologies with potentially detrimental side-effects, such as smog-producing automobiles and supersonic transports, a different strategy may be called for.)

CONCLUSIONS

It would be a mistake for the Council of Governments to consider cable television primarily as a source of public revenues. Rather, the Council should be concerned with the positive and direct contribution that cable television can make to the area and its inhabitants. Accordingly, it should select the best qualified franchise applicant and impose whatever requirements and controls are desirable to encourage the full potential of the cable system to be exploited for the public benefit. This potential can be far more significant than the conventional uses to which the city might devote large franchise fees.
XII. TELEVISION SET LEASING BY CABLE OPERATORS

Some observers have suggested that cable operators be permitted to lease television sets along with cable service to provide an integrated service package for which the cable operator would be wholly responsible. Such an arrangement prevails in the telephone industry where the company is responsible for service encompassing not only the telephone-line distribution network but also telephone instruments. In contrast, cable operators are often explicitly excluded in the franchise from providing anything more than cable service to the customer's own television set. For example, Section 13 of the Akron franchise states:

The Company agrees to restrict its operation within the City so as not to compete with the television sales, service and repair industry; that is, it shall not offer nor accept employment directly or indirectly in the repair or servicing of a customer's television set or sets other than the technical servicing that may be needed in the cable installation within the home and its connection to the customer's television set. Nor will the Company engage directly or indirectly in the referral of such repair or servicing to any particular repair or service agency.

The reason for such a restrictive clause is clear enough: Local repairmen and retail stores are opposed to the added competition of cable operators. Moreover, some fear that adding the television set to the cable service could create conditions of monopoly, or at least an undue concentration of economic power in the procurement, repair, and servicing of television sets.

The purpose of this discussion is to explore the pros and cons of permitting integrated service as a condition of franchise. Major questions to be addressed are:

- Could the cable operator reduce maintenance costs by being able to offer integrated service?
- Would the cable operator enjoy savings in interest costs and procurement of television sets that could be passed on the customer?
Would the cable operator be able to introduce sets more easily if they were specifically designed for cable?

Would serious problems of monopoly arise?

MAINTENANCE COSTS

In conversations with Rand staff members, some cable operators have complained that their repairmen are called to subscribers' homes only to find that the problem is not located in the cable but in the television set. The subscriber is inconvenienced because he has to look elsewhere for help; the cable operator loses in terms of whatever time has been consumed by the repairman; and sometimes there is a residual of ill-will because of disagreements between the repairman and the subscriber as to where the problem really lies. If the cable operator were responsible for the whole system, as the telephone company is responsible for its system, he would simply make repairs regardless of where the problem is located, replace the set, or do whatever else is required — all for a fixed monthly fee.

The magnitude of this problem appears to be highly variable from one cable system to another. We have talked with cable operators who complain that over one-half of their repair calls (which averages one or two per year per subscriber) stems from problems in the receiver; other operators report that for them it is not a serious problem. We suspect that much has to do with the quality of signals on the cable. If the quality is generally high, requiring little "small knob" set adjustment by the viewer, then most repair calls will relate to sudden problems in the cable (such as cable amplifiers going out of adjustment). However, if quality is low, with some ghosting and poor color quality, set adjustment may be necessary. If the viewer is not skilled in making fine adjustments, he may call the cable repairman who, attaching his own adjusted television set demonstrator to the subscriber's cable, shows that the receiver and not the cable is at fault. (In a sense, both the receiver and the cable service are at fault in this example.) Clearly, this is a case where ill-will can be generated
between the subscriber and the cable company -- a problem that could be mitigated by offering integrated service.

SAVINGS IN PURCHASE PRICE AND IN INTEREST CHARGES

A second question is whether the cable operator may be able to offer the set at a lower price on a lease basis than the subscriber would pay in purchase price and interest. It is commonly observed that low-income groups are at a disadvantage in purchasing a wide range of consumer products. Not having access to credit on favorable terms and frequently buying in small neighborhood stores with high mark-ups, these groups may pay substantially higher prices for consumer products than is true of high-income groups. Could cable operators offer more favorable terms when leasing television sets? To the extent that high interest rates reflect the higher credit risks of lower-income groups, the cable operator faces essentially the same problem as the retailer. Losses on poor credit risks have to be covered one way or another out of revenues. Thus, there is no reason to believe a priori that the cable operator would be able to offer more favorable credit terms.

As far as other costs of retailing are concerned, the cable operator would have some advantage in being able to advertise and jointly promote the use of cable and television receivers so that revenues generated per dollar of advertising by the cable operator would be higher than those of retail stores. The joint promotion of cable and receivers could be especially important in providing television service as an alternative to the small-shop, high mark-up phenomenon that works especially to the disadvantage of low-income, poorly informed groups.

On the other hand, the cable operator would suffer a disadvantage if leased sets were subject to more abuse and carelessness than in the case of sets owned by television viewers. It is here that the analogy between the telephone and the cable industry breaks down. The telephone company has an advantage in offering integrating service because the telephone instrument is quite durable. It is not easily damaged, and the frequency of repair is not greatly affected by the amount of use. Whether a telephone is used for 10 minutes or 3 hours a day makes
little difference with respect to maintenance requirements. (Probably
the greatest danger is that it could be accidentally knocked off the
desk or table, irrespective of the amount of use it receives.) But
television sets, at least as now designed, are much more vulnerable to
abuse and carelessness. Moreover, as far as repairs are concerned it
does make a difference whether a set is used for 10 minutes or 3 hours
per day. If the viewer purchases his own set, he may have more incen-
tive to treat it carefully and to take into account the prospect of re-
pairs than if he were to lease it at a flat monthly rate. In other
words, the rates the cable operator would have to charge to cover total
cost would be higher than the careful viewer would pay in purchasing the
set directly and bearing full responsibility for having it maintained.

INTRODUCTION OF SPECIALLY DESIGNED SETS

A major problem in the expanded use of the cable system is that
the standard television receiver is not optimally designed for cable.
For example, the lead-in wire from the back of the set to the tuner is
susceptible to interference form over-the-air signals. Hence, channels
in the cable operating at the same frequencies as nearby broadcasting
stations are subject to ghosting. For this reason, we have assumed in
our technical studies that cable channels in the Miami Valley region
operating at the same frequencies as the two local VHF stations would
remain unused for television to the home; signals from these VHF
stations would be carried on other clear frequencies on cable.

Another example of the problem is that the only frequencies on
cable that can be picked up by a conventional set are those shown on
its 12-channel VHF tuner. To receive other frequencies in the VHF re-
gion of the radio spectrum, the viewer must have a separate set-top
converter unit that converts each of these frequencies to one already
on his VHF dial. Although these converters are now in production and
are being used in some cable systems (as in New York City), cable
operators frequently complain that converters tend to degrade signal
quality and are subject to high maintenance costs.
If a set were especially designed for cable, it could have a built-in converter, with some overall cost savings, and it could have a fully shielded lead-in wire to prevent all over-the-air interference.* However, the viewer is likely to be reluctant to purchase a set that can be used only on cable for he would no longer have the option of discontinuing cable service and reverting to his rooftop antenna if cable rates go up, if service is poor, or if his preferences change. However, he might be amenable to leasing a set on a month-to-month basis as part of a package deal with cable service. To permit the cable operator to offer the integrated service would facilitate development and use of these sets.

At the same time, there is no reason why retailers could not also lease sets to customers. Whether the cable operator would have an advantage over retailers with respect to set leasing is not clear. On one hand, by serving many subscribers simultaneously, the cable operator may enjoy some economies of scale in set procurement that would be passed on to subscribers. On the other hand, subscribers are accustomed to an extraordinarily wide variety of sets from which to choose (variety in screen size, cabinet size and design, portable versus console, combinations with stereo receivers, etc.) that may reduce the potential economies of scale. Here again, the analogy with the telephone company breaks down. The variety in telephone instruments to which people are accustomed is far less than is true in television.

THE QUESTION OF MONOPOLY

Some observers fear that integrated service would lead to undue concentration of control that would eventually result in higher prices and restriction on consumer choice. This fear arises in part out of the experience in the telephone industry. Only in the last few years, since the Carterfone decision by the FCC in 1968, have customers had wide

* One of these sets, manufactured by Magnavox, was demonstrated at the annual meeting of the National Cable Television Association in Washington in June 1971. It includes 31 VHF channels -- in contrast to the standard 12 -- plus the normal 70-channel UHF tuner for over-the-air broadcast. See Television Digest, August 16, 1971, p. 9.
latitude (subject to certain technical standards) in attaching their own instruments to telephone lines. The decision was reached only after long and bitter controversy. Clearly, in the new industry of cable television one would want to avoid similar problems if the cable operator were to attain a monopoly over both distribution plant and terminal equipment. Fortunately, a solution to this problem seems rather straightforward: The cable system should be designed to be compatible with existing television receivers, and the subscriber should be free to purchase or lease a specially designed set from whichever source he chooses.

In the longer term, with the development of two-way terminals for a host of new services (both television and non-television) that cable might provide, technical standards may have to be established for terminals to prevent interference on cable channels. This is the same problem that today is faced by the telephone industry -- terminal standards have been established to permit a large variety of equipment not owned or designed by the telephone company to be attached to telephone lines.

CONCLUSIONS

Difficulties have arisen in this analysis because there is much that cannot be quantified at this time. We do not know how serious the problem is in regard to low-income groups who are faced with making purchases involving high interest rates and high prices. We do not know enough about the "false" housecall problem or the problem regarding mishandling and abuse of leased sets. Moreover, we do not know the magnitude of the advantages the cable operator would have over retailers and repairmen in the procurement and maintenance of sets.

We do not suggest that Dayton area franchises include the highly restrictive clause of the sort in the Akron franchise; we propose that the cable operators should be given the option of providing integrated service. If the problem of abuse and careless handling of leased sets does become serious, if the cable operator cannot offer better terms than the retailer, or if the operator does not enjoy economies of scale
in set procurement, he would discontinue the integrated service, and local retailers and repairmen would continue to have the entire market as they do today. If, on the other hand, the cable operator does enjoy significant maintenance cost savings in integrated service, if set abuse is not a severe problem, and if savings are incurred on interest rates and set procurement, then the integrated service would redound to the benefit of the consumer. Although retailers and repairmen would be disadvantaged, it would be hard to argue that they should be artificially protected from the pressures of the market.

Thus, we suggest that the franchise be written to permit the cable operator to offer integrated service subject to three major conditions: (1) the cable system be designed to be fully compatible with the existing conventional sets; (2) the subscriber have full freedom to purchase or lease his set from any source and be permitted to have it attached to the cable system at a monthly fee reflecting only use of the cable system; and (3) for the fee the subscriber pays for cable service, he should be permitted to have his set repaired or maintained in any manner he wishes.
Consider the problem faced by a cable operator deciding whether or not it is worthwhile to extend service into a particular new area. If that area is very sparsely settled, it would not be worthwhile; the additional income from the few potential subscribers would not repay the large investment necessary to reach them with cable. Only if the area is sufficiently densely settled will the investment appear attractive. How densely settled does the area have to be? This Addendum presents a simple analysis that yields an approximate answer to that question.

Table 9-3 shows the additional net operating income to be realized from extending service into a new area. Revenues would increase by about $80 per new subscriber per year, though some costs would rise as well. Additional annual operating costs would total approximately $14 per new subscriber and $500 per mile of new trunk and feeder cable. (Other costs would not change. We assume, for example, that costs of local program origination and interconnection would not be affected by wiring the new area.) Net incremental income would thus be approximately $65 per new subscriber less $500 per new mile of cable.

Say there are $n$ dwellings per mile of cable and the fraction $p$ of those will subscribe to cable service. Then we can write net incremental yearly income per new subscriber as

\[
\text{Net income} = 65.38 - 499/(n \times p).
\]  

(1)

Table 9-4 shows the net investment necessary to wire the new area and increase income per subscriber by the amount given by Eq. (1). Net investment would be about $27 per new subscriber plus $8725 per mile of new cable. Writing this on the basis of one subscriber, we have

\[
\text{Net investment} = 27.18 + 8725/(n \times p).
\]  

(2)
Table 9-3

INCREMENTAL RECURRING RECEIPTS AND OUTLAWS

<table>
<thead>
<tr>
<th>Item</th>
<th>Per Subscriber</th>
<th>Per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receipts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First outlet</td>
<td>$72.00</td>
<td>--</td>
</tr>
<tr>
<td>Second outlet</td>
<td>5.40</td>
<td>--</td>
</tr>
<tr>
<td>Other revenue</td>
<td>2.30</td>
<td>--</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>79.70</td>
<td>--</td>
</tr>
<tr>
<td><strong>Outlays</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service technician salary and fringe benefits</td>
<td>2.29</td>
<td>--</td>
</tr>
<tr>
<td>Maintenance technician salary and fringe benefits</td>
<td>--</td>
<td>$ 66</td>
</tr>
<tr>
<td>Bench technician salary and fringe benefits</td>
<td>--</td>
<td>25</td>
</tr>
<tr>
<td>Service dispatcher salary and fringe benefits</td>
<td>0.86</td>
<td>--</td>
</tr>
<tr>
<td>Bookkeeper salary and fringe benefits</td>
<td>2.01</td>
<td>--</td>
</tr>
<tr>
<td>Vehicles for service and maintenance technicians</td>
<td>0.58</td>
<td>17</td>
</tr>
<tr>
<td>Pole rental</td>
<td></td>
<td>171</td>
</tr>
<tr>
<td>Line maintenance material</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Power</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Billing</td>
<td>1.08</td>
<td>--</td>
</tr>
<tr>
<td>Dues, travel, entertainment, professional services</td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td>Property tax on drop and feeder cable</td>
<td>0.35</td>
<td>170</td>
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<tr>
<td>Franchise tax</td>
<td>1.90</td>
<td>--</td>
</tr>
<tr>
<td>Bad debts</td>
<td>1.90</td>
<td>--</td>
</tr>
<tr>
<td>FCC fee</td>
<td>0.30</td>
<td>--</td>
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<tr>
<td>Copyright</td>
<td>2.85</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>14.32</td>
<td>499</td>
</tr>
</tbody>
</table>

**Net Income**

$65.38 $499

SOURCE: Paper Two, Sec. IV, "Notes to Financial Projections."
Table 9-4
INCREMENTAL ONE-TIME RECEIPTS AND OUTLAYS

<table>
<thead>
<tr>
<th>Item</th>
<th>Per Subscriber</th>
<th>Per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Receipts</strong></td>
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<td></td>
</tr>
<tr>
<td>Installation fee</td>
<td>$7.50</td>
<td>--</td>
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<tr>
<td><strong>Outlays</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installer salary and fringe</td>
<td>9.59</td>
<td>--</td>
</tr>
<tr>
<td>benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle for installer</td>
<td>2.60</td>
<td>--</td>
</tr>
<tr>
<td>Selling cost</td>
<td>5.00</td>
<td>--</td>
</tr>
<tr>
<td>Trunk and feeder cable</td>
<td>--</td>
<td>$8500</td>
</tr>
<tr>
<td>Drop material</td>
<td>17.50</td>
<td>--</td>
</tr>
<tr>
<td>Equipment and tool</td>
<td>--</td>
<td>225</td>
</tr>
<tr>
<td>inventory</td>
<td></td>
<td></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>34.68</td>
<td>8725</td>
</tr>
<tr>
<td><strong>Net Investment</strong></td>
<td>$27.18</td>
<td>$8725</td>
</tr>
</tbody>
</table>

SOURCE: Paper Two, Sec. IV, "Notes to Financial Projections."

How much income (from Table 9-3) is necessary to justify the investment (in Table 9-4)? To compare the future income with the present investment outlay, we must discount it to find its present value. We assume that revenues build up over a 3-year period in accordance with the pattern of subscriber buildup assumed in Paper Two. We ignore other changes in income due to subscriber service charge increases, cost inflation, or other reasons. As in Paper Two, we assume that the system is sold after 10 years for 10 times its operating income. Under these conditions, present-value factors for discounting future income are calculated in Table 9-5. The calculations are done for two different discount rates:

- The interest rate on borrowed capital, assumed to be 10 percent. If money can be borrowed to completely finance service to the new area, this may be an appropriate discount rate.
Table 9-5

PRESENT-VALUE FACTORS

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>Fraction of Income Realized</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10-percent Interest</td>
</tr>
<tr>
<td>0.75</td>
<td>0.25</td>
<td>0.23</td>
</tr>
<tr>
<td>1.5</td>
<td>0.65</td>
<td>0.56</td>
</tr>
<tr>
<td>2.5</td>
<td>0.90</td>
<td>0.70</td>
</tr>
<tr>
<td>3.5</td>
<td>1.0</td>
<td>0.71</td>
</tr>
<tr>
<td>4.5</td>
<td>1.0</td>
<td>0.64</td>
</tr>
<tr>
<td>5.5</td>
<td>1.0</td>
<td>0.58</td>
</tr>
<tr>
<td>6.5</td>
<td>1.0</td>
<td>0.53</td>
</tr>
<tr>
<td>7.5</td>
<td>1.0</td>
<td>0.48</td>
</tr>
<tr>
<td>8.5</td>
<td>1.0</td>
<td>0.43</td>
</tr>
<tr>
<td>9.5</td>
<td>1.0</td>
<td>0.39</td>
</tr>
<tr>
<td>10.0</td>
<td>10.0</td>
<td>3.72</td>
</tr>
<tr>
<td>TOTAL.........</td>
<td></td>
<td>8.98</td>
</tr>
</tbody>
</table>

The rate of return to total investment for the system as a whole, calculated to be 14 percent in Paper Two. This rate is appropriate if equity capital must be used along with debt so that the debt-equity ratio is not changed by financing service to the new area. Then investment in the new area must earn a return of at least 14 percent in order not to reduce the return to the system as a whole.

To justify the investment, we must have

Present-value factor $\times$ net income $\geq$ net investment.

It is now a simple matter to solve Eqs. (1), (2), and (3) for the dwelling density $n$ that is necessary to justify wiring the new area. Denoting present-value factor by $f$, we find

$$ n \geq \frac{1}{p} \times \frac{8725 + f \times 499}{f \times 65.38 - 27.18} $$

(4)

Applying Eq. (4) to three levels of cable penetration of particular interest in Dayton, we calculate the figures in Table 9-6:
Table 9-6

BREAKEVEN DWELLING DENSITIES

<table>
<thead>
<tr>
<th>Penetration (percent)</th>
<th>Breakeven Dwelling Density (homes per mile)</th>
<th>10-percent Interest</th>
<th>14-percent Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td>59</td>
<td>72</td>
</tr>
<tr>
<td>37</td>
<td></td>
<td>64</td>
<td>78</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>84</td>
<td>103</td>
</tr>
</tbody>
</table>

Penetration of 40 percent is the expected level for Montgomery County as a whole.* Median household income in the city of Dayton is somewhat lower than for the whole country, so we expect penetration to be lower as well. Recent Rand research ** enables us to calculate the effect of the lower income, yielding an estimate of 37-percent penetration for the city of Dayton. Income of black residents of Dayton is lower yet on average with expected penetration at 28 percent.

The significance of the breakeven dwelling densities in Table 9-6 is discussed in Paper Nine.

---

* See Paper Two, Addendum 2-A.

Addendum 9-B

A NOTE ON TECHNICAL STANDARDS

N. E. Feldman

Technical standards are generally regarded as necessary to protect the subscriber of cable service. However, to deal with every aspect of picture and sound quality would require the definition of up to 30 parameters and their limits, as well as specifications of equipment and techniques for measurement. Not only are the effects of these parameters (separately and in various combinations) poorly understood today for signals distributed over cable systems, but the cost of achieving a given level of performance for each parameter remains in doubt.

Because of the danger of setting detailed standards that turn out to be inappropriate, ineffective, or too costly to achieve, we suggest that it would be preferable to set standards only in terms of subjective viewer response -- that is, a standard in terms of output -- and let the cable operator himself decide how to mix the various elements of the system design to achieve that output.

As an aid in setting standards of output, consider the subjective standards used by the FCC in setting broadcast station contour areas.

1. Grade B Service: The quality of picture is expected to be satisfactory to the median observer at least 90 percent of the time for at least 50 percent of the receiving locations within the contour, in the absence of interfering co-channel and adjacent-channel signals.

2. Grade A Service: Satisfactory service is expected at least 90 percent of the time for at least 70 percent of the receiving locations.

3. Principal City Service: Satisfactory service is expected at least 90 percent of the time for at least 90 percent of the receiving locations.
Thus, Fairborn is at the edge of the grade B contour for WLWC, WBNS-TV, and for WTVN-TV, all Columbus stations; while the entire Dayton urban area is well within the grade A contour for the four Dayton stations, WHIO-TV, WKEF, WLWD, and WKTR-TV. Oakwood is at the edge of the grade A contour for three Cincinnati stations, WCPO-TV, WKRC-kV, and WXIX-TV.

Table 9-7 is drawn from a study* designed to determine a scale of picture quality suitable for the average television viewer. It shows a numbering scheme and classification for six grades of picture quality. These number grade designations were used in conjunction with observations by some 200 test subjects under 63 test conditions for monochrome and color reception. The FCC's "satisfactory" grade is assumed to fall between numbers 2 and 3.

Table 9-7

<table>
<thead>
<tr>
<th>Number</th>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excellent</td>
<td>The picture is as sharp as you could desire.</td>
</tr>
<tr>
<td>2</td>
<td>Fine</td>
<td>The picture is of high quality, providing enjoyable viewing, though interference is perceptible.</td>
</tr>
<tr>
<td>3</td>
<td>Passable</td>
<td>The picture is of acceptable quality. Interference is somewhat objectionable.</td>
</tr>
<tr>
<td>4</td>
<td>Marginal</td>
<td>The picture is poor in quality and you wish you could improve it. Interference is somewhat objectionable.</td>
</tr>
<tr>
<td>5</td>
<td>Inferior</td>
<td>The picture is very poor, but you could watch it. Definitely objectionable interference is present.</td>
</tr>
<tr>
<td>6</td>
<td>Unusable</td>
<td>The picture is so bad that you could not watch it.</td>
</tr>
</tbody>
</table>

Service that is "satisfactory" at least 90 percent of the time at 90 percent of receiving locations as an overall average will exceed this at locations near the headend but will fall short near the ends of the cascades, where service may be "satisfactory" to only 50 to 60 percent of subscribers. Within the range of costs assumed in Paper Two, it is reasonable to expect that a dual cable system provide at the ends of the cascades 20 channels of "fine" quality, without set-top converters for ordinary home use. With a relatively expensive converter for specialized users, the system could reasonably be expected to provide 40 channels of "fine" quality. These are examples of quality standards that should be stipulated in the franchise.*

As a practical matter, the cable operator will have a strong interest in providing good service, at least for entertainment channels, quite apart from the conditions in the franchise. Since average penetration in the Dayton area is expected to be about 40 percent in the near term, the strong competition with over-the-air reception will force the cable operator to provide good service. Only if penetration were to rise to perhaps 70 to 90 percent, so that cable becomes the dominant means of television distribution, would it be necessary to reexamine the question of what additional consumer protection would be warranted. (Fortunately, by that time the Council of Governments would have a much better notion of the technical feasibility and costs of achieving particular levels of service.)

The importance of setting quality standards in the franchise arises largely from the use of cable channels by schools, governments and other users, where no direct competition exists with over-the-air broadcast entertainment. In these cases the cable operator would

*Since co-channel and adjacent-channel interference originating within the cable system are functions of the system design, while for broadcasting they are functions of the vagaries of propagation, the specification of satisfactory service to 90 percent of subscribers at the ends of the cascades should not contain the phrase "in the absence of interfering co-channel and adjacent-channel signals" as does the FCC definition of broadcast station contour areas.
have less incentive to provide good service. Here the conditions of franchise would play an important role.

Finally, it is most important to note that the purpose of quality standards is to ensure adequate service by the cable distribution system, not to control the quality of the program material being distributed. It would be undesirable to restrict the kinds of material carried on cable. For example, if a community group prefers to use 1/2-in. video tape equipment because of its low cost, technical standards relating to the cable system should not be written in a manner to exclude its use. Thus, to evaluate the performance of the cable system, high quality input signals (for example, from a film chain) should be used in testing for compliance with performance standards delineated in the franchise.

This approach does create difficulties of additional viewer complaints about poor reception, with the problem stemming from the poor quality of input signals rather than from the cable system. In recognition of this problem, the franchise should be written to absolve the cable operator from responsibility for the quality of inputs, and to judge his performance only with respect to input signals that are themselves of high quality.
Paper Ten

OWNERSHIP ALTERNATIVES

Walter S. Baer and Donald H. Camph
SUMMARY

This paper explores various ownership alternatives for cable television in the Dayton area. At least five functions are involved in providing current broadband cable service: ownership, operation, control over access and program content, program production, and regulation. Some criteria for evaluating various ownership alternatives are delineated. Ownership and access can be considered separately, and assignment of the "gatekeeping" function should be a conscious decision by the franchising authority, not an automatic corollary to the choice of cable owner.

Advantages and disadvantages of private, governmental, and noncommercial ownership are examined with particular reference to the Dayton case.

We conclude that, although public benefits can be obtained with private ownership through appropriate franchise provisions, the possibility of county ownership of cable facilities outside Dayton with leaseback to a private operator should be explored. Government or noncommercial ownership of a large cable system would be a pioneering effort demanding a very strong commitment from all involved. If successful, however, it would serve as an important yardstick by which to measure the performance of privately owned systems in other areas.
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I. INTRODUCTION

Alternative futures for cable television depend largely on who will own and control cable systems. Up to now, nearly all systems have been owned and operated by private, profit-seeking corporations under local franchises. The private owner has also determined what programming was distributed on his system, subject to Federal Communications Commission rules on signal carriage and the terms of his franchise. The only real division of authority has been between government franchiser and private franchisee.

Today, however, growing public expectations from cable, and the large capital investment necessary to build a cable system in a major market, necessitate a close examination of the alternatives for cable ownership, operation, and control. There are, in fact, at least five functions involved in providing current broadband cable services:

1. Ownership of the cable system.
2. Operation of the system.
3. Control over access and program content.
4. Program production.
5. Regulation of the system.

New services on cable, such as remote shopping or business data transmission, may introduce additional functions.

Our discussion is concerned principally with cable system ownership and operation. Paper Nine discusses local access, control over program content, program production, and regulation. In this paper, we first consider the general public interest criteria on which ownership decisions might be based. We then look at the specific forms of ownership -- private, governmental, or noncommercial -- that seem most feasible in the Dayton metropolitan area. The legal information used here was obtained from informal telephone conversations with knowledgeable individuals in the Dayton area, previous Rand work on cable television, and other published materials. These are referenced in the text where appropriate. Neither author is an attorney, however, and this paper is
not intended to convey any professional legal opinions. Further legal study by the Miami Valley Council of Governments or others is necessary before any decision on ownership can be made.
II. COMPARING OWNERSHIP ALTERNATIVES

PUBLIC INTEREST CRITERIA FOR OWNERSHIP

The concept of "public interest" is open-ended, and any attempt at an exact definition is doomed from the outset to failure. Yet through many past franchising proceedings, many reasons have been advanced as to why one private cable owner will operate more in the public interest than another. Prospective owners usually offer a mix of the following features:

- Lower subscriber rates.
- Higher fees to the city.
- Greater ability to finance and build the system.
- Willingness to operate at a loss for some time.
- Faster system construction.
- More efficient operation.
- "Free" educational or municipal services.
- Service to low-income areas.
- Better local origination facilities and programming.
- More channels.
- Higher-quality service.
- New services.
- Greater responsiveness to the public.
- Faster system updating and improvement.
- Greater innovation.
- Nondiscriminatory use of cable channels.
- More sensitivity to local issues.
- More local hiring or job training.
- More minority group ownership, management, employment, and programming.
- More equitable rate of return for private investors.

Many of these features conflict with one another. In a franchise competition among private companies, therefore, the trade-offs among them must in the end be determined by the value judgments of the decisionmakers.
For example, consider the trade-off between subscriber rates and operating income from the system. Perhaps the rate to subscribers should be low enough so that nearly everyone can afford it. On the other hand, some may regard cable television as a luxury, not an essential component of modern American living, so that increased revenues realized from higher subscription rates could be more beneficially used for other purposes, such as job training for the unskilled. These revenues could be reinvested in the cable system itself, enabling a higher quality of service and a faster rate of innovation in both operation and programming. Moreover, a private profit-seeking owner would want a reasonable return on his investment. These countervailing ideas, such as low subscriber rates, alternative uses of revenues, and adequate return on investment, obviously cannot all be optimized simultaneously.

The same considerations apply in choosing among forms of ownership -- private, governmental, or noncommercial. Some may argue, for example, that a municipally owned cable system will provide more free services to the police, the fire department, and the public school system than a commercially owned system. The cost of providing a "free" service, however, will appear as an increased subscriber rate, perhaps pricing cable service higher than some low-income residents can pay. As economists are fond of saying, there is no such thing as a "free" lunch.

A more important point is that most of these value choices are independent of the form of ownership. The trade-off between lower subscriber fees and more expensive local origination facilities must be made whether the cable system is owned by a large corporation, a non-profit group, or the city itself. The public benefits from cable will be determined as much by the terms of the local franchise -- which must deal explicitly with trade-offs among the criteria listed above -- as by the form of system ownership.

SEPARATING OWNERSHIP AND ACCESS

The question of who controls access to cable television channels is, we believe, separable from the question of who owns the cable.
system. Access involves both the availability of cable channels for local program origination and control over program content. As Leland Johnson points out in the preceding paper, the cable franchise should itself contain provisions for determining how to allocate time to local groups for program origination and what limitations, if any, to place on the material presented. Insofar as possible, these decisions should be made on the basis of rules set in advance rather than by ad hoc individual or group judgment.

Someone, of course, must interpret the rules. As with ownership, this "gatekeeper" could be a private corporation, a governmental body, or a noncommercial group. The cable system owner could also serve as gatekeeper, but there are no compelling reasons why this must be the case. In fact, to eliminate any possibility of governmental censorship or other violations of the First Amendment, it would seem best not to have a government gatekeeper. A nonprofit group representative of all elements in the community might instead be chartered to perform the gatekeeping function for a privately owned or government owned system. A private cable owner might even prefer this alternative, since it would remove a time-consuming and nonremunerative burden from his shoulders.

Establishing a broadly representative noncommercial group to control cable access would not be easy (as we discuss in detail below when considering noncommercial ownership), but we think it is an alternative well worth considering. Successful operation of such a group in Dayton would certainly provide an important example for other cities. But in any event, assigning the "gatekeeping" function should be a conscious decision, not an automatic corollary to the choice of cable owner.

COMPARING ALTERNATIVES

Many of the past arguments for governmental or noncommercial ownership have really been arguments against private control of cable channels. There is much to be said in favor of this view that program control should not be left to the particular private individuals or
corporations who own cable systems. Yet if the issue of cable access can be resolved largely in the franchise provisions, and if the role of gatekeeper can be assigned separately, the case against private ownership is much less strong.

The three best arguments remaining for governmental or noncommercial rather than private ownership are (a) more direct responsiveness of the system to public policy considerations, (b) direct application of system profits to public uses, and (c) use of such systems as yardsticks for comparison with private operations. A governmental or noncommercial system might be more likely to hire and train unemployed workers than a private system, for example, or it might extend service to low-income areas more readily. But, as stated above, each of these public benefits can be achieved only at the expense of others. Moreover, benefits that are explicitly recognized as important -- minority hiring, for example -- could be required in a franchise with a private owner.

A governmental or noncommercial system would not have to return profits to shareholders, of course, so that the argument for direct application of excess revenues to public purposes is valid. However, cable systems with high capital costs in major markets may not be profitable for many years; in fact, these systems will almost certainly return large operating losses at first. By owning the system itself, a city would be sacrificing franchise fees and other tax revenues in the early years in hope of receiving higher net revenue in later years. Such a calculation of future benefits is highly sensitive to small changes in assumptions of penetration level, subscriber rates, and operating costs. One can only state that any expected financial gain for the city from government ownership would be clouded by far more uncertainty. This argument would apply even more strongly to a noncommercial system, since its net operating income would be further reduced by franchise fees or other direct payments to the community.

The "yardstick" argument is probably the most important from a national viewpoint. As broadband cable systems are constructed in the
large cities, it would be useful to have some models of major government or noncommercial cable systems for comparison with private ownership. A few such examples would not lead to a rush toward public ownership, as many in the cable industry profess to fear. But they would allow direct comparison in operating systems of the advantages and disadvantages of each form of ownership.
III. PRIVATE OWNERSHIP

The most likely forms of ownership for cable systems in the Dayton metropolitan area are shown in Table 10-1. No single franchising authority now exists in the Miami Valley area that could franchise a regional cable television system. Incorporated municipalities can franchise within their own boundaries, but neither Montgomery County nor townships within the county appear to have authority to franchise in unincorporated areas. An alternative form of government for Montgomery County would have authority to issue franchises in unincorporated areas, but this alternative form was rejected by the voters on November 2, 1971. On the other hand, a private cable operator might be able to build in unincorporated areas without a franchise. This possibility needs to be explored further.

The most straightforward and least controversial approach to cable ownership, then, would be for each community to award a franchise to a private, profit-seeking corporation. The corporation would finance, build, and operate its cable system to serve the community residents. The city of Dayton itself clearly represents a prize plum for a commercial cable operator, and other cities such as Kettering and Fairborn have already encountered considerable interest in franchising. But commercial cable companies would find it less attractive to build advanced cable systems in the smaller communities surrounding Dayton or in the unincorporated areas of Montgomery and Greene Counties. Smaller municipalities could, however, work together to issue a joint franchise to a private operator.

However many franchises are written, close coordination among them will be essential if an interconnected, truly metropolitan cable system is to be the end result. The substantive issues involved in cable franchising have been discussed in Paper Nine; the concern here is who would be responsible for ensuring adequate area coverage and compatibility among systems in different communities. At the present

Table 10-1

OWNERSHIP ALTERNATIVES FOR CABLE TELEVISION IN THE DAYTON METROPOLITAN AREA

<table>
<thead>
<tr>
<th>Form of Ownership</th>
<th>Basic Financing</th>
<th>System Operator</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private Corporation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single corporate owner</td>
<td>Private debt and equity financing</td>
<td>Single operator</td>
<td>Regional interconnection would require extensive coordination among separate franchises</td>
</tr>
<tr>
<td>Multiple corporate owners</td>
<td>Same as above</td>
<td>Multiple operators</td>
<td>Same as above</td>
</tr>
<tr>
<td><strong>Government</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal department (e.g., Dayton water or airport departments)</td>
<td>General municipal obligations, earned surplus, or revenue bonds</td>
<td>Municipal department, or private corporation under management contract from municipality</td>
<td>Regional coordination needed to tie together individual municipal systems; unincorporated areas not covered</td>
</tr>
<tr>
<td>Special regional authority</td>
<td>Authority’s general obligations or revenue bonds</td>
<td>Regional authority</td>
<td>Requires new enabling legislation from State of Ohio</td>
</tr>
<tr>
<td>County, with approval from Community Improvement Corporation</td>
<td>Industrial development revenue bonds</td>
<td>Private corporation under lease from county</td>
<td>Total project limited to $5 million for each municipality or unincorporated area; special IRS rule probably needed</td>
</tr>
<tr>
<td><strong>Nonprofit Corporation or Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonprofit institution (e.g., private university, foundation, public television station)</td>
<td>Endowment funds, foundation grants, or governmental support needed for basic (equity) capital; private financing for debt</td>
<td>Noncommercial group, or private corporation under management contract</td>
<td>Foundation or government loan guarantees might be available under some circumstances</td>
</tr>
<tr>
<td>Local community group</td>
<td>Same as above</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>Subscribers' cooperative</td>
<td>Same as above</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
</tbody>
</table>
time, the Miami Valley Council of Governments seems the obvious choice, both because of its interest in cable and because no other appropriate regional body exists. The Council of Governments has authority at present to coordinate cable franchises and may, in fact, be able to draft a common franchise that can be adopted by its member municipalities.

Writing compatible cable franchises would be the first and perhaps the most difficult problem faced by the Council of Governments in planning for a privately owned cable network serving the Miami Valley. However, the question of single or multiple ownership must also be resolved. Assuming compatible franchises were written that required system interconnection, one alternative is to franchise separate companies -- one for each community. Dayton might itself be divided into several cable franchises, as other large cities such as Philadelphia and Seattle have been; or a single company could be selected to own and operate systems throughout the metropolitan area. The cable system in the Vancouver, British Columbia, area today serves more than 100,000 subscribers.

There are arguments on both sides of this question. Multiple corporate ownership would have the following advantages:

1. Smaller companies serving single communities or distinct areas would be more responsive to local community interests than would a single company serving the entire region.

2. Minority groups and other local residents could obtain more significant ownership and control positions in a smaller system.

3. Raising capital in smaller pieces by several corporate owners may be easier than raising one large sum for a single system.

4. Construction may proceed faster if several owners build in parallel.

5. Competition among owners may lead to better service and a greater rate of innovation.
On the other hand, granting franchises to a single private owner would have different advantages:

1. It would be reasonable to ask a single cable owner to serve low-density or low-income areas, since he could balance them with other, more profitable sectors. Dividing low-profit areas among several owners might prove more difficult and result in some areas remaining unserved.

2. Economies of scale realized by a single owner could lead to better service or lower cost for all subscribers.

3. Innovation may be increased by single ownership, since the cost of developing new programming and services would be spread over more subscribers.

4. Although the franchises may specify system interconnection and compatibility, separate cable owners would have little economic incentive to assign high priority to this. Thus, in the absence of strong regulation, separately owned systems may be compatible in theory, but not in fact.

The choice between single and multiple private ownership would involve weighing the advantages of more local control with those of more likely metropolitan integration. Whichever choice was made, however, local residents would undoubtedly participate in the ownership and management of private cable systems. Cable "multisystem operators" make strenuous efforts to include the names of community leaders as stockholders in their franchise applications, and they usually offer equity ownership to individuals and groups -- including minority groups -- who may be helpful to their cause. Beyond this local participation in ownership, which is in the private operator's self-interest, franchises might stipulate that a certain ownership fraction be reserved for local residents or some other group. This has recently been proposed to the City Council of Madison, Wisconsin, but the legal enforceability of such a requirement is in doubt.

Profit-seeking cable systems are financed through the owner's ability to raise private debt and equity capital. Cable operators
now must borrow money at comparatively high rates, since the industry is still considered speculative by most banks and institutional lenders. Long-term lenders to the industry typically require equity participation as well as interest payments, so that the true cost of money to the private cable owner is 10-15 percent annually. The operator obviously must keep this cost in mind in deciding where to build his system, or whether he can afford to serve marginally profitable areas. His calculations would certainly favor additional plant construction if his cost of money were reduced. One possible way to provide lower-cost capital for privately operated cable system construction would be through issuing tax-exempt, industrial development revenue bonds. This possibility is discussed in the following section on governmental ownership.
IV. GOVERNMENTAL OWNERSHIP

A few communities have experimented with public ownership of cable systems. Frankfort, Kentucky, and San Bruno, California, are the best-known examples, but there are other, smaller municipal cable systems in rural areas. The city of Palo Alto, California, is considering building and operating its own system, using as many as three parallel cables. No regional government-owned cable systems now exist.

MUNICIPAL OWNERSHIP

Political jurisdictions with authority to issue cable television franchises usually also have the legal authority to own and operate such systems themselves. Yet municipal ownership of cable systems is rare, and most previous examples have been extensions of municipally owned water and electric utility systems. If the city already delivers these utility services to business and residential customers, it is argued, why not provide cable communications as well? The city will already have employees with many of the construction skills needed for installing cable, and the administrative machinery for large-scale residential servicing will have been developed. Existing bookkeeping and billing procedures can be adapted to cable. Most important, cities that own and operate their own electric and water utilities may have built up cash surpluses from them that can be used to finance cable system construction. And having seen monetary surpluses generated from providing these residential services, city officials can argue -- rightly or wrongly -- that a similar surplus will come from municipal ownership of cable.

Cities could also finance a municipally owned cable system through tax assessments, general obligation bonds, or revenue bonds. With most cities sorely pressed for funds, however, it is hard to argue that local tax dollars should be diverted from other needs to cable television.*

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*The municipally owned cable system in San Bruno has been questioned on the grounds that a "general law" city in California may not have the power to own a cable system. Presumably a "charter law" city, such as Dayton, has this authority under Ohio state law.
construction -- particularly if private industry stands ready to use investment capital for this purpose. The same argument would apply to general municipal obligations that are backed by the city's taxing authority. Revenue bonds, under which the bondholder can look only to the project's earned revenue for interest and principal repayment, seem more appropriate debt instruments for municipally owned cable systems. A higher interest rate is attached to revenue bonds than to general obligation bonds, of course, with the actual rate determined by the relative risk involved. The city of Dayton has previously issued revenue bonds to finance municipal airport construction.

A municipally owned cable system could be operated as a city department or agency, as the municipal airport and water departments are run in Dayton. Alternatively, the system could be operated by a private company under a management contract from the city. The rationale for this approach would be that cable television, unlike water and power, is not a household necessity -- especially in cities where over-the-air television reception is adequate. Subscriber penetration will depend on aggressive salesmanship as well as on service quality and price.* The financial success of a municipal cable system could thus depend largely on the marketing skills and efficiency of the operator. One might expect a commercial cable company with a good track record in running its own systems to operate a municipal cable system more successfully than could the city itself.

REGIONAL OWNERSHIP -- A SPECIAL CABLE AUTHORITY

Municipal ownership would not itself aid in creating an interconnected metropolitan cable network; it might, in fact, make the problem worse. Not only would the difficulties of coordinating separate community systems remain, but small municipalities might find it harder to join together to build a common system. And without new county authorities, such as the alternative form of government that was recently

defeated by the voters of Montgomery County, unincorporated areas could not be served.

One way of creating a regional, publicly owned cable system would be to establish a special authority similar to those now authorized for regional transit or airport facilities. Special regional authorities usually have their own taxing powers and the ability to raise capital by issuing general authority obligations or revenue bonds. One of the largest regional authorities, the Bay Area Rapid Transit District (BARTD) that covers three counties in Northern California, is described in the Addendum.

A special cable authority for the Miami Valley would be the most effective way to build a government-owned, regional cable system. It could build a single interconnected cable system unconstrained by existing municipal boundaries. It could serve unincorporated areas. In general, it would have the power and the fund-raising ability to do the job. On the other hand, special authorities are sometimes alleged to be unresponsive to the needs and desires of their constituents — and responsiveness would be, after all, a principal argument for a government-owned cable system in the first place. Moreover, creation of such an authority would require new enabling legislation from the Ohio State Legislature. Existing regional authorities could not be used, since constructing a broadband cable system is not now recognized as a valid public purpose for a special district. Such legislation would set a new precedent, and it might well be opposed vigorously by the cable industry and by those who would see it as a diversion from more important government tasks. One expects that a strong and concerted effort by the Miami Valley Council of Governments would be necessary to pass enabling legislation for a regional cable authority. Were such a district created, however, it could serve as an important national yardstick to measure the performance of large, private cable systems, much as the Tennessee Valley Authority served in the electric power field.
COUNTY OWNERSHIP -- THE COMMUNITY IMPROVEMENT CORPORATION

Another alternative for government ownership would use the resources of the Montgomery County Community Improvement Corporation (C.I.C.). Under Ohio statutes, C.I.C.'s are nonprofit corporations formed "for the purpose of advancing, encouraging, and promoting the industrial, economic, commercial, and civic development of a community or area."* Commercial facilities approved by the C.I.C. can be financed through the sale of industrial development revenue bonds (federally tax-exempt) by the Montgomery County Board of Commissioners. The facilities are owned by the county and generally leased to a commercial corporation for its business use. Bond interest and principal repayment come solely from revenues derived by the county from these facilities; the county's tax power and credit do not stand behind them. Industrial development revenue bonds have appreciably lower interest rates than general corporate bonds, however, because of their tax-exempt status.

According to its brochure, the Montgomery County C.I.C. has the following criteria for approval of projects:

1. Will the proposed expansion or new facility be located in Montgomery County?
2. Will it increase jobs and payrolls in Montgomery County?
3. Will it increase the tax base in Montgomery County?
4. If the proposed expansion or new facility is not approved, would there be a danger of losing activity through a move to another location outside the county?
5. Would the proposed project be in direct competition with an existing operation, and if so, would its approval be detrimental to an existing operation within the county?

Most projects previously financed by industrial revenue bonds are structures such as factories, convention halls, and sports arenas. A cable

*Montgomery County Community Improvement Corporation brochure, prepared by the Community Development Department, Dayton Area Chamber of Commerce.
television system would appear to satisfy the above criteria, however, with the possible exception of the "move" criterion in (4). Moreover, in a preliminary, informal telephone conversation, one municipal bond counsel saw no fundamental legal obstacles to C.I.C. approval of a cable television system that would be owned by the county and leased to a commercial cable operator.

The tax exemption for industrial development revenue bonds applies only for projects whose total capital is $5 million or less in any single municipality or unincorporated county area.* This limit applies to the total capital investment, not just the part financed by tax-exempt bonds, and extends three years beyond the date of bond issuance. Thus industrial revenue bonds could not be used to finance a cable television system in the city of Dayton, since the total investment in a cable plant would exceed $5 million. A system in Dayton itself would have to be built with private capital. But industrial revenue bonds could be used for a cable system or systems in the surrounding municipalities and in the unincorporated areas of Montgomery County. Low-interest financing might specifically encourage a private cable operator to extend his system beyond Dayton into the lower-density suburban areas where per-household capital costs will be higher.

As with a special cable authority, industrial revenue bond financing for a broadband cable system would be precedent-setting. It would require approval by the Montgomery County C.I.C. as important to the industrial development of the area. The project would have to be coordinated with municipalities, such as Kettering, that have their own C.I.C.s (Dayton has no C.I.C. at present), and with communities outside of Montgomery County such as Fairborn. The legal issues involved might be complex, and a special Internal Revenue Service ruling would probably be needed in order to sell the bonds. This approach, however, would provide incentives to a private cable operator to build a metropolitan cable system rather than one confined to the city of Dayton alone. It appears worthy of further examination.

V. NONCOMMERCIAL OWNERSHIP

The third general alternative for cable system ownership is a nonprofit corporation or other noncommercial group. Few noncommercial cable systems currently exist -- the best example is the university-run system in Vincennes, Illinois. But increasing interest in noncommercial ownership has been shown in the past year by foundations, producers of noncommercial television programming, minority groups, and some individuals in the federal government.

NONPROFIT INSTITUTION

The simplest path toward noncommercial ownership would be to have an existing, financially strong, nonprofit institution obtain a cable television franchise -- for example, a local university, especially one already involved in instructional television programming, or a nonprofit foundation. These institutions would have the resources to plan and provide seed capital for a multimillion-dollar effort. They also would have some experience in administering large projects. On the other hand, an established institution may not represent all elements in the community, particularly minority groups and the poor. These groups may not consider their interests well served simply by inclusion within an existing institutional framework.

LOCAL COMMUNITY CONSORTIUM

Establishing a new noncommercial corporation expressly to own a cable system seems the best way to ensure full community representation. The new corporation could be a consortium of other nonprofit groups, as recommended by The Ford Foundation in its 1970 FCC filing: "Obvious candidates for participation in such a consortium, in addition to public television stations, include universities, libraries, service organizations, community action agencies, neighborhood associations, PTAs,

*A brief description of the Vincennes system is contained in the Ford Foundation filing to the FCC, December 1970.
school systems, chambers of commerce, professional associations, non-profit organizations primarily interested in television (such as Children's Television Workshop) and foundations." One example of this kind of consortium is the Community TV Trust of Monroe County, New York, which was organized around the public television station in Rochester. The Trust conducted an initial feasibility study of an interconnected, county-wide cable system, but it does not now hold a franchise to own and operate such a system.

The principal difficulties with the community group or consortium approach are (1) determining who is eligible to participate in it and how decisions are to be made; (2) fixing ongoing responsibility for building and operating the system; and (3) financing the system. The first is a particularly knotty problem. One can anticipate long and arduous sessions in working out leadership roles, divisions of authority, and decision-making procedures for a noncommercial cable consortium. The process may be eminently healthy for the community, and highly appropriate for resolving policy issues such as access to cable channels, but it may not lead to effective management of a large cable system.

Existing community consortia such as United Funds and Model Cities agencies usually do not manage large projects themselves.

A noncommercial community group might then contract the operation of the cable system to a private, profit-seeking corporation, retaining the ownership and policymaking functions. Or it might negotiate with a private operator to share ownership of the system -- providing such an arrangement was accepted in advance by the franchising authority. Although we are not aware of any example of this approach in other cities, it might well be worth considering in Dayton as a kind of public-private partnership.

Raising capital to build the system also would be more difficult for a community group than for an established institution, public or private. Some basic-risk capital -- probably at least 25 percent of the total capital investment, or at least $5 million -- would be needed before additional debt money could be obtained. The risk capital could
be sought from foundations, participating nonprofit organizations, local businesses, or even government agencies, but it would not be easy to acquire. Moreover, institutional lenders such as banks and insurance companies probably would be reluctant to finance a cable system owned by an inexperienced, noncommercial group. A foundation or other well-endowed agency * might be willing to guarantee some loans, which would make them much easier to obtain, but the difficulty of financing a noncommercial system owned by a community group should not be underestimated. Here again, noncommercial ownership by local community groups in the Dayton area would represent a pioneering effort.

**SUBSCRIBERS' COOPERATIVE**

One final form of noncommercial ownership would be a system owned by the subscribers themselves. Some of the earliest cable operations in the 1950s were organized by individuals in remote areas who pooled their capital in order to build a community antenna television -- CATV -- system. The same approach could, in principle, be used to own and finance a modern broadband cable system. An investment of perhaps $50-$75 per subscriber would be needed (the rest could be debt-financed), and a commercial company could be called in to operate the system under a management contract. The advantage of direct ownership of the system by those who use it is obvious; but so, too, are the disadvantages of discriminating against the poor and creating a cumbersome apparatus that, like mutual insurance companies and savings banks, may not be truly responsive to its shareholders. Although the idea of a cable cooperative or condominium ** is intriguing, its problems would seem to outweigh its advantages for a large-scale system.

* Loan guarantees and direct subsidy of noncommercial cable ownership by federal agencies such as OEO, HEW, or HUD have both been discussed, but are not likely in the near future. However, loans for cable systems in New Towns can be guaranteed by HUD under the New Communities Act of 1970.

** At least one large corporation is considering forming an industrial condominium that would own and operate a nationwide broadband (principally microwave) network for business communications.
VI. CONCLUSIONS

Private ownership is an attractive alternative for cable systems in the Dayton metropolitan area if strong, compatible franchises can be written and enforced. Public benefits from cable, including local access to cable channels and funds for programming and other public purposes, can be obtained with private ownership through appropriate franchise provisions. However, the possibility of county ownership of cable facilities outside the city of Dayton, financed by industrial development revenue bonds and leased to a private operator, should be explored. Such low-interest financing would encourage a private operator to serve low-density areas with high capital costs per subscriber.

Creation of a special cable authority would provide the strongest regional management for a cable system. It would require special enabling legislation from the State of Ohio. On the other hand, a municipality or noncommercial group that owned a system might have difficulty attracting capable management or otherwise operating it successfully. We would recommend that system operation by a private company under a management contract be considered in these cases. In general, governmental or noncommercial ownership of a large cable system would be a pioneering effort and would demand a very strong commitment for success from the communities, organizations, and individuals involved. If successful, however, such a system would serve as an important yardstick to measure the performance of privately owned systems in other areas.
Addendum

THE BAY AREA RAPID TRANSIT DISTRICT (BARTD) AS AN EXAMPLE OF A SPECIAL REGIONAL AUTHORITY

In 1951, the California State Legislature authorized a study of the transportation needs of the San Francisco Bay Area. At that time, the city of San Francisco was well along in the now familiar process of decay common to most American cities. Modern freeways were precipitating the spread of low-density suburbs, retail businesses and industries were moving out of the city, and both the job market and the city tax base were declining. Six years later, the legislature created the Bay Area Rapid Transit District (BARTD)* to deal with the problem of moving people and materials on a regional basis. Three prime motives were behind this action. The first and most salient at the time was the revival and rejuvenation of San Francisco. The second was the desire to anticipate and meet the demands of the Bay Area for future transportation capabilities. The third, and perhaps the most significant in the long run, was the creation of a means for influencing industrial, commercial, and residential growth patterns.

Noting the city-shaping consequences of existing transportation systems, [the planners] argued that a transit system could be used to shape development patterns in the suburbs and inject new financial and cultural vitality into downtown San Francisco. To this end, the commission [the one created in 1951] and its successor, the Bay Area Rapid Transit District, recommended that the region invest in a high-speed, rapid rail transit system.**

BARTD originally consisted of five counties in the Bay Area: San Francisco, Contra Costa, Alameda, Marin, and San Mateo. Marin and San Mateo subsequently withdrew from the District for reasons

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*The District was created in 1957 by Chapter 1056 of the Statutes of 1957 of the State of California, constituting Sections 28,500 to 29,757, inclusive, of the Public Utilities Code.

that are discussed below. Representation in the District is described in this paragraph from a BARTD Bond Series statement:

The government of the District is vested in a Board of Directors (the "Board") composed of eleven members representing the various counties within the District, of whom four represent Alameda County, three represent Contra Costa County and four represent the City and County of San Francisco. The Directors are appointed by both the County Supervisors serving the three county area now comprising the District and by "city selection committees" which consist of the Mayors of the incorporated communities in the District. Each of the Directors serves a term of four years. *

There is apparently no provision for representation of unincorporated areas.

The legislative act permits counties to withdraw from the district, but also declares that withdrawal does not invalidate financial obligations incurred by the withdrawing county prior to withdrawal. San Mateo County withdrew primarily because local developers prevailed on the Board of Supervisors to do so, arguing that the county was paying too much for too little. They were disturbed by potential competition from San Francisco developers and feared that the system might assume a configuration not in accordance with their wishes. The removal of the San Mateo tax base from the District, combined with the finding that BARTD cars could not safely be suspended from the Golden Gate Bridge, precipitated the withdrawal of the more sparsely populated Marin County to the north. The act permits inclusion of other counties in the future (or the re-inclusion of the two withdrawn counties), but how these counties would share the tax burden is not clear.

The District has the authority to issue general obligation bonds that must be approved by at least 60 percent of those voting in a special bond election. In 1962, the three remaining counties approved

$792,000,000 in general obligation bonds with 61.2 percent of the vote. The requirement is that the bond be approved by 60 percent of the votes for the entire District; this figure does not have to be reached in each county. Thus, in 1962, at least one of the three counties voted less than 60 percent in favor of the bond issue. The District may also raise money from the issue of revenue bonds, equipment trust certificates (for purchases of equipment such as trolley cars and buses), and special assessment bonds. In addition, a tax not in excess of five cents per $100 of assessed property value may be levied for purposes other than debt service on general obligation bonds. Taxes for maintenance and operation must be supplemental to the revenues of the system and are limited to actual requirements. The District also has the right of eminent domain in acquiring private property for public use.

The single most expensive part ($132 million) of the system is the Trans-Bay Tube connecting San Francisco with Oakland. The tube was financed under the California Toll Bridge Authority, with part of the funding from the auto toll revenues from the Bay bridges. Thus revenues from one mode of transportation were used to support another deemed to be in the public interest.

In 1962, four Contra Costa taxpayers brought suit against BARTD charging "(1) that the legislative act creating BARTD was unconstitutional, (2) that agents of BARTD illegally used public funds to advocate voter approval of the bond issue, and (3) that BARTD, in unilaterally awarding the design and construction supervision contract, failed to seek competitive bids, all in violation of state law." The suit was thrown out of court on all points.

The BARTD experience may be significant to regional planning of cable television systems on several counts. It represents a cooperative effort among three counties and sixteen cities that would probably not have been possible without the creation of the "special district" as a framework within which to work. It shows how revenues from one public authority can be earmarked for another. And under the original BARTD plan, one initially unprofitable area (Marin) would have in effect
been subsidized by the counties in the District that had larger tax bases. In general, BARTD represents a working model of a regional approach to a complex problem.
Appendix A

REPORT OF THE ELEMENTARY AND SECONDARY EDUCATION COMMITTEE
OF THE STUDY OF DAYTON-AREA CABLE T.V.

The Elementary and Secondary Education Committee attempted to consider all facets of the cable T.V. system and their relationship to the education of elementary and secondary students. The discussion and study of the committee have resulted in three broad general categories of recommendations. In an effort to provide sound educational practices and technically feasible functions of a cable T.V. system, we make the following recommendations:

Technical capability

1. Utilizing the available films within the systems establishes a library with two functions:
   a. Retention of the present system to some degree to accommodate those educators who would make effective utilization of a film in the "traditional" way
   b. Development of a system to show films via cable and/or microwave T.V. Location of all films at one central hub with all other hubs having the capability to request any film at the central hub to be channeled (via dedicated cable) to any outlying hub. Any school located within a hub would book and receive films through the hub servicing that school

2. The plan would incorporate the following:
   a. Dial access system for booking films
   b. A computerized system for the automatic retrieval of a cassette/cartridge type of film

3. The dedicated cable system would encompass the following characteristics:
   a. Sound volume -- presently exists
   b. Freeze frame
   c. Reverse
   d. Stop-start
4. A library retrieval system incorporating the Dayton-Montgomery County Public Library and Wright State Library would be incorporated into the dedicated cable system. This would give access to all university libraries in Ohio since Wright State University is connected to all university libraries in the state -- Ohio College Library Association.

5. The dedicated cable should have the capability to bring to schools the activities of Museum of Natural History, Art Institute, City Government Activities, Court Activities, etc.

6. Integrate into the system a two-way capability which would give students of the home bound program an immediate communication (voice only) with the teacher.

Utilization

7. Development of a system which should have more than twenty (20) channels assigned to a dedicated cable system. A minimum of forty (40) channels should be considered. Twenty (20) could be utilized at the initial stage with adequate channels available for expansion of the dedicated channel system.

a. Dedicated cable and/or microwave should be set with the following plan:

   (1) 75% of the channels going from the hub to schools

   (2) 25% of the channels going from school to the hub

The percentages are basic guidelines; therefore, we recommend flexibility for communication to travel either direction, based upon programming needs and demands.

b. The dedicated cable and/or microwave should have two-way communication from school to school through the hub

8. The universities within the geographical boundaries of the dedicated cable system should be connected to the central hub. This would make the university production facilities available for staff in-service training, student teacher training, and observation.

9. Twenty-five per cent (25%) of the public cable system (not including the dedicated cable) should be devoted free of charge to educational purposes.

   (1) 25% of the channels reserved for educational purposes if one public cable is installed

   (2) 50% of the channels reserved for educational purposes if two public cables are utilized
10. The Cable T.V. System should be compatible with and make use of the existing MDECA Computer System (Metropolitan Dayton Education Cooperative Association), where computer systems would be involved.

11. The system should have the capability of local programming which would serve to supplement the educational programs being broadcast from channels 14 and 16, the two public broadcast channels in this area.

Finance and Control

12. A governing board to control the dedicated cable, and the educational operational phase of the basic cable system should be organized prior to the beginning of the operation of the system. This governing board should consist of educators being served by the cable T.V., and/or microwave system, as well as representatives of the cable T.V. franchise. The governing body would replace the existing Elementary and Secondary Education Committee. One or more members of this governing board should also serve on the Board of Directors for S.O.I.T.A. (Southwestern Ohio Instructional Television Association).

13. Develop a set of specifications for all equipment involved in the system to guarantee that any using school system will be compatible with the total system.

14. A plan of leasing equipment and maintenance of equipment should be built into the system to protect school systems against obsolescence. The use of this plan would be an option to each participating school system.

15. Equipment for handling educational programming should have the capability to either microwave or record programs for use in surrounding outlying districts.

16. Education should have equal opportunity to use hub equipment and studios. Technicians and directors at each hub should be available to education for assistance in production and for in-service to educators.

17. Public, not-for-profit corporation ownership further recommends enabling legislation where conflicts exist with local charters.

18. Fixed rates and maintenance fees should be built into the franchise to protect users against rising costs in both maintenance and rates.

19. Franchise should be subject to an efficiency review at the end of a ten (10) year period.

20. A percentage of the gross revenue would be committed to the educational component for capitalization on the educational potential of cable.

21. Control and responsibility of local educational production rests with the originator of the programs.
This committee concerned itself with two areas relating to the "religious" dimension: (1) programing in the religious area, (2) ethical issues.

The committee determined to use the word "religious" in its broadest possible sense, going beyond the parochial confines of traditional concepts. We assumed that any issue which touches the human condition and the complete fulfillment of persons in society is inherently religious and therefore of concern to the religious community. This means that our interests will necessarily intersect the interests of some of the other committees. It was our decision, nevertheless, that this wider view must prevail if we are to represent the religious community accurately.

I. ETHICAL ISSUES

The Committee makes the following recommendations—

A. We consider CATV to be a public communications network. As such, the public should have continuing opportunity to determine the use of this network. This could be done either by creating a public board made up of representative community persons who would determine policy, use, and guidelines for programing, or by making the system a public utility as a common carrier, under the control of the public utilities commission. After much discussion the Committee decided to recommend the latter alternative endorsing the ACLU document written by Jerrold Oppenheim, Cable Television—Broadband Communications June, 1971. This document strongly commends the public utility approach.

B. We endorse the notion that every citizen has the right to the full use of the CATV system. The freedom of speech implications regarding both the sending and receiving of information must be guaranteed to every citizen. Such free access is, furthermore, in the public interest of the entire community. We therefore recommend that some means be devised whereby this system is made operational in every home regardless of the ability to pay, and that program time be available to every citizen on a first come, first served basis.

C. We recognize and support the value of localized programing within the CATV subsystems, but some provision must also be made to insure common community-wide exposure to a variety of issues, ideas, and cultures to prevent radical fragmentation and parochialism. We especially oppose the potential of beaming sponsored programs to high potential consumer areas and denying that programing to perhaps less-affluent areas.

D. We wish to call special attention to the RAND preliminary report entitled Cable TV Systems and the Social Geography of Dayton, Ohio, August, 1971 by Robert K. Yin (No. WN-7553-KF/FF), and recommend that the issues raised in this important document be considered thoroughly in every phase of the development of the Dayton CATV system.

E. We recommend that a citizen review board be created to review regularly the uses of the CATV system. This board would have specific responsibility for stimulating the best possible uses of the system and for creating the means whereby the system will be as fully responsive to community needs as possible. Such a review board working in cooperation with the public utilities commission (on the common carrier model?)

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*Incorporated in this report as Paper Four.
II PROGRAMMING SUGGESTIONS

A. Formal Instruction
   1. Adult Education, e.g. formal courses in areas of moral and public concern, value
      clarification, etc.; perhaps viewer participation in such issues through the use of
      simulation games via CATV, etc.
   2. Religious Education for Children, e.g. children’s programing of the Davey and
      Goliath or Sesame Street types.

B. Drama
   1. Presentation of plays and involvement of community in confrontation with
      controversial issues through public discussion of the plays following
      presentation.

C. Political, Public, and Societal Programming
   1. The airing of the values issues inherent in political concerns, i.e. school bond issues,
      public transit, community economy, etc.
   2. Discussion of ethnic and religious minority viewpoints.
   3. Spot announcements

D. Cultural and Religious Festivals
   1. Church and synagogue celebrations, such as the consecration of a bishop, high holy
      days, musical festivals, etc.

E. Creative Life Styling Conferences
   1. Programs on alternative communal life styles
   2. Marital and pre-marital counseling via CATV
   3. Discussions on values and human sexual behavior
   4. Child-rearing seminars

F. Professional Enrichment
   1. Continuing education for clergy
   2. Leadership training
   3. Ecumenical dialogue

G. Experimental Ministries

Respectfully submitted,
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