GENERAL ASSEMBLY OF IOWA

LEGAL AND COMMITTEE SERVICES DIVISION
JOHN C. POLLAK, ADMINISTRATOR

LEGAL COUNSELS
DOUGLAS L. ADKISSON
AIDA AUDEH
MARY M. CARR
JULIE A. SMITH CRAGGS
SUSAN E. CROWLEY
MICHAEL J. GOEDERT
MARK W. JOHNSON
GARY L. KAUFMAN
MICHAEL A. KUEHN
LESLIE E. WORKMAN

RESEARCH ANALYSTS
PATRICIA A. FUNARO
KATHLEEN B. HANLON
THANE R. JOHNSON

LEGISLATIVE SERVICE BUREAU
STATE CAPITOL BUILDING
DES MOINES, IOWA 50319
(515) 281-3566
FAX (515) 281-8027
DIANE E. BOLENDER, *DIRECTOR*
RICHARD L. JOHNSON, *DEPUTY DIRECTOR*

ADMINISTRATIVE CODE DIVISION
LUCAS BUILDING (515) 281-5285
PHYLLIS V. BARRY
ADMINISTRATIVE CODE EDITOR

LEGISLATIVE INFORMATION OFFICE
CAPITOL BUILDING (515)-281-5129
JULIE E. E. LIVERS
DIRECTOR

IOWA CODE DIVISION
LUCAS BUILDING (515) 281-5285
JoANN G. BROWN
IOWA CODE EDITOR
JANET L. WILSON
DEPUTY IOWA CODE EDITOR

March 18, 1991

MEMORANDUM

To: Chairperson Arnould and Members of the Legislative Council

From: Diane Bolender, Council Secretary DB

Re: March 19 Council Meeting

This memorandum is a reminder that the next meeting of the Iowa Legislative Council is scheduled for 12:00 noon on Tuesday, March 19, 1991, in Committee Room 22 of the State House.

Enclosed are copies of the Minutes of the February 26, 1991, Legislative Council meeting and a copy of the Report of the March 7 Redistricting Committee meeting. The tentative agenda was included with your March 14 meeting announcement.

REPORT OF THE REDISTRICTING COMMITTEE

TO THE LEGISLATIVE COUNCIL

March 7, 1991

The Redistricting Committee of the Legislative Council met on March 7, 1991, and respectfully submits to the Legislative Council the following report and recommendations:

1. The Committee authorized a three-member subcommittee consisting of Chairperson McKinney, Vice Chairperson Hutchins, and Representative Van Maanen to negotiate with Election Data Services, Inc. to allow for additional public access to the electronic data base used for redistricting.

2. The Committee recommended that the Legislative Council require the Legislative Service Bureau to provide to the public, upon request, a report on the demographic composition of each district created in a redistricting plan submitted to the General Assembly for consideration. The report would be based on demographic information available from the 1990 federal Census Bureau data and would include information on the minority population composition of legislative districts in any submitted redistricting plan. The report need not be prepared by Legislative Service Bureau employees drawing redistricting plans if preparation by those employees would conflict with the requirements of Code chapter 42.

3. The Committee requested the Committees on State Government of the Senate and House of Representatives to hold one or more joint public hearings on any suggested changes in Code chapter 42 regarding the consideration of minority populations in the redistricting process.

Respectfully submitted,

REPRESENTATIVE WAYNE MCKINNEY
Chairperson

Rpt307
RJ/dg

REPORT OF THE REDISTRICTING COMMITTEE

TO THE LEGISLATIVE COUNCIL

March 19, 1991

The Redistricting Committee met on March 19, 1991, and makes the following report to the Legislative Council. The Committee adopted separate preliminary motions providing for the release of additional data to the general public. However, the motion to recommend adoption by the Legislative Council of amendments to its policy, "Release of Redistricting Information and Access to the General Assembly's Redistricting System's Hardware and Software" did not receive a sufficient number of affirmative votes for the action to be a recommendation to the Legislative Council.

Preliminary motions adopted by the Committee were to provide for the release of the following data and to charge to members of the general public a reasonable fee based upon the cost of providing the data:

1. Public law 94-171 tape including complete population data for each census block.
2. Voter registration and election return data for each precinct.
3. TIGER/Line file which gives geography for each census block.
4. Correlation between both geography and population for each redistricting data unit. (Estimated one-time programming cost by EDS of $3,000.)
5. Data for each redistricting plan by LSB converted to ASCII format.

RPT319

FINAL REPORT

HEALTH BENEFITS TO IPERS RETIREES STUDY COMMITTEE

Presented to the Legislative Council
and the Iowa General Assembly
January 1991

Prepared by the Legislative Service Bureau

FINAL REPORT

HEALTH BENEFITS TO IPERS RETIREES STUDY COMMITTEE

November 1990

AUTHORIZATION AND APPOINTMENT

The Health Benefits to IPERS Retirees Study Committee was established by the Legislative Council and directed to study the feasibility and cost of providing supplemental Medicare insurance coverage for retired members under the Iowa Public Employees' Retirement System who have attained the age of 65 years.

The members of the Study Committee were:

Senator William D. Palmer, Co-chairperson
Representative Michael R. Peters, Co-chairperson
Senator Donald Doyle
Senator Richard Drake
Senator John Kibbie
Senator Jack Nystrom
Representative Dorothy Carpenter
Representative John Connors
Representative Darrell Hanson
Representative Dennis Renaud

COMMITTEE PROCEEDINGS

The Study Committee was authorized two meeting days. The meetings were held on August 1 and September 26, 1990.

At its first meeting on August 1, the Study Committee invited representatives from the Iowa Public Employees' Retirement System (IPERS) Division of the Department of Personnel, the Insurance Division of the Department of Commerce, the American Association of Retired Persons (AARP), the American Federation of State, County, and Municipal Employees (AFSMCE), and other interested public employee retirees to present testimony regarding the IPERS Division acting as a financial agent to deduct health insurance premiums for IPERS retirees from their IPERS benefits. The invited testimony also covered the high cost of obtaining

health care coverage by early retirees such as fire fighters and police officers who are commonly eligible to retire before the age of 65 years.

Speaking on behalf of the IPERS Division of the Department of Personnel, Ms. Carol Swanson stated that the Department does not endorse the proposed legislation which would inappropriately involve the Division in retirees' health care plans and would probably involve the Division in resolving problems between the insurance provider and the retirees. She added that the premium deduction proposals may involve more than one insurance company and, therefore, increase the expected costs beyond the one and one-half to two full-time equivalent positions plus equipment costs estimated in the fiscal note prepared for the 1990 Session. Ms. Swanson also presented the Study Committee with information relating to current insurance benefits available to IPERS retirees.

Mr. David J. Lyons, Acting Insurance Commissioner, testified that IPERS retirees would qualify for group health insurance which could be administered by a private entity. He further stated that he does not foresee a significant difference between an employer or an employee group plan. Concerning the likely competition among Medicare supplement providers, Mr. Lyons stated that the bidding should be quite competitive among insurers.

Ms. Betty Powell presented testimony on behalf of AARP. She stated that increasing costs of health care premiums are quite threatening to IPERS retirees who now are subjected to income taxes on their state retirement benefits. She urged the Study Committee to consider additional health care benefits to retirees to compensate for the loss of income tax exemption.

Mr. Mel Ahlquist, representing AFSCME and the Retired Iowa Public Employees Insurance Association, presented testimony relating to the plight of many IPERS retirees who must pay very high premiums to receive health and dental care insurance. Mr. Ahlquist urged support for a plan promoted by the Association to provide full group insurance coverage for IPERS retirees who are less than 65 years of age and a supplemental group insurance plan for those retirees 65 years of age or older. He added that the plan does not request funding from the state or IPERS and does not request IPERS to administer the group plans. Mr. Paul Combs, also representing AFSCME, and Mr. Ben Riley, a retired fire fighter from Sioux City, supported Mr. Ahlquist's testimony and provided cost comparisons showing the high cost of health and dental insurance particularly for those public retirees who retire before the age of 65 years.

At its second meeting on September 26, the Study Committee received additional testimony from groups or associations representing retired public employees in Iowa. Dr. Robert Denny, representing the Iowa Retired Teachers Association, stated that in 1989 a task force of the Association urged the General Assembly to consider increasing retiree benefits to meet the increased cost of health

care insurance and to provide additional supplementary insurance coverage to Medicare. He stated that the General Assembly found the two requests to be too expensive to implement, but the Association urges that the current study charge be expanded to lessen the impact of supplementary health care insurance costs to public employees in Iowa. The Study Committee also received additional information from Mr. Ben Riley and Mr. Mel Ahlquist concerning health insurance costs for early retirees and received additional health care cost information from Blue Cross/Blue Shield and Holmes/Murphy. Mr. Thomas Iles and Ms. Laurie Burdick, respectively, represented their insurance companies before the Study Committee.

Additional written material comparing health and dental insurance costs among selected cities, counties, and school districts was provided by the Legislative Service Bureau staff. Current health and dental cost information for state retirees was provided by the Department of Personnel and a survey of health plan costs for 1990 among the various states was also provided to the Study Committee. A copy of the various reports on health care insurance costs are filed with the Legislative Service Bureau.

RECOMMENDATION

The Health Benefits to IPERS Retirees Study Committee unanimously agreed to the following recommendation, but when the vote was taken the Senate members did not have a quorum present to formally endorse the recommendation:

The Health Benefits for IPERS Retirees Study Committee recommends that the Legislative Council create a Public Retirees Health Benefits Task Force consisting of 14 members selected to represent the following agencies and organizations: two representatives of the Department of Personnel, one of which would represent the IPERS Division, one representative of the Insurance Division of the Department of Commerce, one representative of the Iowa State Education Association, one representative of the Iowa State Association of Counties, one representative of the League of Iowa Municipalities, one representative of the Iowa Association of School Boards, two representatives of the Retired Iowa Public Employees Association, two members of the House of Representatives, two members of the Senate, one retiree under chapter 97A or 411 of the Code, and one person representing the general public. The Task Force shall study the possibility of obtaining group health insurance products which may be purchased by retired public employees and also study the availability of services for the direct payment of health insurance premiums through financial institutions. The Task Force shall report its findings and recommendations, including draft legislation deemed necessary to implement the recommendation, not later than March 1, 1991, to the Legislative Council, or if the General Assembly is in session, to the presiding officers of the Senate and the House of Representatives.

Analysis of the Proposed ICN

Presented to:

The Iowa General Assembly

March 19, 1991

ERNST & YOUNG

Briefing Outline

- Scope of Our Analysis
- Analysis of State Ownership
- Analysis of Video Quality Issues
- Analysis of Kiewit Proposal
- Analysis of Alternative Technologies
- Phase 3 Technology Options

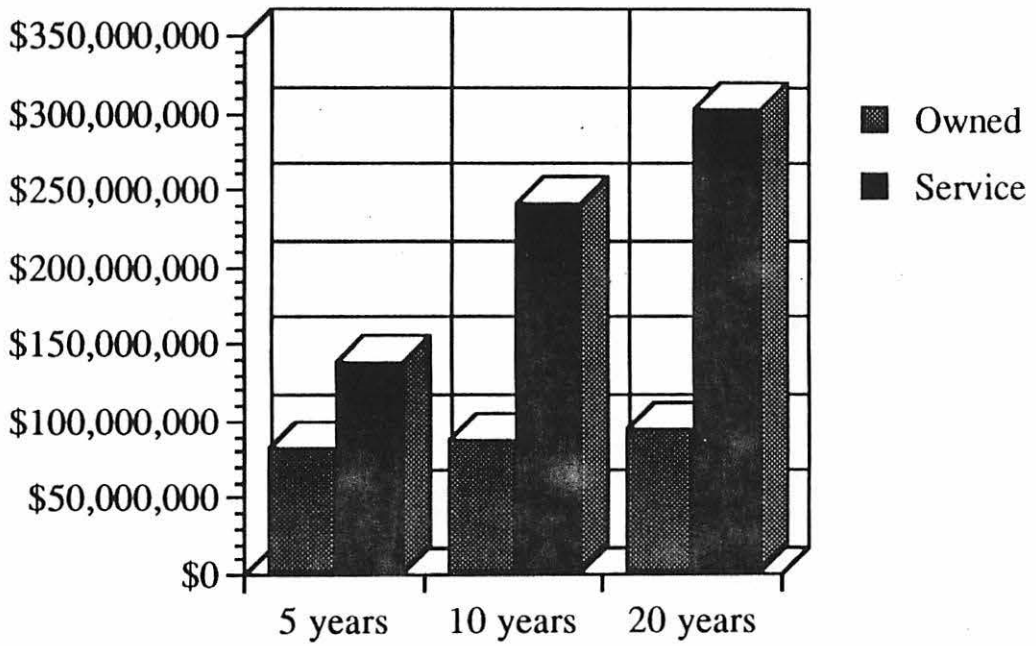
Scope of Our Analysis

- High Level Financial Analysis
- Comparison With Other States
- Comparison to Industry Norms
- Focus on Key Issues

Analysis of State Ownership

Issue	Should The State Own the ICN Transmission Facilities?
Considerations	• State Ownership Can Have A Positive Impact Of Network Infrastructure • The ICN Does Not Present A Significant Threat To The Telecommunications Industry • The Financial Analysis Period Used Was Inappropriately Long • State Ownership Was The Only Available Option To Procure Needed Services
Conclusion	State Ownership Of ICN Is Appropriate In This Case

T3 Service Versus Owned Network



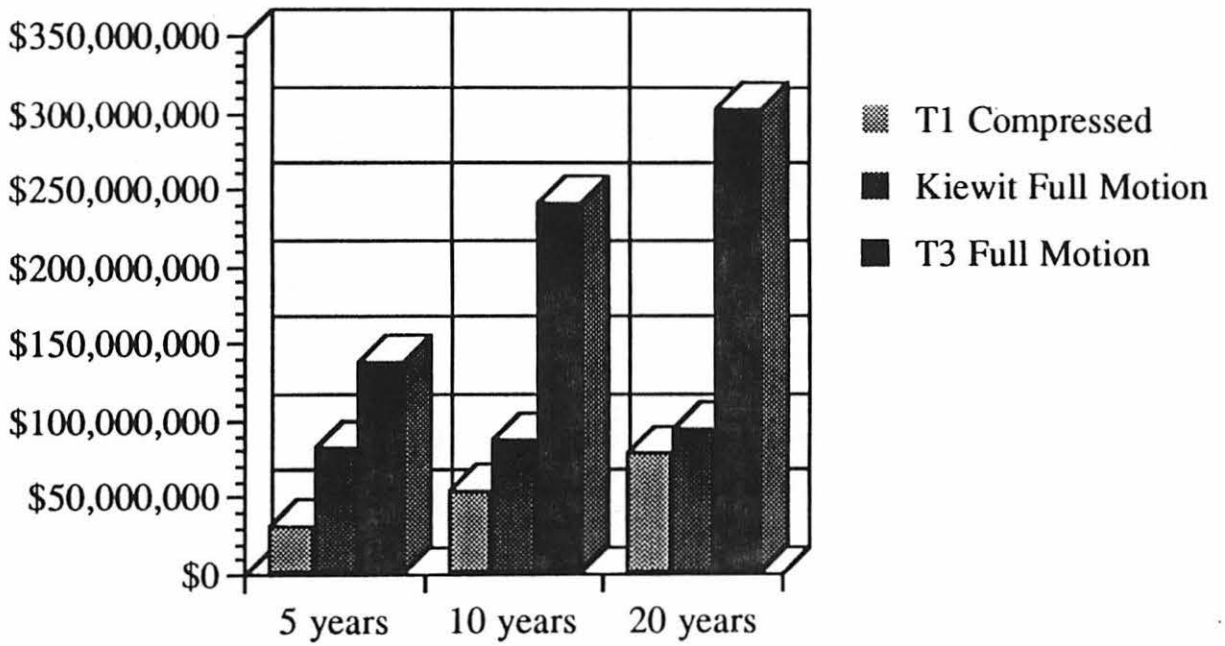
Note: Owned includes additional maintenance costs typically provided by service alternatives

Analysis of Video Quality Issues

Issue	Is wideband video (45 Mbps) necessary to provide the educational value desired for ICN?
Considerations	• Compressed video technology is improving steadily • All knowledgeable parties agree that compressed will not equal wideband video in the foreseeable future • All educators we consulted stated that wideband video is preferred, especially for K-12 • The wideband video solution proposed by Kiewit is about twice the cost of a compressed video network over a 10 year period
Conclusion	Compressed video will not be as effective as wideband video for distance education in the foreseeable future

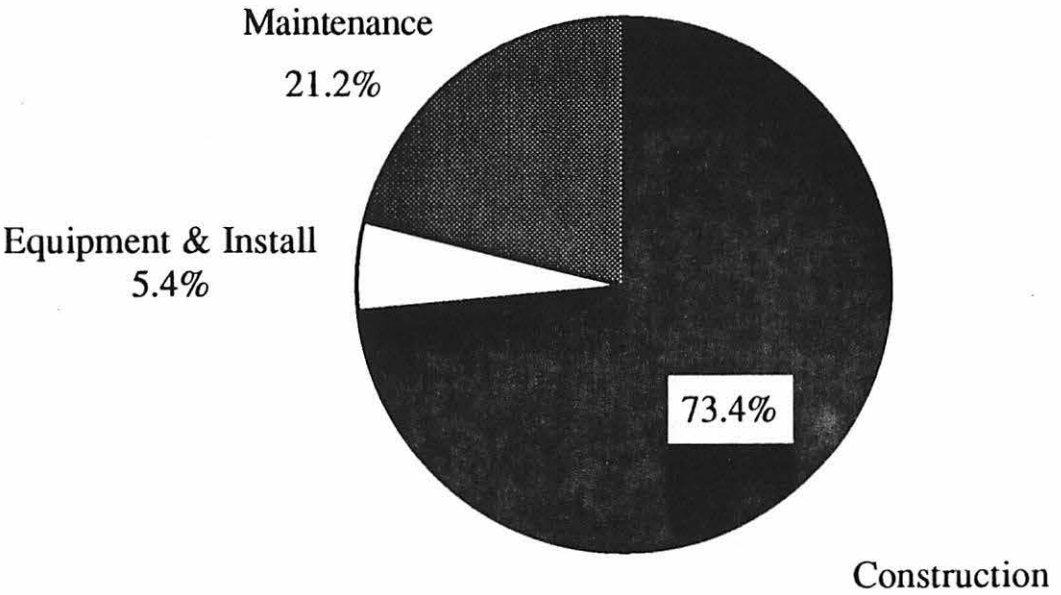
Compressed vs. Full Motion

NPV for Full Motion 2-way Interactive System



Cost Breakdown of ICN

Total Cost = $ 89,527,277



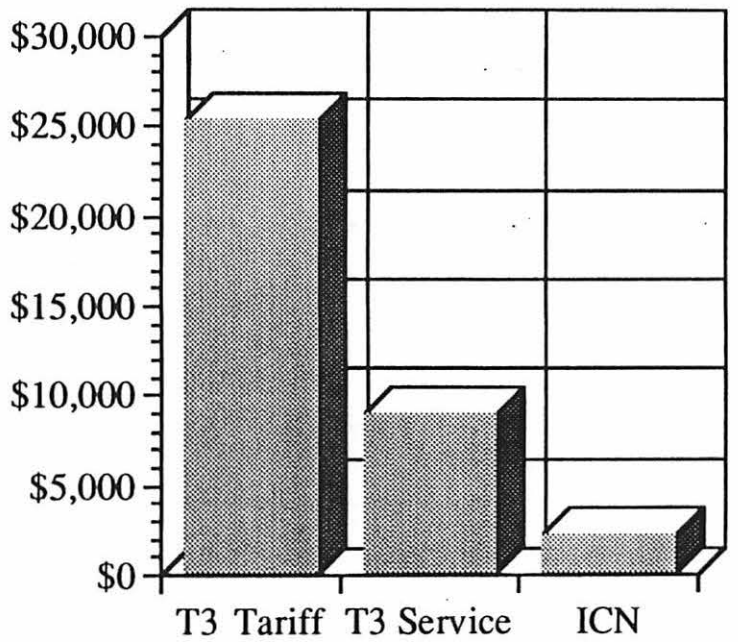
Video Codec Equipment Is A Very Small Component of the Overall Cost of ICN

ERNST & YOUNG

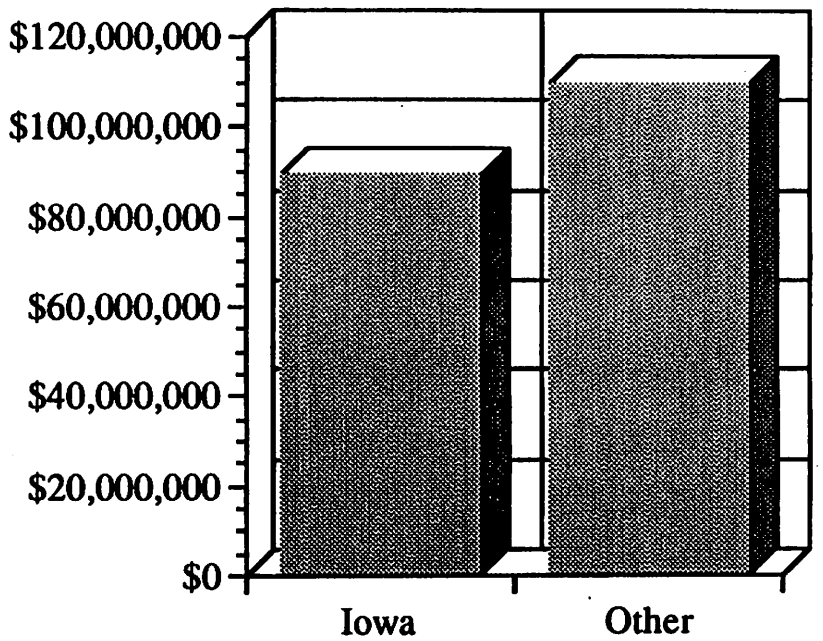
Analysis of Kiewit Proposal

Issue	Does the Kiewit Proposal Represent a Complete and Reasonable Assessment of the ICN's Cost?
Considerations	• Additional Management Costs Add a Net Present Value of $22.5 Million To ICN • The Kiewit Financial Proposal Is Very Attractive Compared to Other Similar Networks • Potential Cost Offsets Exist That Could Amount To $16.8 Million Plus $5.7 Million Per Year
Conclusion	The Kiewit Proposal Provides an Excellent Value For This Type of Network

Costs for a 45 Mbps Circuit

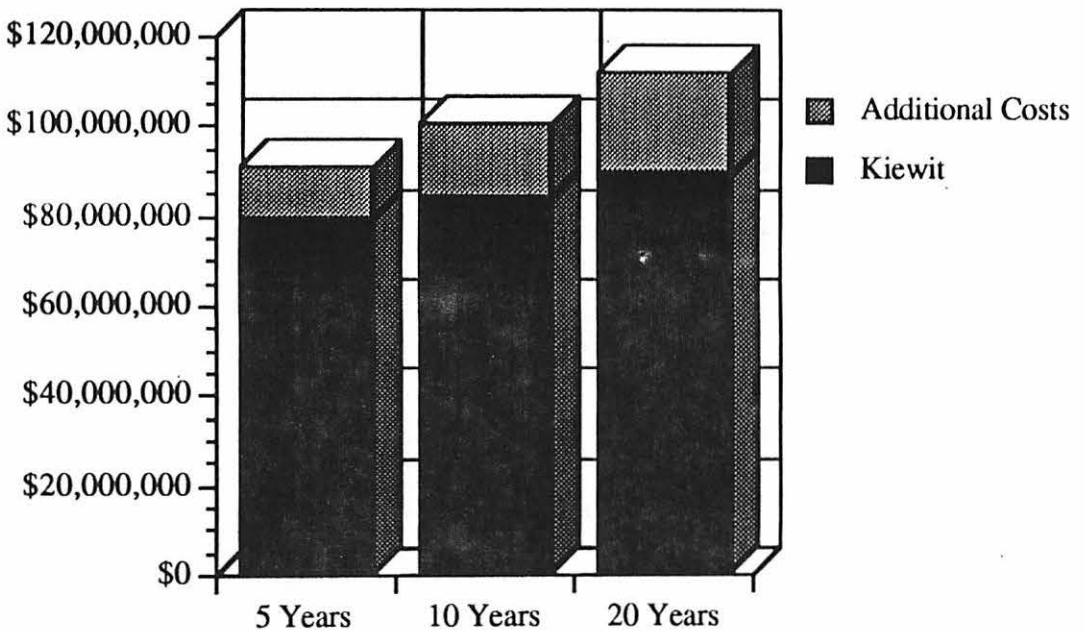


ICN vs. Other Similar Networks



Note: Other networks scaled to the size of the ICN

Total ICN Costs



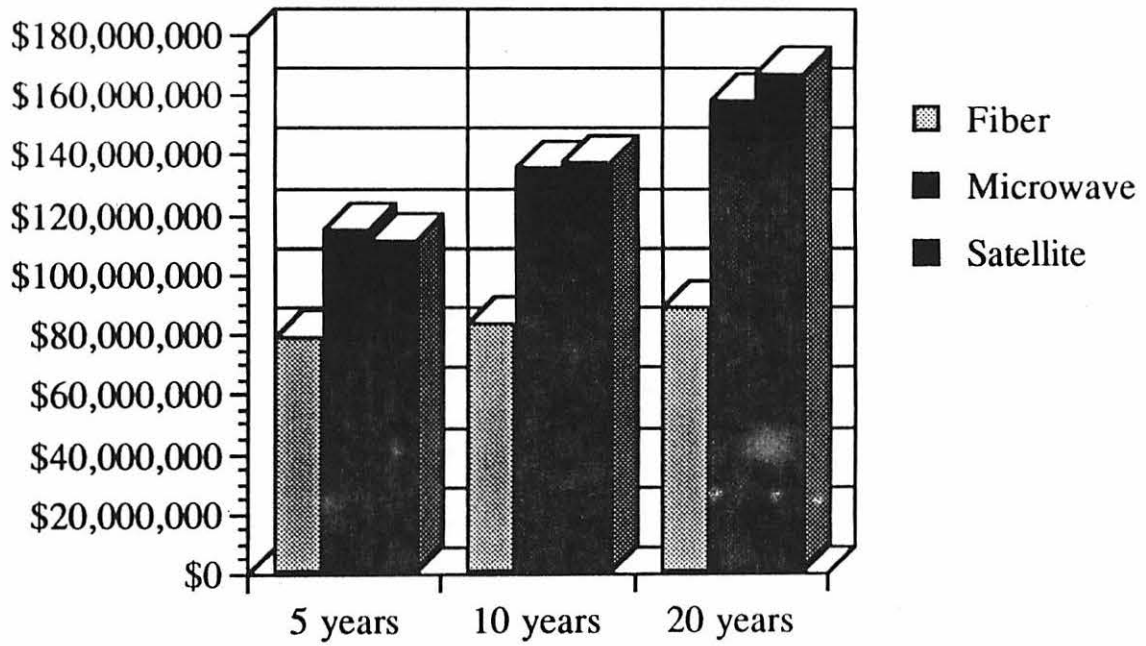
Note: Additional costs include operational, extra maintenance, administrative, and additional network management costs

Analysis of Alternative Technologies

Issue	Are There Any Other Network Technologies That Could Provide A Superior Network?
Considerations	• Satellite Networks Are Not Cost Effective For Two-Way Intra-State Use • Microwave Technology Is Less Cost Effective and May Not Provide Sufficient Capacity • Fiber Optic Transmission Systems Are Becoming The Dominant System Used By Carriers
Conclusion	Fiber Optic Transmission Is The Appropriate Technology For ICN

Technical Alternatives

NPV for Full Motion 2-way Interactive System



Phase 3 Technology Options

	Transmission Type	Video Quality	Capacity
ITFS	1 way video 2 way audio	Full Motion	Four channels per license
Compressed Video	2 way video 2 way audio	Compressed	One channel per circuit
Full Motion Video	2 way video 2 way audio	Full Motion	One channel per circuit

Conclusions And Recommendations

- State Ownership Is Appropriate In This Case
- Wideband Video Appears To Be Necessary
- The Kiewit Proposal Represents A Good Value
- Revisit Key Issues Prior To Next Phase Of ICN:
  - Financial Analysis Period
  - Availability Of Services From Telephone Carriers
  - Phase 3 Technology Options

ANALYSIS OF THE PROJECT TO ESTABLISH A STATE COMMUNICATIONS NETWORK FOR EDUCATION

ERNST & YOUNG

ERNST & YOUNG

Fairfax Square Tower II
8075 Leesburg Pike
Vienna, Virginia 22182

Phone [illegible]

March 15, 1991

The Honorable Bill Hutchins
The Honorable Jack Rife
The Honorable Robert C. Arnould
The Honorable Harold G. Van Maanen
Members of the Iowa General Assembly
State Capitol Building
Des Moines, IA 50319

Gentlemen and Ladies:

We are pleased to present our final report "Analysis of the Project to Establish a State Communications Network for Education." This report was prepared over the past three weeks in response to the Scope of Services specified in a Request for Proposals from the Legislative Council . We believe that this report fully satisfies the Scope of Services requested.

We would like to express our thanks to the many parties who provided information to us and spent time with our project team. These individuals and entities are listed in the body of our report, and we would not have been able to complete this study without their assistance.

If you have any questions, comments, or concerns with this report, please free feel to contact Jeff Held, our Engagement Partner, at 703-903-5350. We are pleased to have had this opportunity to serve the General Assembly in this vital matter.

Sincerely,

Ernst + Young

EXECUTIVE SUMMARY

The State of Iowa has embarked on an ambitious project to improve the quality of its educational system and the efficiency of government operations through the application of telecommunications technology. The Iowa Communications Network (ICN) will extend the reach of the State's educational system at all levels by providing access to real-time, high-quality video transmission at many points throughout the State. In addition, the State hopes to achieve cost savings by routing its existing voice and data traffic on the same network backbone.

Background

The State has reached a crucial point in the ICN project. The Department of General Services has selected a vendor, Kiewit Network Technologies, Inc., and has stated that it is ready to enter into a contract with this vendor. However, various parties within the state have raised issues that should be resolved before the State proceeds with ICN. The General Assembly has engaged Ernst & Young's Network Strategies Practice to perform an independent review and an analysis of the following key issues:

- Should the State own network transmission facilities?
- Can compressed video technology provide the appropriate video quality more cost effectively than full motion video technology?
- Are there any reasonable alternatives that have not been considered?
- Is the cost of the proposed approach reasonable and consistent with comparable projects?
- Have all of the relevant costs been included in the proposed network?

Approach

We were directed by the General Assembly to use our knowledge of other state systems, network technology trends, and carrier services to provide a high level analysis of the above key issues. Our analysis is not a revisitation of the many detailed studies completed throughout this project, nor is it intended to provide a detailed technical analysis of the Kiewit proposal.

This project began on February 25 and was completed on March 15, 1991. During this time, we reviewed roughly 1,500 pages of documentation, interviewed over 35 people, and held numerous phone conversations in pursuit of the information needed for our analysis.

Conclusions

This following summarizes our conclusions regarding the key issues identified above. The reader can find a more detailed analysis of these issues in the main body of this report.

<u>State Ownership of Transmission Facilities</u>

We conclude that the benefits offered by the proposed contractual arrangement offered by Kiewit outweigh the risks of owning transmission facilities. Several factors support this conclusion:

- The State's ownership of ICN transmission facilities will not have an adverse effect on the development of the telecommunications infrastructure within the State. In fact, Kiewit's offer to share construction costs with other carriers could promote the development of an advanced network infrastructure.

- We see no evidence that the ICN would cause a significant revenue loss to telecommunications carriers within Iowa. The revenue loss we estimate is more than offset by cost savings.

- We find that the 20-year period for financial analysis of the ICN proposals is inappropriately long. However, we also conclude that even when considered over a more realistic 10-year period, the ICN still represents a good value.

- We do not expect cost-competitive, equivalent services to be widely available from the telecommunications industry throughout Iowa until the early part of the next decade.

We should note that the State did not receive pricing for a custom service arrangement in its Request for Proposal. As a result, we cannot be certain what would have been offered by the telecommunications carriers in Iowa. Therefore, we based our analysis on information we have obtained in other similar network procurements.

Full Motion Video versus Compressed Video

We conclude that full motion video will continue to be superior to compressed video for educational purposes for the foreseeable future. In reaching this conclusion, we considered a) the specific educational applications proposed for ICN; b) the uses of educational video in many other states; and c) the trends in video compression technology. We also conclude, however, that compressed video technology is continuing to improve rapidly, and may be acceptable for some educational applications.

Technical Alternatives

We conclude that fiber optic transmission is the best currently available technology to satisfy the requirements for ICN as described in the Request for Proposal. The driving factor behind this conclusion is the requirement for large numbers of full-motion, two-way video channels. We examined alternative technologies including satellite systems, microwave transmission, and copper wire transmission systems, and concluded that none of these alternatives were either superior or more cost-effective than fiber optics.

Analysis of the Kiewit Proposal

We conclude that the price offered by Kiewit Network Technologies, Inc. is reasonable and is financially attractive. We compared the price offered by Kiewit with industry benchmarks for the cost of constructing transmission facilities and the costs for other state government networks. We found that the unit cost for ICN is lower than any similar networks we are aware of, and is well below the industry benchmarks we used. Therefore, we conclude that the Kiewit financial proposal is very advantageous for the State.

We examined the Kiewit proposal for completeness and found that there are no omissions substantial enough to have a material impact on the relative cost of ICN. Certain additional network management and administrative services will be required for the proposed system, although they were not specified in the RFP. We estimate the net present value of these additional costs to be about $22.5 million over 20 years, increasing the net present value of the project to about $112 million. The 105 end points will incur a fixed cost of roughly $40,000 for video classrooms, and $42,000 yearly for support costs if these facilities do not already exist.

We also examined the possibility of further cost reductions for ICN. DGS plans to use certain Federal funds to offset the cost of constructing the ICN. It appears that the use of these funds is appropriate and that more such funds could become available, although their availability is not certain at this point. The Department of General Services has stated that, with the use of Federal funds and other cost reductions obtained through contract negotiation, the net cost of the ICN to the State would be significantly reduced.

Conclusion

After examining the information made available to us, and weighing the issues and concerns raised by many parties, we conclude that the benefits of the ICN approach specified by the RFP and the Kiewit proposal outweigh the risks. We therefore recommend that the General Assembly direct the Department of General Services to proceed with the Kiewit contract for this phase of the ICN. We also recommend, however, that the issues raised by the telephone industry and the other areas of concern that we identified in this report be revisited prior to proceeding with the final phase (Part 3) of the ICN project.

SECTION 1

INTRODUCTION

The Iowa General Assembly engaged Ernst & Young to provide an independent analysis of the current Iowa Communications Network (ICN) project. This report documents the results of our analysis.

1.1 BACKGROUND

In 1987, the Iowa General Assembly contracted with a consultant to help plan a statewide educational network to provide distance learning throughout Iowa. During the past three years, this plan has been modified as it went through two unsuccessful procurements. The Department of General Services (DGS) in conjunction with Spectra Associates, developed the current Request for Proposal, RFP No. 51045S. The Narrowcast Committee, comprised of key individuals from the educational community, specified the capacity requirements upon which the RFP is based. These requirements call for high capacity 45 Mbps transmission facilities to support two-way interactive video to 105 locations throughout Iowa. The RFP also requests switching and codec equipment. While the transmission facilities may be owned or leased, the State requested that the switching equipment and codecs be offered for purchase only.

Two vendors responded to this RFP, and after evaluation by Spectra Associates and McGladrey & Pullen, the Department of General Services announced an intent to award a contract to Kiewit Network Technologies, Inc. (KNT), a subsidiary of Peter Kiewit Sons', Inc. The net present value of the total recurring and nonrecurring cost for the Kiewit Network Technologies bid is $89, 527, 277[1].

Before certifying the award of the contract, the Legislative Council of the Iowa General Assembly requested that an independent consulting firm with expertise in telecommunications perform a comprehensive financial analysis of the project. The Iowa General Assembly engaged the Network Strategies practice of Ernst & Young to perform this analysis.

1.2 APPROACH

On February 25th, Ernst & Young began the data gathering phase of this project. We interviewed several people from various organizations that have a strong interest in the ICN. Figure 1-1 is a partial list of these individuals. We also reviewed several related documents, including:

- The ICN Request for Proposal and its addenda
- The Kiewit Proposal
- An "Illustrative Example" prepared by the Iowa Telephone Association
- Related documents provided by the Department of General Services and others

From the Iowa General Assembly's Request for Proposal and our interviews with the General Assembly, we identified the following critical issues for analysis:

---

[1] McGladrey & Pullen letter to Mr. Warren Fackler of Spectra Associates, December 11, 1990.

Interviews

General Assembly

Representative Robert Arnould
Representative Kay Chapman
Representative Wayne McKinney, Jr.
Representative Harold Van Maanen
Senator Bill Hutchins
Senator Jack Rife
Senator Richard Varn
Chief Clerk Joseph O'Hern

Telephone Industry

US West
GTE
Iowa Telephone Association
Iowa Network Services

Department of General Services

Tony Crandell
Dean Crocker

Narrowcast Committee

Dr. Richard Gross
George Klingler

Iowa Public Television

Linda Schatz
Dave Bolender
John Saveraid

Others

James Pack	Kiewit Network Technologies
Don Deeds	Spectra Associates
Ann Marie Brick	Attorney's Office
John Pollak	Committee Services
Richard Bartel	Disaster Services Division
Ed Stanek	Telecomm. and Info. Management Counsel
Alan Kniep	Utilities Commision

Figure 1-1

- State ownership of network transmission facilities
- Effectiveness of full motion versus compressed video
- Applicability of alternative technical approaches
- Reasonableness and Completeness of the Kiewit proposal

The following report addresses each of these issues (Sections 2 through 5). Each section presents a qualitative and quantitative analysis of the issue. In performing the qualitative analysis, we have used our experience with other state network procurements and our knowledge of the telecommunications industry and have substantiated our analysis through discussions with various industry experts. Our quantitative analysis uses cost models we have developed for various technologies and services. Our analysis uses the financial modeling variables and assumptions used in the bid evaluation conducted by Spectra Associates. The Ernst & Young Audit staff in Des Moines has assisted in verifying our calculations using the T-VALUE software specified in the ICN RFP.

SECTION 2

ANALYSIS OF STATE OWNERSHIP OF TRANSMISSION FACILITIES

In our discussions with representatives from Iowa's telecommunications industry, it became apparent that state ownership of transmission facilities is a major issue. Our discussions revealed four fundamental issues:

- State Competition - The concern that the State would compete with the telecommunications industry by reselling spare capacity on a system it owned. Several individuals also expressed concern about revenue loss if the State were to migrate its voice and data traffic onto the ICN backbone.

- Impact on Infrastructure Investment - The concern that state ownership of transmission facilities diverts investment funds away from the telecommunications carriers within Iowa and does not contribute to building an infrastructure that all citizens can use.

- Impact of Financial Analysis Period - The concern that comparing a purchased system to a system obtained through a services contract with telecommunications carriers was not a fair comparison due to the analysis period selected for the financial analysis of bids.

- Availability of Services - The concern as to whether the telephone industry can provide the capabilities specified in the RFP at this point in time.

Our conclusions are as follows:

- State competition does not pose a serious or credible threat to the Iowa telecommunications industry.

- A small loss in revenue for the local telephone companies will result when the State off-loads some of its voice and data traffic on to the ICN.

- The State's ownership of the transmission facilities can have a positive impact on infrastructure investment.

- The 20-year time period selected by the State for the financial model is unrealistically long. However, the proposed ICN still represents a good value when analyzed over a 10-year time period.

- The proposed approach by Kiewit Network Technologies is the least expensive way to acquire the desired capabilities in the foreseeable future.

The following sections discuss the aforementioned concerns in more detail, and present a cost analysis comparing the Kiewit bid to a service option based on similar network procurements.

2.1 STATE COMPETITION WITH THE TELECOMMUNICATIONS INDUSTRY

We find that the concerns expressed by the telecommunications industry have some basis, but that the actual potential for harmful competition or revenue loss is small. It is technically possible for the State to re-sell capacity on the fiber optic routes that it owns. However, current law limits such

resale of the state's bandwidth[2]. We also note that the actual capacity that would be available for resale is modest compared to the existing and planned facilities of telecommunications carriers in Iowa. In addition, the ICN is a dedicated network that serves only a limited number of state and educational premises, with no capability to distribute traffic to a more widely dispersed customer base. Providing telecommunications services to customers not on state premises would require the State to obtain "access" circuits from local telecommunications carriers to connect to its customers, and the cost of these access circuits would make the State's prices considerably less attractive. Thus, we conclude that even if it were legally permissible, the State would have difficulty reselling telecommunications services on a competitive basis.

The State's plan to migrate its existing voice and data traffic onto the ICN backbone will unquestionably cause some loss of revenue to local exchange carriers and inter-exchange carriers, but our investigation indicates that such loss will be modest. Although a detailed analysis of this traffic is beyond the scope of this study, we estimate, based on prior experience, that between 30% and 50% of this cost is for "access" circuits, while the rest is for the "inter-exchange" portion of the network. The difference between access circuits, which are provided by Local Exchange Carriers (LEC), such as U.S. West, and inter-exchange circuits provided by carriers such as AT&T or MCI is shown in Figure 2-1.

The Department of General Services (DGS) currently operates a network using T1 circuits to carry data traffic, Lottery traffic, and some voice traffic to State premises. DGS has estimated that moving the traffic now carried on this T1 network to the ICN will save approximately $5.1 million annually. This would result in approximately $1.5 to $2.5 million in lost revenue for local telephone companies within Iowa. Inter-exchange carriers would suffer a revenue loss between $2.6 and $3.6 million. Balanced against this revenue loss is the $5.1 million cost savings to the taxpayers.

2.2 IMPACT ON INFRASTRUCTURE INVESTMENT

One of the most common arguments against the ownership of telecommunications transmission facilities by a government entity is that such ownership does not contribute to the overall public network infrastructure, and thus does not benefit the State as a whole. We generally subscribe to this argument, but find that it does not apply in the case of the ICN. The reasons behind this conclusion are as follows:

- The construction planned by Kiewit has the potential to benefit the telecommunications industry within Iowa. Kiewit has indicated that it is willing to share construction costs with other carriers who may be planning to build fiber routes in the same area as Kiewit's construction. Sharing of construction costs would substantially reduce the cost of construction for any participating carrier, and could hasten the implementation of advanced fiber optic facilities throughout the State.

[2] Iowa Code 18.134 and Code 18.137 as modified in 1990 by SF 2280.

Dedicated Circuit Components

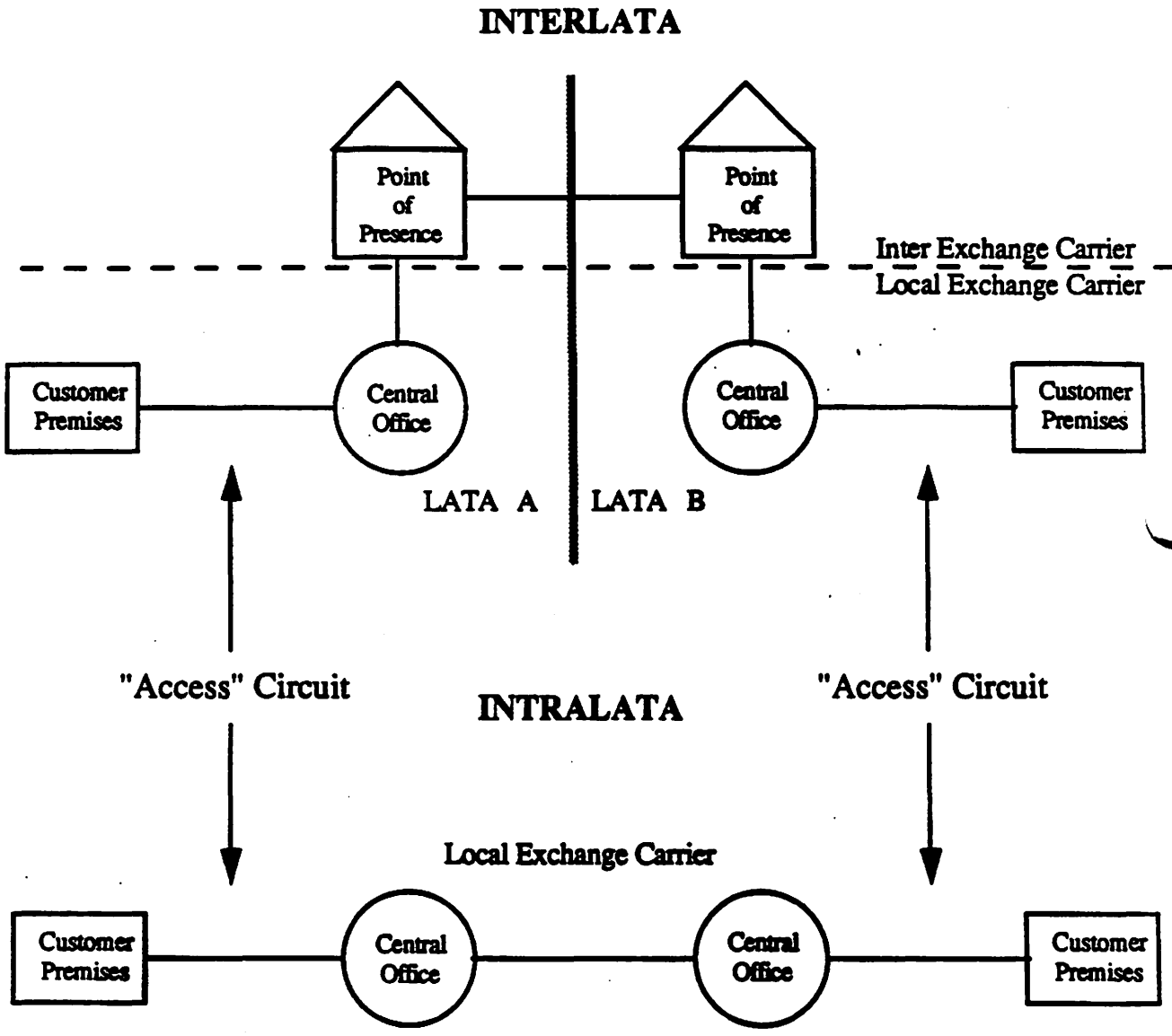


Figure 2-1

- The potential connections to additional end users[3] may significantly affect investment in the public network infrastructure. In our discussions with the Iowa Telephone Association, U.S. West, and GTE, we were impressed by the aggressive plans of Iowa's local telephone companies to deploy large quantities of fiber optic transmission capacity throughout the State over the next 5 years. Based on these discussions, we conclude that additional services for the ICN could be provided by local telephone companies in Iowa within the next five years. Thus, development of the ICN provides an opportunity for the State to promote investment in the public network infrastructure.

- We should also note that DGS solicited bids for the ICN from local telephone companies and inter-exchange carriers. Had a carrier bid successfully, the State's funding of ICN would certainly have had a stimulating effect on the development of the telecommunications infrastructure within Iowa. The decision by the carriers not to respond to the ICN Request for Proposal eliminated this possibility for additional infrastructure investment.

We conclude that the State's ownership of ICN transmission facilities has a positive impact on infrastructure investment in Iowa and may actually provide benefits through increased competition within the Iowa telecommunications industry.

2.3 IMPACT OF FINANCIAL ANALYSIS PERIOD

We conclude that the financial analysis period selected by the State was inappropriately long, but that even if the State had selected a shorter period, the ICN as proposed would still represent an excellent value. This position is explained in detail below.

We believe that the period of 20 years selected by the State for the financial model of ICN is unrealistically long. As a comparison, we typically advise our clients that technology investments should be amortized over a period of no more that five years in the private sector, and no more than ten years in the public sector.

The key issue in this analysis is determining the useful life of the ICN transmission facilities. The Department of General Services has stated that the useful life of the fiber optic components of ICN is considered to be at least 20 years from an *operational* perspective. We agree with that assessment and note that the operational life may in fact even be longer. However, the choice of a 20 year period ignores *functional* obsolescence.

Functional obsolescence occurs when services available from the evolving telecommunications industry can provide a greater capability for a lower or equivalent cost than an existing system. Our analysis of the trends in the telecommunications industry indicate that services similar to those offered by the ICN should be obtainable from telecommunications carriers throughout Iowa in the first half of the next decade. Thus, we expect ICN as defined today to encounter functional obsolescence after about 10 years of operation. At that point, it may very well be more cost effective for the State to acquire the needed services elsewhere.

---

[3] These additional connections have been referred to as "Part 3" of the ICN. The current procurement addresses Parts 1 and 2.

Considered over a 10-year evaluation period, the total cost of the ICN is still an excellent value. We have compared the ICN to other state networks and have found that the unit cost per T3 channel is far lower than any other end user network of which we are aware (refer to Sections 2.5 and 5.1). Based on that analysis, we conclude that the State can proceed secure in the knowledge that it has negotiated a very favorable arrangement.

2.4 AVAILABILITY OF SERVICES

During the course of our analysis, concern was expressed as to whether the telecommunications industry was currently capable of providing the services specified by the RFP. We conclude that the State had little choice other than to own the transmission facilities:

- It is unlikely that the State could have obtained the capabilities specified in the RFP through the normal telecommunications circuit procurement process. Our discussions indicated that the carriers within Iowa would not be able to provide these services through their existing public network facilities in the immediate future, and that these same carriers were not interested in undertaking special construction to provide the requested capabilities.

- We do not expect that capabilities equivalent to those requested in the RFP will be widely available from the public networks operated by carriers in Iowa until the early part of the next decade. This conclusion results from our discussions with carriers in Iowa and research performed in other studies of state government networks in the Midwest.

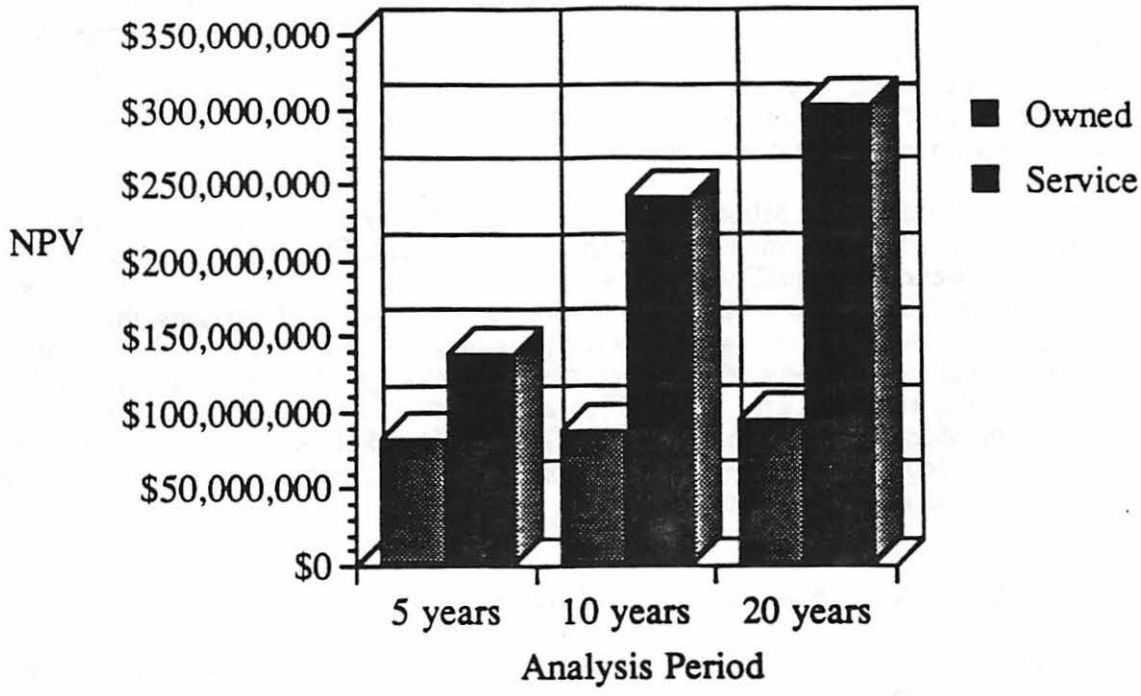
Our analysis indicates that the approach proposed by Kiewit is the least expensive way to acquire the desired capabilities in the foreseeable future.

2.5 COST ANALYSIS

To analyze the financial impact of an owned network versus a leased service, we have developed a cost model based on procurement experiences in other states. Recognizing that there are some additional costs that would be incurred with the owned option, annual costs of $550,000 were added to the Kiewit proposed costs. This increase takes into account maintenance and services inherent to a leased service option that are not explicitly accounted for in the Kiewit proposal[4]. As Figure 2-2 illustrates, the T3 service option is two to four times more costly than the Kiewit owned option.

[4] While Kiewit's proposal includes maintenance costs, there are additional services that carriers inherently provide that were not requested in the RFP nor proposed by Kiewit.

T3 Service Versus Owned



Note: Owned includes additional maintenance costs typically provided by service alternatives

Figure 2-2

SECTION 3

ANALYSIS OF FULL MOTION VERSUS COMPRESSED VIDEO

One of the driving forces shaping the size and architecture of the Iowa Communications Network (ICN) is the choice of video technology to be employed. The Narrowcast Committee, in defining the requirements for the ICN, determined that 45 Mbps full motion, two-way interactive video must be supported. Several parties have expressed concern that rapid advances in video compression technology might warrant installing a smaller size network, such as 1.544 Mbps T1 technology, to reduce the overall cost.

We conclude that the 45 Mbps quality video requested by the Narrowcast Committee will not be achievable through compressed T1 technology in the next five to seven years. By the end of the decade, however, the quality of T1 video may begin to approach that of today's T3 video. Furthermore, it is the cost of the transmission facilities, not of the codecs, that drives the overall network cost. A T3 service based network providing full motion video will typically cost four to five times that of a T1 network based on the ICN topology. Our models indicate that the Kiewit solution costs roughly twice as much as a corresponding T1 service based solution, yet this solution provides 28 times the bandwidth. This section explores the issues related to full motion, 45 Mbps video technology versus compressed video technology, in terms of educational applications, technological trends and cost.

3.1 EDUCATIONAL APPLICATIONS

Our analysis of the educational applications for ICN video is based upon conversations with members of the Narrowcast Committee and our experience with distance education in many other states. Most educators with whom we met stated that full motion video was necessary to achieve educational value and that compressed video in its current state was not acceptable.

The educational application of video was a key factor in determining the appropriate technology for the ICN. The ICN will be used for interactive teaching at all grade levels at all educational levels. In our discussions with Narrowcast Committee members, they emphasized that for interactive teaching to be effective it was necessary to produce real-time, high-quality interaction with teachers and students in several different classrooms. Their goal is to develop a system where the difference between being present in the same classroom as the teacher and being present in a remote classroom is negligible. This requirement is what, in their opinion, made compressed video technology unacceptable.

This notion of interactive video teaching at all grade levels is relatively new and is not widely implemented. The State of Minnesota is one state with a substantial program that involves all educational levels. The systems in place in Minnesota all use full motion, two-way video, and the educators there insist that compressed video would not work for this application. Minnesota is currently in the midst of a procurement for a statewide network similar to ICN, and it also requires full motion, two-way video transmission.

Several states use one-way video transmission with two-way audio. Examples include Pennsylvania, Indiana, Illinois, Wisconsin, Maine, and Maryland. In almost every case, these systems are oriented toward college and graduate level courses offered by a university or community college. These systems have been very successful, but it is important to note that they are addressing a different educational application than ICN.

3.2 TECHNOLOGICAL TRENDS IN VIDEO NETWORKING

We discussed the future of compressed video with users, industry analysts, and manufacturers of compression video equipment. We also viewed demonstrations of compressed video technology and have observed the operation of many existing statewide video networks. Current trends in compression technology indicate that codec quality will approximately double every two years[5,6]. If this trend continues indefinitely, the 45 Mbps video specified for the ICN may be achievable on T1 or 1.544 Mbps facilities in nine to ten years. Based on our understanding of the market and the technology, we believe T1 compressed video will be noticeably inferior to broadcast quality video for the next several years. In the latter half of this decade, it is possible that T1 video will begin to approach T3 quality video, although many experts have noted T1 compressed video will never have sufficient quality for television networks.

Two key factors that influence the picture quality of a video system are the bandwidth used and the compression capability of the codec[7]. The amount of bandwidth defines the amount of information that can be sent over the transmission facility. Higher bandwidth systems provide better picture quality (e.g., higher resolution and faster refresh rate). Codecs are the devices used to convert and compress analog video signals into digital form. They often use compression algorithms to "squeeze" more information over a given amount of bandwidth, improving picture quality over lower bandwidth systems. A bandwidth of 90 Mbps is considered "broadcast quality", the type of video generally used by television stations. Basic compression technology can provide essential broadcast quality over 45 Mbps transmission facilities. Such technology is also used by television networks and is the quality that the Narrowcast Committee has specified for the ICN.

Codec technology has been rapidly improving over the past few years. In particular, compression algorithms have been improving, prices have been dropping, and standards have begun to emerge. These trends are most dramatic with lower bandwidth codecs (T1 and below). The latest codec standard is CCITT's H.261, otherwise known as Px64. This standard will help provide future vendor interoperability and drive costs for codecs down. The standard itself will not significantly improve picture quality, however; proprietary compression algorithms will continue to be the driving force to improved picture quality.

Every knowledgeable source we contacted stated that there is no objective, quantitative method for comparing picture quality associated with various codecs. Instead, the assessment of picture quality is highly subjective. Based on the Narrowcast Committee's current requirement for 45 Mbps, we do not expect that a network based on T1 technology will be able to provide equivalent video quality during the next five to seven years.

3.3 COST ISSUES

The choice of video technology influences the cost of the network in two ways: the cost of transmission facilities needed to provide the bandwidth and the cost of the codecs required. The codecs required for high bandwidth video systems (e.g., T3) are significantly less expensive than

---

[5] "Local Area Communications", Gartner Group, Inc., June 27, 1990.

[6] Frost and Sulivan Videoconferencing Study referenced in "Iowa Telecommunications Industry Illustrative Example", Iowa Telephone Association, December 19, 1990.

[7] Another critical factor is the quality of the camera and related video equipment at the transmitting site; however, this equipment is not part of the procurement.

those required for low bandwidth video systems because sophisticated compression algorithms are not required. However, the transmission facilities required for high bandwidth video systems do add a significant cost.

T1 codecs are currently about three to four times the cost of T3 codecs. These costs will drop significantly over the next few years, in part because of the new H.261 standard[8]. These costs, however, are a relatively small portion of the overall network cost. Figure 3-1, for example, shows a breakdown of transmission facilities and equipment as proposed by Kiewit Network Technologies.

The most significant element of the overall network cost is the amount of bandwidth required. To compare the relative cost of compressed video to full motion video, we have developed a cost model based on the proposed ICN architecture. This model considers the projected costs for compressed T1 service and for a full motion T3 service that provide the number of video channels specified in the ICN RFP over 5, 10 and 20 years. We have also compared these projected costs with the full motion Kiewit costs. Figure 3-2 illustrates these estimated costs, which include transmission facilities, codecs and related switching equipment. While the T1 and T3 models illustrate the typical cost difference between full motion and compressed systems, we note that the Kiewit bid represents only a modest additional cost over the compressed system.

[8] Standards will provide a more cost-competitive market for hardware components needed in codecs.

Cost Breakdown of ICN

Total NPV = $ 89,527,277

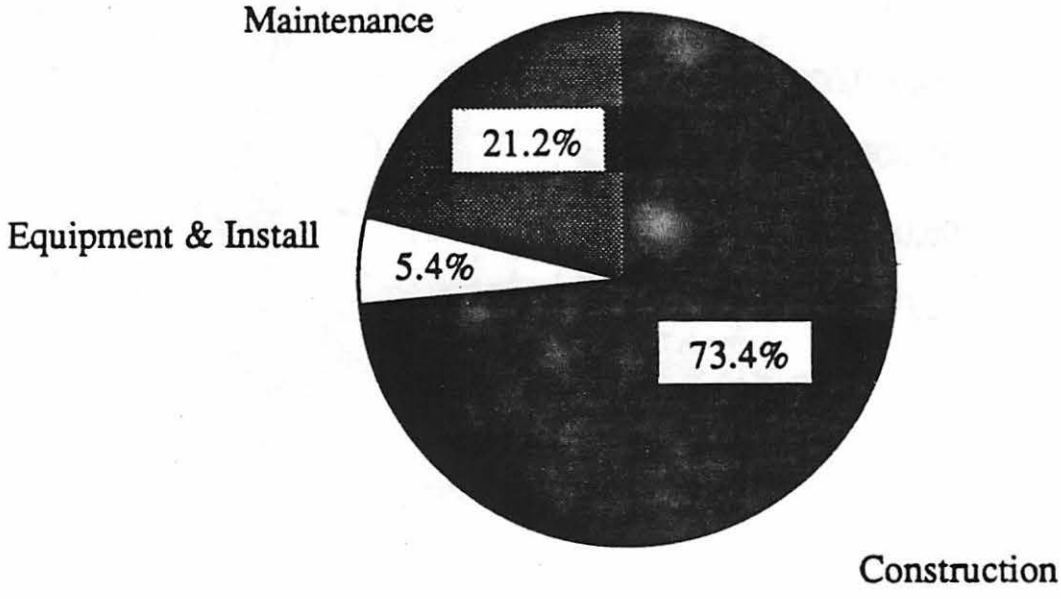


Figure 3-1

Compressed vs Full Motion

NPV for Full Motion 2-way Interactive System

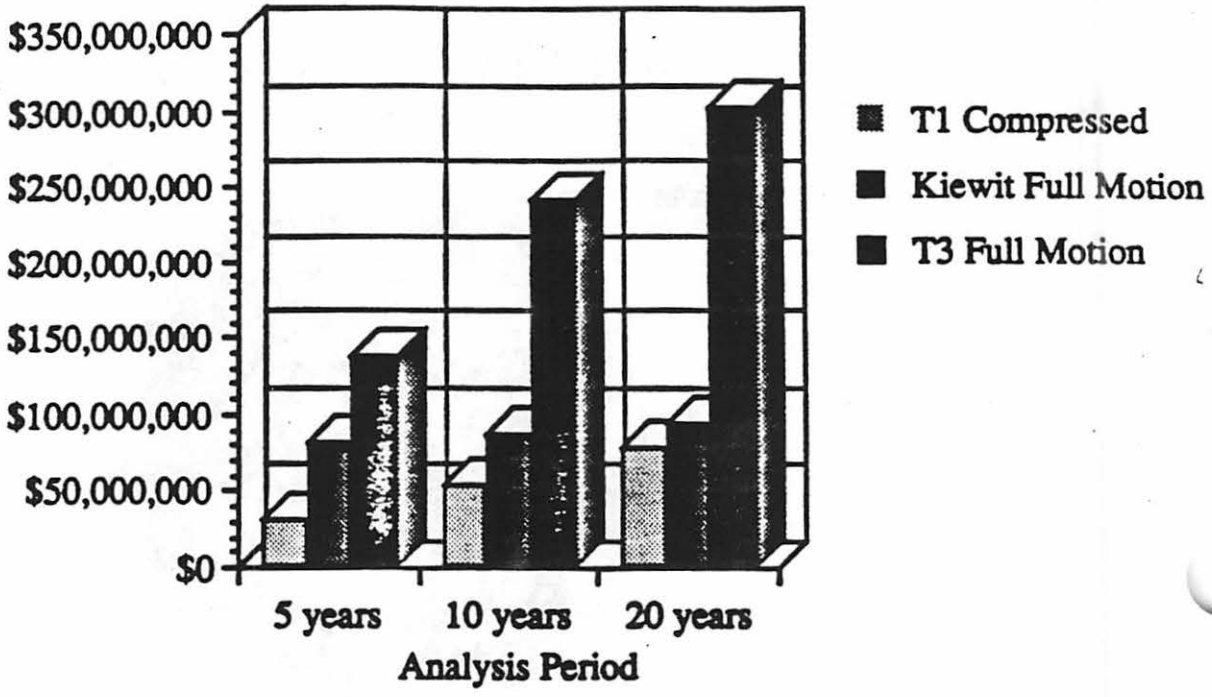


Figure 3-2

SECTION 4

TECHNICAL ALTERNATIVES

The Kiewit Network Technologies proposal for the Iowa Communications Network calls for the use of fiber optic technology. This section explores the possibility of providing the requirements of the ICN with technological alternatives to fiber optics. The RFP specified two-way, 45 Mbps video. This requirement can be met by the following technologies: fiber optics, microwave, and satellite.

We conclude that fiber optic transmission is the most cost-effective technology for providing the required capacity for the two-way full motion video network specified in the RFP. The following sections discuss some of the key technical characteristics of fiber, satellite and microwave and provide a cost comparison of these alternatives for providing a network similar in size to the ICN.

4.1 FIBER OPTICS

Fiber optics offers extremely high bandwidth using light pulses transmitted through thin strands of glass. Because of its many advantages, in particular its extremely high bandwidth capacity, fiber optic cable has replaced copper cable as the terrestrial medium of choice. In fact, most carriers are exclusively installing fiber today.

In addition to being able to support very high bandwidths over a single glass strand, fiber also has the benefit of being largely immune to the types of interference that affect copper, microwave, and satellite transmissions[9]. Fiber can also be easily upgraded to increase transmission speed. This involves replacing the electronic equipment on either end of the fiber strand. In fact, the maximum transmission capacity of fiber has not yet been determined since it is more dependent on the electronics transmitting the signal across the media than on the fiber itself. The major drawback of fiber optics is that it is subject to cable cuts disrupting service, happen periodically.

4.2 MICROWAVE

Point-to-point microwave transmission systems transmit signals through the air using transmitters and antennas attached to towers (see Figure 4-1). This type of transmission system requires a clear line-of-sight between two points in order to transmit the signal. The line-of-sight requirement makes the medium sensitive to the environment around it, both natural and man-made. Therefore, microwave systems are most cost effective for high speed transmission across short distances.

The key reasons that microwave systems are not appropriate for the ICN are the complications in acquiring the necessary frequencies and the limited ability to upgrade to higher bandwidths. The frequencies used for transmission must be obtained through a license from The Federal Communications Commission (FCC). The number of frequencies required for a network the size of the ICN would be difficult, if not impossible, to obtain. Furthermore, microwave systems are difficult to upgrade to higher bandwidths. Therefore, the capacity growth schedule specified in the RFP would be difficult to implement with a microwave system.

[9] Electromagnetic interference and weather effects

Microwave Transmission

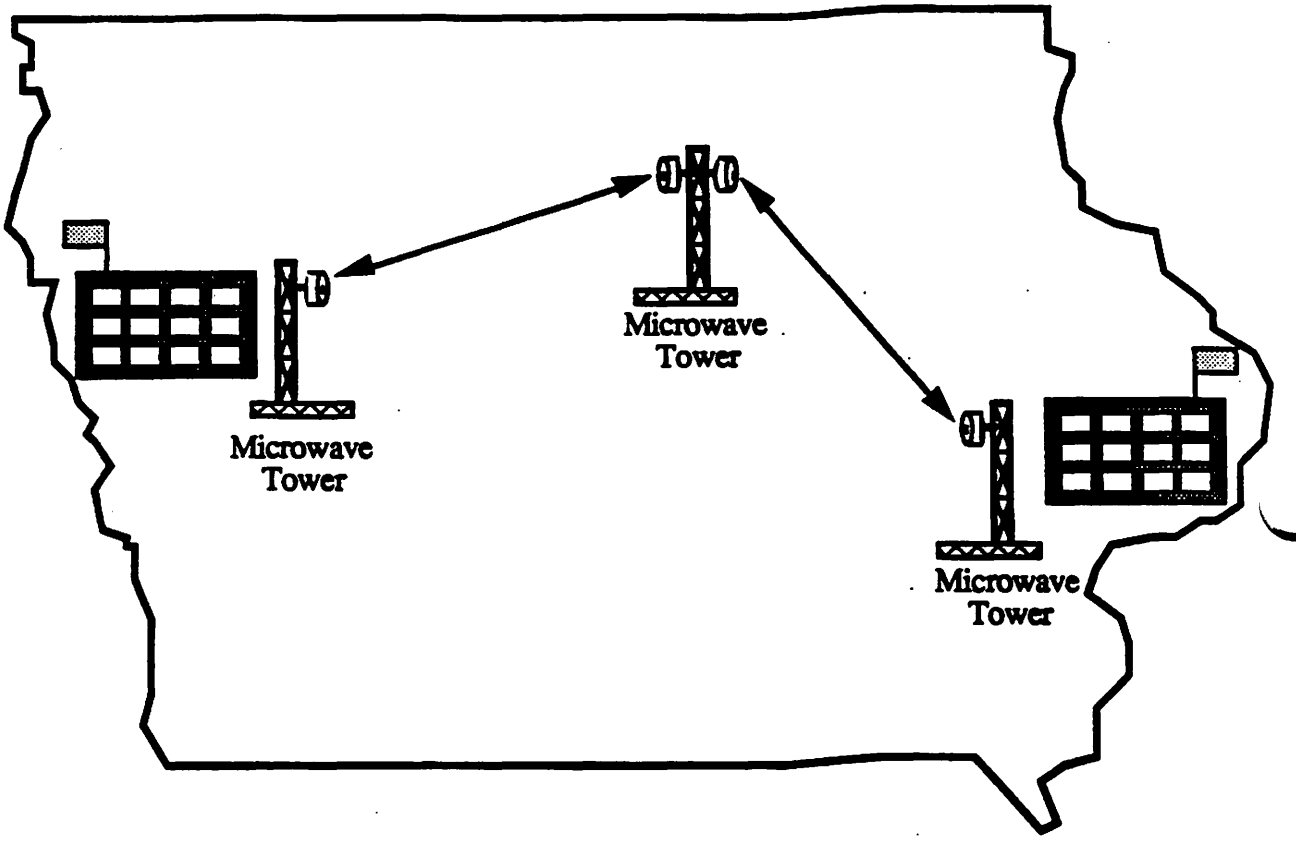


Figure 4-1

4.3 SATELLITE

Satellite transmission systems make use of orbiting satellites to transmit signals to a large geographic area (see Figure 4-2). Transmitted signals are sent from satellite dishes called uplinks, to the orbiting satellite. The satellite then retransmits the signal back to Earth where it is received by satellite dishes called downlinks in the satellite's coverage area. In order to provide service using a satellite system, a transponder on the satellite needs to be leased for each channel being used.

Satellite Transmission

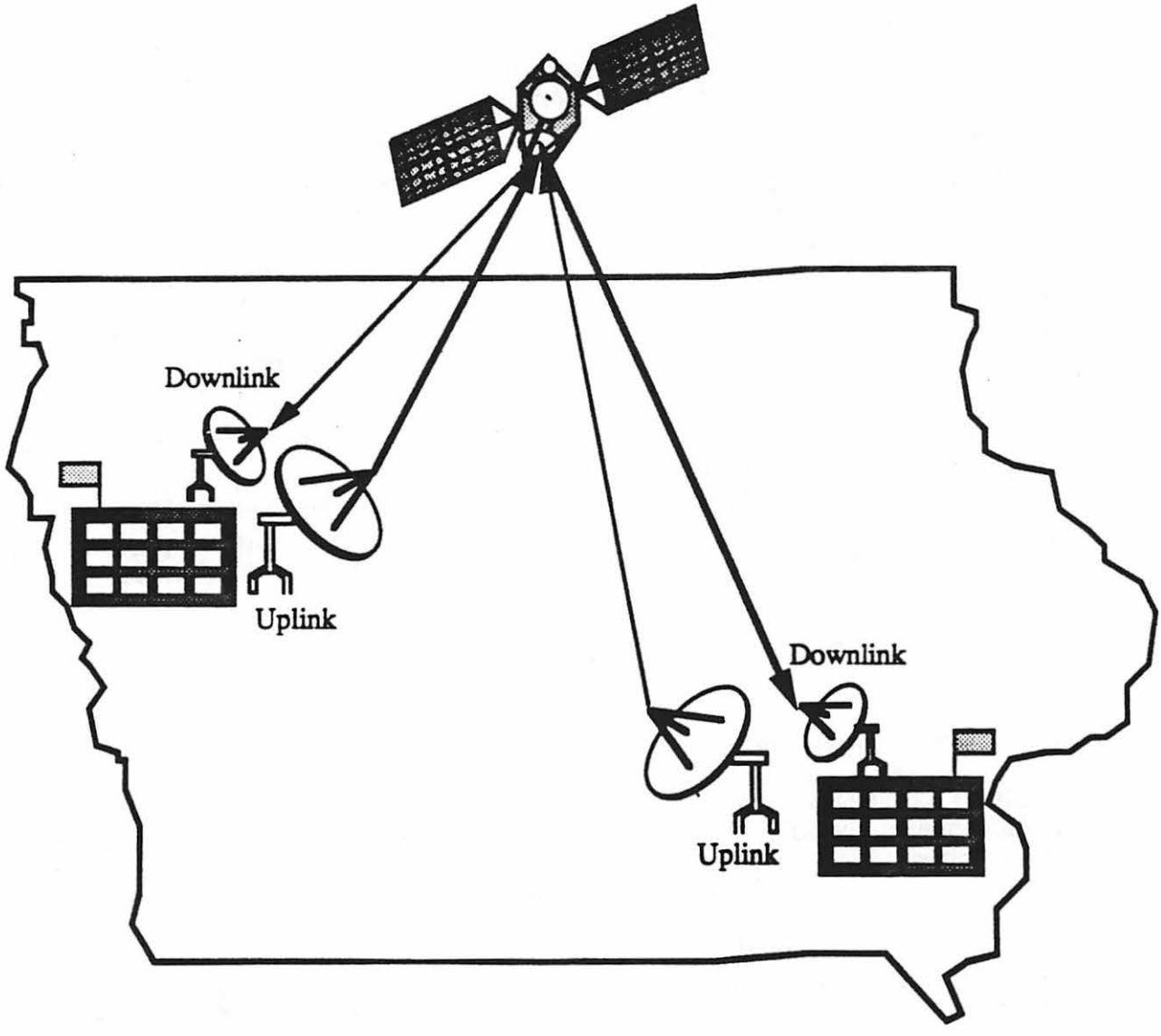


Figure 4-2

A key advantage to satellite systems is their ability to reach a large geographic area from a single transmitting site. This quality makes them ideal for one-way broadcast video systems. Unfortunately, implementing a two-way broadcast system requires expensive uplink facilities at each location, in addition to the down link facilities. This is the primary reason satellite technology is not appropriate for the ICN.

	PROS	CONS
Fiber Optics	• "Unlimited" Capacity • Capacity Easily Expanded • No Interference Problems	• Vulnerable to Cable Cuts • High Installation Cost • Requires Right-of-Way
Microwave	• Rapid Installation • Minimal Right-of-Way Issues • Portability	• Weather Degradation • FCC licensing • Limited Bandwidth • Tower Space or Location may be difficult to obtain • Difficult to Expand Capacity • Crowded Frequencies • Line-of-Sight Required
Satellite	• Wide Coverage Area • Cost is not Distance Sensitive • High Capacity	• Expensive Equipment • High Transmission Costs • FCC licensing of Uplinks • Affected by Interference

Figure 4-3: Comparison of Technical Alternatives

4.4 Cost Comparison

To illustrate the relative costs of these technologies, we developed cost models which adhere to the specifications in the RFP. Figure 4-4 presents these costs over 5, 10 and 20 year time periods. This comparison shows that fiber optics is the most cost-effective technology for providing the two-way full motion video capacity required for the ICN.

These models include installation, equipment, transmission, and maintenance costs. Installation costs include all costs involved in setting up the transmission systems. Equipment costs include all equipment necessary for an operational network as requested in the RFP. Transmission costs include the necessary facilities to provide the bandwidth specified in the RFP. Maintenance costs include all costs involved with preventive and technical maintenance along with network management.

NPV for Full Motion 2-way Interactive System

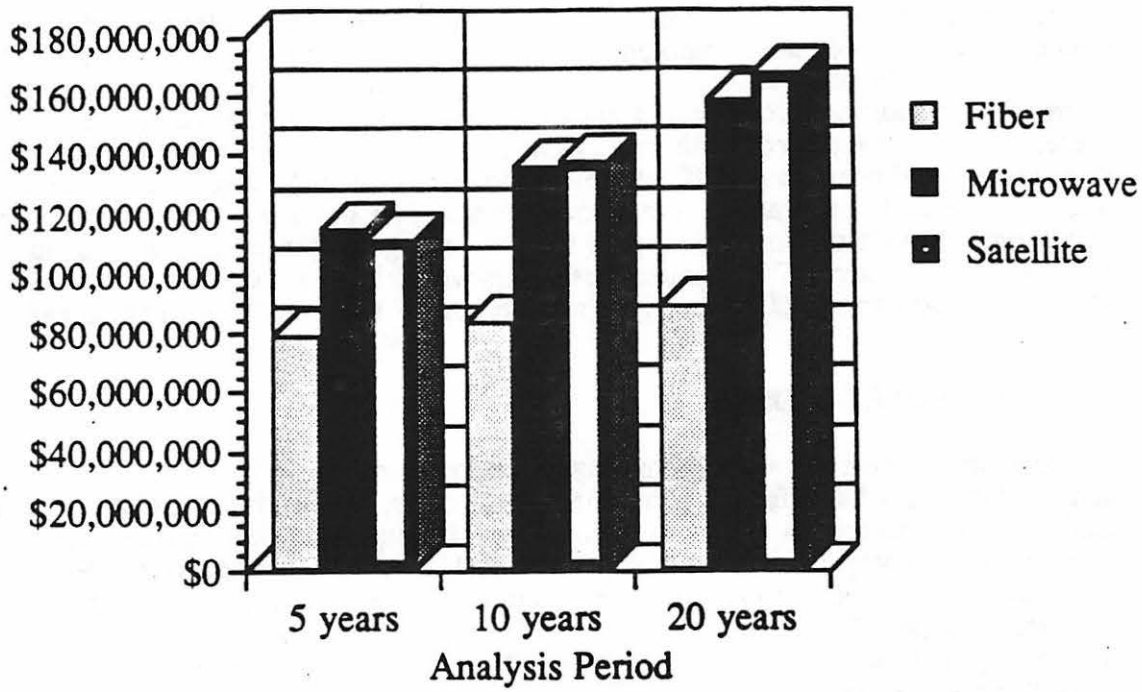


Figure 4-4

SECTION 5

ANALYSIS OF THE KIEWIT PROPOSAL

This section focuses on the financial aspects of the Kiewit proposal for the ICN. We understand that the General Assembly has the following concerns:

- Is the cost of the Kiewit bid reasonable and in line with similar projects?
- Are there network related costs not included in the bid?
- What are the potential cost offsets?

We find that the Kiewit bid is extremely cost-competitive with similar networks in other states. While the Kiewit proposal is comprehensive relative to the requirements specified in the RFP, we recognize that additional costs are required to operate the network. We estimate the net present value of these additional costs to be approximately $22.5 million over 20 years, increasing the net present value of the project to about $112 million. These costs account for additional network management and operations staff, administrative overhead, and equipment needed to support the State's voice and data traffic. We also recognize that users will incur costs to equip video classrooms, provide the power and space for networking equipment, and provide staff to help run and operate the system. We estimate these users would incur a fixed cost of roughly $40,000 for video classrooms and $42,000 yearly for support costs if these facilities do not already exist.

5.1 PROPOSED COSTS

We compared Kiewit Network Technology's proposed cost to similar state and industry networks and to standard T3 tariffs. In comparing these costs, we used a technique called "unit cost analysis." This technique allows us to compare different networks of various sizes and types by focusing on the comparison of the cost per a typical "unit" of network service. We have identified two such units for comparison: cost per T3 circuit and cost per mile. Figure 5-1 shows Kiewit's estimated cost per T3 circuit as compared with our industry examples. Figure 5-2 shows the result of applying cost per mile calculations to the ICN network as a whole. Both scenarios confirm that Kiewit's costs are very competitive with the current industry. All of the costs illustrated include transmission facilities, codecs, and switching equipment.

The T3 service cost in Figure 5-1 refers to an aggregated sample of competitive costs for T3 services from similar projects. The T3 Tariff cost represents a typical intrastate T3 tariff[10]. The ICN cost is based on the five year NPV proportioned over the average number of T3 circuits provided. The "Other" cost referenced in Figure 5-2 represents an aggregated sample of network costs from similar projects.

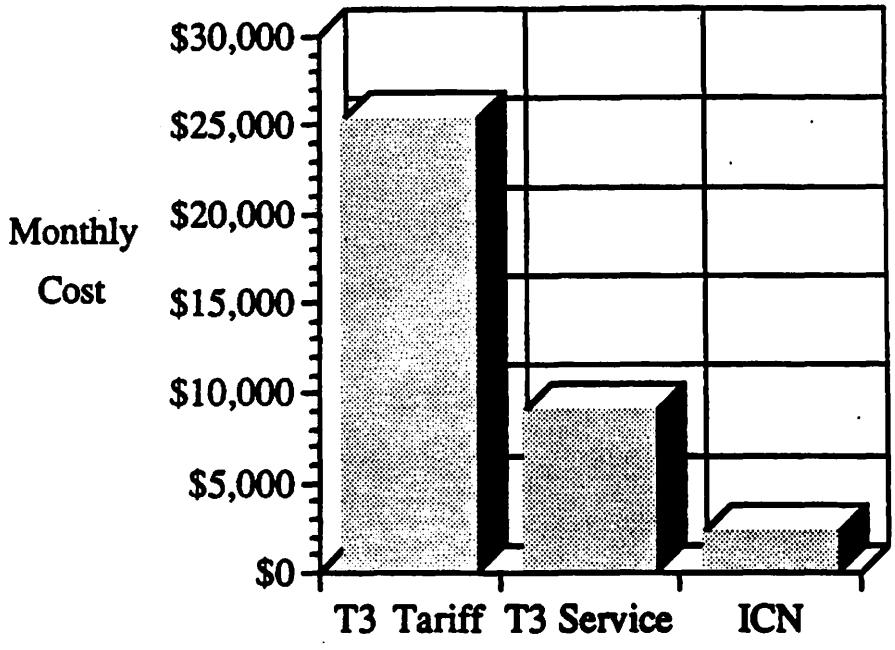
5.2 ADDITIONAL COSTS

While the Kiewit proposal is comprehensive relative to the requirements stated in the RFP, there are additional costs that the State and/or users will incur as a result of this project. The State will incur additional costs to administer and maintain the network. Colleges and regional schools will need to budget for the costs of video classrooms and other costs related to running the transmission

[10] This type of service is deregulated in Iowa, so Iowa has no such tariff.

equipment. Finally there are intangible costs, like user training and production of video programming, that need to be recognized.

Costs for a T3 Circuit



Note: T3 Tariff is a published rate whereas T3 service is a rate from a competitive procurement.

Figure 5-1

5.2.1 STATE COSTS

The State will incur additional expenses in the areas of network management, administration, and equipment needed to support voice and data traffic. The network management costs account for the 17 state employees identified in the RFP to support the switching sites, Iowa One-Call Inc.

services, and additional maintenance and network management personnel. We've estimated these costs to be about $1,200,000 per year.

ICN vs. Other Similar Networks

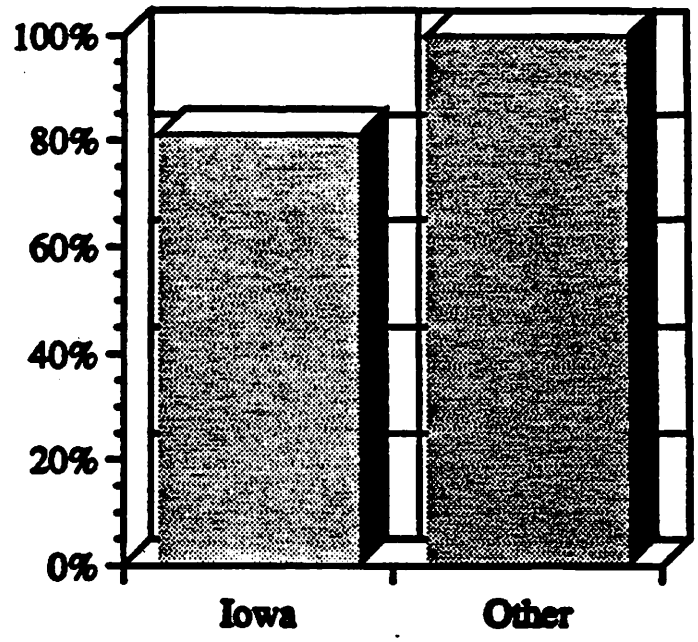


Figure 5-2

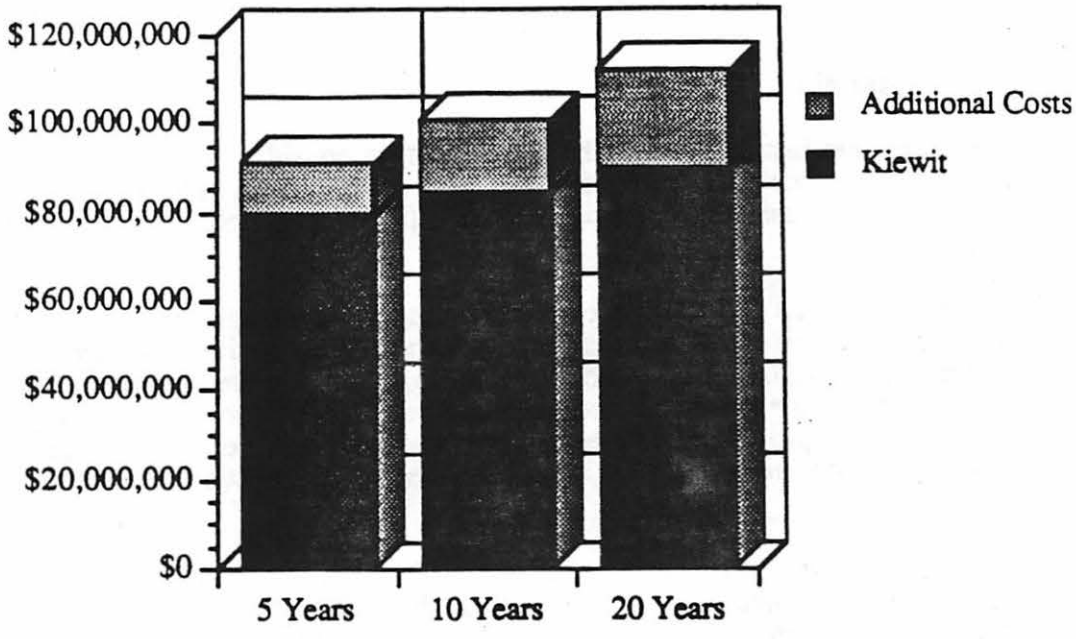
The network will also require additional administrative personnel to provide user support, billing functions, and general office functions required for a network of this magnitude. We estimate these additional costs to be about $500,000 per year.

The State plans to off-load some of its voice and data communications traffic onto the proposed network. While this will save some money annually, there is a one time cost for the additional equipment necessary for implementing this feature. The estimated cost for the extra equipment for voice and data communications is $5,000,000[11]. We understand that some of this equipment may already exist, so this figure represents a conservative upper bound.

Figure 5-3 illustrates the impact of the discussed costs on the Kiewit proposed costs.

11 Interview with Don Deeds, Spectra Associates.

Total ICN Costs



Note: Additional costs include operational, extra maintenance, administrative, and additional network management costs

Figure 5-3

5.2.2 USER COSTS

Other costs that need to be considered are those incurred by the colleges and regional schools. These costs account for video classroom equipment, power, space, and technical staff. The average video classroom capable of providing two-way interactive video has a one-time cost of $40,000. The estimated annual power cost per location is $3,000. The electronic equipment will require building space which translates to an estimated annual cost of $3,000. Finally, each school will need a technician for the day-to-day operations and maintenance of the equipment. This will

result in an annual cost of approximately $36,000, assuming that personnel would be hired to perform these functions.

	Fixed	Annual
Video Classroom	$40,000	
Power		$3,000
Space		$3,000
Technical staff		$36,000
Total Cost per School	$40,000	$42,000

While some schools may already have some of these resources, this figure represents a conservative baseline for budgeting purposes.

5.2.3 Intangible Costs

There are other intangible costs that the State must consider in the aggregate cost of the network. These costs include the costs for training users of the system, video production, video purchasing, for adding other users to the network, and replacement of equipment during the life cycle of the network.

The proposed costs do include the initial training of state employees in the functions and technical maintenance of the equipment; however, the costs do not include additional training for these and new employees of the State. Also, the costs do not include the training required for the users, like the teachers, of the system. Other costs for running a video network include video production costs for taped programming and the cost for purchasing educational programming. Finally, depending upon the technology chosen, extending the network to other users could involve a significant cost.

During the 20-year time period used for evaluation, the electronic equipment will need to be replaced at least once. Since the future of the industry is difficult to predict, the cost for the replacement equipment is difficult to quantify. We anticipate, however, that these costs will be similar in magnitude to the current equipment costs.

5.3 POTENTIAL COST OFFSETS

The Department of General Services has identified funds which may offset some of the State's costs for the proposed network. These include potential funding from the Federal Emergency Management Agency (FEMA), and contributions from the regional schools. There is also the potential cost avoidance realized by supporting administrative voice and data traffic over the ICN, as well as, Iowa Public Television's (IPTV) broadcast traffic.

The proposed network can potentially draw upon funds from FEMA for federal grant assistance. These funds are contingent on the network meeting specific FEMA requirements, many of which were incorporated into the RFP. The elements of the proposed network which assist the State of Iowa in meeting the FEMA specifications may be met dollar for dollar by federal grants. The Disaster Services Division has identified $11,800,000 of potential FEMA funding for the Iowa Communications Network, and has filed an application for these funds[12].

[12] "SCM Phase II Application to the Federal Emergency Management Agency for Federal Grant Assistance", Charles Richard Bartel, September, 1990.

We understand that regional schools serving as ICN hubs will help finance network costs. The contribution from the regional schools has been estimated at $5,000,000[13].

FEMA funding	$11,800,000
Regional School contributions	$5,000,000
Total Potential Funds	$16,800,000

Finally, the State may be able to avoid future costs for administrative voice and data traffic and IPTV broadcast video traffic. The costs paid to carriers for providing dedicated circuits between locations served by the ICN could be avoided, as the ICN could carry this traffic. The annual costs for administrative traffic have been estimated at $5,100,000[14]. Finally, if full motion video technology is implemented, IPTV can migrate approximately $600,000 worth of leased circuits to the ICN[15].

[13] Interview with Don Deeds, Spectra Associates.
[14] Interview with Don Deeds, Spectra Associates.
[15] Interview with John Saveraid, IPTV.

GLOSSARY

Bandwidth	Bandwidth determines the rate at which information can be transmitted across that medium. These rates are measured in bits (bps), kilobits (kbps), megabits (Mbps), or gigabits per second (Gbps). Typical transmission services are 64 Kbps, 1.544 Mbps (T1), and 45 Mbps (T3).
Central Office	The physical location where communications carriers terminate customer lines and locate the switching equipment that interconnects those lines.
Circuit	Means of two-way communication between two or more points.
Codec	A coder-decoder device which codes analog signals, such as speech, music, or television, into a digital format for transmission over digital networks. The reverse process is used to decode the digital format into analog signals. One is needed at each end of the channel.
Compression	The application of any of several techniques that reduce the amount of information required to represent that information in data transmission. This method reduces the required bandwidth and/or memory.
Customer Premise	The location at which the local exchange carrier is no longer responsible for the circuit and the customer's responsibility starts.
DS1	Digital signal level 1; a digital transmission format in which 24 voice channels are multiplexed into one T1 channel. (Also see T1 and Bandwidth)
DS3	Digital signal level 3; a telephony term describing the 45 Mbps signal carried on a T3 facility. (Also see T3 and Bandwidth)
Fiber Optics	The use of thin strands of glass to propogate transmissions signals. The maximum bandwidth at which a fiber optic cable can transmit signals has not yet been determined.
H.261	A developing CCITT standard for video compression. This compression method will be used to transmit video at rates between 64 Kilobits per second and T1 speeds. It is also referred to as Px64.
ICN	Iowa Communications Network
Inter-Exchange Carrier (IXC)	Carriers that can carry inter-LATA traffic. Long distance telephone companies such as AT&T, MCI, and US Sprint.
Interactive video	The capability to transmit and receive two-way video transmissions between two or more sites.

Local Exchange Carrier (LEC)	Carriers that can carry only intra-LATA traffic. Local telephone companies such as US West, Contel, Centel, and the independent Iowa telephone companies.
Medium (Media)	Any material substance(s) that can be used for the propagation of signals. Examples are copper, air, water, and fiber optics.
Microwave System	Point-to-point transmission system that transmit signals through the air using transmitters and antennas attached to tall towers.
Point of Presence	The point where the inter-exchange carriers responsibilities for the line begin and the local exchange carrier's responsibility ends.
RFP	Request for Proposal
Satellite System	The use of orbiting satellites to relay transmissions from one satellite dish to another or multiple dishes.
T1	A digital signal facility used to transmit at 1.544 Mbps. (Also see DS1 and bandwidth)
T3	A digital transmission facility used to transmit at 45 Mbps. (Also see DS3 and bandwidth)