A Study of the Major Problems Encountered in the Production of Videodiscs

J. Taylor Klotz

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A STUDY OF THE MAJOR PROBLEMS
ENCOUNTERED IN THE PRODUCTION OF VIDEODISCS

by

J. Taylor Klotz

An Abstract

of a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in the School of Communications at
Ithaca College

August 1983

Thesis Advisor: Dr. Charles Vance
ABSTRACT

The purpose of this study was to ascertain the major problems in videodisc production and to answer questions about the difficulties related to these problems. A survey was mailed to a randomly selected sample of 490 people throughout the United States and Canada, who had attended either a symposium or workshop on videodisc technology at the University of Nebraska E-TV Center. A total of 213 people or 43.4% responded to the survey. Responses were calculated in simple numerical tabulations and by a simple content analysis procedure. Major results indicated that (1) the major difficulties in videodisc production were in the areas of computer programming, single frame edits, shooting and mastering; (2) the majority of videodiscs that were produced were interactive laser videodiscs for education and training; (3) 98% of the videodiscs that had been produced were "successful" and (4) major reasons why respondents who had not produced videodiscs included cost and lengthy time involved in videodisc production.
A STUDY OF THE MAJOR PROBLEMS
ENCOUNTERED IN THE PRODUCTION OF VIDEODISCS

A Thesis Presented to the Faculty
of the School of Communications
Ithaca College

In Partial Fulfillment of the
Requirements for the Degree
Master of Science

by
J. Taylor Klotz
August 1983
Ithaca College
School of Communications
Ithaca College

CERTIFICATE OF APPROVAL

MASTER OF SCIENCE THESIS

This is to certify that the Thesis of
J. Taylor Klotz

submitted in partial fulfillment of the requirements
for the degree of Master of Science in the School of
Communications at Ithaca College has been approved.

Thesis Advisor: 

Candidate:

Chairman, Graduate
Program in Communications:

Dean of Graduate Studies:

Date: August 8, 1983
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Appreciation is given to the 213 respondents who made this survey possible, and also to The Nebraska Videodisc Design Production Group for their assistance in this study.

The author would like to give a note of thanks to Rick and Ralph Varn, not only for the much appreciated use of their word processor, but also for their friendship during the writer's stay in Ithaca.

Special appreciation is due to his girlfriend, Barbara Coleman, for her relentless love and assistance during the many months of this endeavor.
DEDICATION

To Mom and Dad—for twenty-three years of love, devotion and guidance.
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I. INTRODUCTION

Background

For the past three years the present author has studied the emerging videodisc industry. He attended both a videodisc symposium and a videodisc workshop at Station KUON-TV ETV-Network in Lincoln, Nebraska. The Second National Videodisc Symposium on the Design, Production, Premastering and Dissemination of Videodiscs (October 1981) afforded him the opportunity to see a number of videodiscs which had been produced and to listen to a number of guest speakers who had produced these discs. Along with the speakers were smaller workshops provided by hardware manufacturers and producers of various other videodiscs. These presentations and workshops enabled the author to see and hear from various producers what was the state-of-the-art. Of the 180 people who attended, the author spoke with at least 40.

The author enjoyed attending and participating in the demonstrations and lectures. Yet, when he left, he felt inspired but unfulfilled. He was still unsure about the detailed procedure of producing a videodisc.

Therefore, in December of 1981 the author travelled back to Nebraska to attend the Videodisc Design Production Workshop. This workshop was much smaller, about 30 people,
and included hands-on labs as well as lectures and group discussion. The author now understood the complexities of producing videodiscs from pre-production planning to final mastering. The production, which at the time of the symposium seemed so fascinating, was now an incredibly complex, highly technical process.

Over the past few years, the Nebraska Videodisc Design Group has been one of the foremost leaders in the videodisc field. Since so many people have gone to Nebraska to learn about the technology, and because they represent the population for the sample of subjects of this survey, the author felt it relevant to include some background on the symposia and workshops.

In the past three years, approximately 800 people have travelled from all over the world to Nebraska to see and hear the state-of-the-art in videodiscs. Each year, the Nebraska Videodisc Design Group holds one symposium and two workshops to provide the public with the most current information on videodiscs and videodisc technology.

This dissemination of information at these events takes place in a number of ways. The symposium includes a number of guest speakers (in 1981 there were six) who are the foremost producers of videodiscs at the time of the conference. Each speaker talks to the entire group of people for an hour on his/her specific videodisc project. After this presentation, questions are taken from a panel of ten experts in the
field, some of whom are guest speakers. After all questions from the panel are answered, the general audience is allowed to ask questions.

After each presentation, the participants have a fifteen minute break during which they may visit the hardware vendors. After the major presentations are over for the day, the audience may participate in mini-workshops and guest lectures from other videotext producers who are not the main speakers but have produced their own videotexts.

The workshops differ a great deal from the symposia. The audiences are much smaller, usually about 30 people, and include classroom lectures as well as hands-on participation. The lectures include all of the many facets of producing a videotext from the pre-production planning to the post-production and final mastering. Also included is a special guest lecture from a script expert who helps the participants overcome the difficulty of scripting an interactive videotext. The hands-on workshops include programming the videotext players and working with previously developed videotexts. Finally, the entire group is divided into smaller groups of about five people to design, script, shoot and edit a videotext of their own. This exercise, through the use of a specially prepared one-inch video tape recorder, simulates the interactivity of a videotext player.

The workshop gets at the real meat of what producing a videotext is all about. It takes the participant far beyond the remote and often abstract information that one gains at
the symposium. This statement does not suggest that the symposium is ineffective. The information one learns at the symposium is excellent, but doesn't tell the participant about the production end, which is vital to producing a videodisc.

No matter whether one has attended either a symposium or a workshop or both, there is a lot more to the complexity of producing a videodisc than is presented at the symposia or the workshops. Therefore, this study has been conducted not only to ascertain what the majority of production problems are but also to find the solutions to these same production problems.

**Statement of Problem**

With such a large number of people attending symposia and workshops, it would be interesting to know how many people who had attended either a symposium or a workshop had subsequently produced a videodisc; and if they had, what were the nature and reasons for their major problems and successes. This study is important because there are many questions and concerns about the future of videodiscs which remain unanswered. One may assume that videodiscs will be around for a long time in some capacity. There appears to be little in the literature that indicates the current problem trends. More importantly, there appears to be no specific answers to why people are or are not able to produce videodiscs. There are a number of people who have produced videodiscs, but there are many who have tried and failed.
II. REVIEW OF RELATED LITERATURE

The Videodisc Systems

There is a large body of literature that describes the videodisc technology. Presently there are two types of systems as explained by Nugent (1980):

At this point there is more than one type of videodisc. In general, they are separated into two categories: Optical and Capacitance.

Optical systems use a laser to read encoded information from the disc. Capacitance systems use various means to pick up electrical capacitance signals pressed into the disc.

(p. 2)

The major differences between optical and capacitance are that optical systems, because they use a laser beam to read the encoded material, have the ability to provide interactivity. The capacitance systems, because they are not "frame addressable", (Daynes, 1982) do not provide any interactivity. For more information, see Appendix D.

Problems in Videodisc Production

At the present time, there appear to be no surveys published investigating the problems and complications involved in producing videodiscs. The sources used in the literature search for the present study were the ERIC System and the Business Periodicals Index. The majority of articles found described the various uses of the interactive videodisc.
Only one article (Daynes, 1982) discussed the entire production process; yet, even this article only shows the production steps and does not reveal a great deal of information about specific production problems. The remainder of articles relate to a single problem in the area of production. (Bailey, 1980; Bejar, 1982; Clement, 1981; Etherington, 1981; Winslow, 1981)

Producing a videodisc can be quite simple, or it can be very complex. The level of difficulty is determined by the four levels (see glossary) of discs which one can produce. The simplest type of disc to produce (level one) is a straight replication of intermediate materials (see glossary) into disc format. This is the first level of production whereby the only additional material needed in the production are picture stops and chapter stops (see glossary). Regarding the difficulty of producing a videodisc, Clement (1981) wrote:

Videodisc producers generally agree that creating a videodisc program is relatively easy. Organizations with the skills to produce a videodisc or film should have little problem making a videodisc. Authoring systems (see glossary) now available greatly aid in the process of creating program interactivity. (p. 13)

Although Clement states that the production may be relatively easy, it isn't clear how many producers agree with this. In fact, the majority would probably disagree. The production of an interactive videodisc, the kind most often used for educational purposes, is very complex. It involves
a great deal more than the replication of intermediate materials to disc form. Replication itself may be very complicated, and judging from personal experience, can often be the reason for the failure of many disc projects. The steps and associated complications one may encounter, as suggested by the literature, in the production of a videodisc are indicated in the next few paragraphs.

The first step in designing any interactive videodisc is the same step as the design of any media program: needs analysis. Within the needs analysis, one determines the level of disc s/he is going to produce and the use of appropriate media. Once this step is completed, the design stage begins. Scripting the disc, unlike scripting a videotape, involves determining the number of branches (see glossary on branching) one wants to implement. This process varies in length as each branch requires a specific command from the microprocessor or additional computer.

For example, after turning the videodisc player on, the viewer selects one of a number of learning sequences. After the viewer has watched the instructional program, the sequence is followed by a multiple choice question. When the viewer makes his/her choice, the microprocessor, if it is a level two disc player, routes the disc to the appropriate response - branching. If the viewer responded correctly, the player would simply continue. However, if the viewer answered incorrectly, but the response wasn't too far off, the microprocessor would branch the viewer to a remedial assistance
segment. If the response was way off target, the microprocessor would branch the viewer back to the beginning of the learning segment where s/he would have to view the entire learning segment all over again.

The most difficult part of scripting is the process of deciding what the individual designer wants the learners to do after they have made their response. Related to this problem, Etherington (1981) has indicated the following:

Options is the only word that comes closest to describing what it is like to produce for videodisc. Assuming there is a micro-computer coupled with the disc player, options may be left open from the shoot all the way to viewing the disc. It is like working with a piece of putty that can be molded to your specific need at any step along the way. The layout of the program breaks down into various segments which can be individually accessable, or can be combined in any order to conform to the desired presentation. Add some new menus with a character generator, or enter a new series of commands into the micro-computer, and the whole structure of the program can change. (p. 37)

If the design of the disc is level three or level four, more problems arise. In a level three disc, the viewer may be able to answer in whole sentences which complicates the pre-production because it adds the element of computer programming. In writing the computer program, the computer programmer has to allow for all types of responses in order to activate the branching. For instance, if the answer to a question is "yes" the computer program has to be able to identify similar responses, such as "yup" or "I agree", for the program to work.
Level four is the most complicated level. It can include anything from multiple screen, multiple videodiscs, multiple computers and touch sensitive screens. The following is an example of the fourth level which has combined all of the previously mentioned items (Bailey 1980):

The viewer is sitting in front of the television. The scene he is watching is exactly the same as what he would see if he were in a car moving down the street in Aspen, Colorado. The "car" approaches an intersection and the viewer touches a left arrow on the bottom of the screen. The car turns left through the intersection and proceeds down the cross-street. At the next corner the viewer touches the right arrow on the screen and the car turns right in response, moving slowly toward the mountains in the background. Part way down the street, the viewer again presses the screen, this time on a stop signal, and the car halts beside Aspen's City Hall.

This time the viewer reaches out and touches the building on the screen and the view changes to a close-up of City Hall. "Would the viewer like to see the interior of City Hall?" the voice asks. "If the answer is yes, touch the building and a short film of City Hall will be shown." The viewer declines and instead touches the go sign on the screen, and the car resumes its journey down the street. Now there is a bar ahead that looks more interesting.

The armchair traveler may thus continue his remote tour of the city indefinitely, inspecting the sights just as any tourist would in his or her car. But on this trip, the traveler will use no gas, have no accidents, and never leave his television set. Unfortunately, his visit to one of Aspen's bars is strictly visual as well. (p. 11)
This project, the Aspen Project, was produced by MIT. It took over two years just to film it to include a complete change of seasons for the viewer. The sound recording for this project took 100 hours. Special cameras had to be developed and mounted to the top of a van to take pictures from all sides of the car. The sound recording and camera development are only some of the special work it took to produce this project.

The process of moving around on the screen is called "surrogate travel." By using surrogate travel, the viewer can move anywhere on the screen. Another project also developed at MIT was a bicycle manual which also uses surrogate travel. Instead of the town of Aspen, the viewer is presented with a picture of a bicycle. By pressing the pedals, the learner automatically is presented with a close-up of them plus a step-by-step procedure of how to repair them.

A bicycle repair manual on videodisc may seem simple, but not when put into context of far harder things to repair, such as cars. Imagine the mechanic who can't remember which valve to take apart for a compression check. Simply pressing the engine on the screen, then pressing the valves will immediately detail the instructions for the mechanic. Surrogate travel may one day be used in many applications of training. However, the cost and the time
to produce this type of project may prohibit its production for a long time.

Now that one has assembled all of the branches and has finished all of the scripting, the next stage is shooting. Shooting can be done on videotape or on film. The time required for shooting can vary considerably among projects. Assuming that one has no problems with the filming or taping of a disc project, the project must then be edited. Once edited the project must be transferred to one-inch videotape for final mastering. Here, judging by a presentation made at the 1980 Videodisc Symposium, is where some of the biggest problems arise.

When one uses videotape as an intermediate material, the transfer to one-inch videotape will be simple enough, but the disc will be flawed by a jittering picture. Jitter will occur because the speed at which videotape is shot and the speed of the videodisc player do not correspond. If film is used as the intermediate, flicker will occur (see glossary). The process to eliminate this is called "white flagging" (see glossary) but it is costly.

Another problem which receives a great deal of attention is that of "fields" (see glossary). If the final transfer to videotape is done and the fields are backwards, or in other words the transfer was started on the wrong field, the entire disc will be off by one frame.
Other intermediate materials, such as slides, can cause unique production problems. Here is a problem that MIT had with slides in their production (Bailey, 1980):

One important consideration in videodisc accessing is that the time lapse between slides must be optimized before the slide to film transfer. The time required to access one of the 54,000 frames on a disc side varies from 0-5 seconds—proportionate to the distance between the present and forthcoming frame. This problem is more difficult than one might imagine since each intersection is a branching decision. However, by positioning the slides in the order of likely access, the delay can be reduced. The remaining gap is reduced by using two videodisc players. (p. 15)

Now the editing process and final transfer of the intermediate material to one-inch tape is complete. If one is producing a level two disc, the computer information must now be encoded onto the final one-inch tape. If the disc is a level three or four, the computer programming will be done on an external computer and no computer information must be placed on the tape. It is the level two transfer of computer information which can cause another problem for videodisc producers as noted by Daynes (1982):
Some problems exist, however, when using a bare-bones level-two system. First, you can not just enter these programs [see Appendix E] into the player's memories and run them with any old videodisc. Significant frame locations, such as menus, questions, feedback frames, etc., must first be written and recorded onto videotape in an entirely separate environment (called post-production or pre-mastering). Once the significant frame locations, the program and the video have been mastered onto the disc, it becomes a "video ROM (read only memory)," which can cause another, more frustrating problem. If there is a bug in the program (e.g., the video player looks for the wrong frame number), the mistakes must be corrected by re-mastering the disc. DVA will provide a "proof" disc upon request so that the programming can be verified prior to replication. You can also have your program simulated with a computer-controlled video-cassette or video-tape-recorder (VTR) prior to mastering and replication, which seems to be a better solution. Either way, producing an interactive videodisc is a "top-down" situation that can end up costing a lot of time and money if you are not careful. (p. 53)

All four levels of discs require "frame codes" (see glossary) which enable the disc player to operate. However, problems are more likely to occur in the level two disc computer transfer (digital dump) than in the level three or four transfer because levels three and four require no computer information transfer. Therefore, the problems which arise in the computer information for levels three and four can be corrected on the computer diskette.
The computer programming involved in videodisc production differs in level two and three. In level two, computer information must be on the disc to make the player run, and a computer program must be written to activate all of the branching sequences. This second computer program can be input two ways. First, the computer program may be input into the player's internal memory after the disc has returned from the mastering plant. Second, it can be placed directly onto the disc in the pressing stage. The length of the secondary computer program is determined by the microprocessor in each player (see Appendix E). Therefore, if there is a bug in this secondary program, and the disc will not run, the only solution is to re-press the disc.

From looking at the computer program in Appendix E, one should be able to see that the computer program differs in the level two players, the Sony LDP-1000 and the DVA PR-7820. The computer programming for level three is often much more complex than level two programming. With the addition of an external computer, the programmer has a great deal more memory to work with than is available in the players' individual microprocessors. Yet, there are so many microcomputers on the market that choosing the right one is often hampered by the capability of the machine, as Bejar (1982) notes:
This reasoning suggests that it would be inappropriate to base research and development efforts entirely on the current crop of computers because they are now near the end of their life cycle. For example, the TRS-80 [Radio Shack] has definite limitations, such as the difficulty of going beyond 48K bytes of memory and implementing standard operating systems, such as CP/M. The Apple also has a serious limitation in the use of a non-standard video signal, which makes it difficult to integrate the video output from the computer and videot disc. (As it turns out there is a board from Video Associates Lab that makes this possible, but the board itself costs more than the Apple. Also, Adwar sells a black box, the ARS-170, that brings the Apple signal up to National Television Standard Code (NTSC) standards).

A second determining factor in the choice of a computer is the availability of software to facilitate the authoring process as well as the delivery of instruction. Currently the most powerful authoring system that supports both video tape and videot disc is the University of Utah's Video Courseware Implementation System (VCIS). The system runs under UCSD Pascal on a Terak 8510/a computer . . . The educational price was close to $8,000. (p. 80)

Although the right combination of computers and software that are available can determine the success or failure of the disc, there is yet one more piece of vital hardware to add to the level three and four design. This final piece of hardware is the computer interface. Again, because there are so many models, making the correct choice can be difficult, as Daynes (1982) notes:
Level three systems consist of either level one or level two videodisc players interfaced to a personal computer. Because there aren't any standards for videodisc players and due to the conflicting needs of videodisc producers and users, the interface can take many forms: those made exclusively for the Pioneer VP-1000; those designed to accommodate several disc players; interfaces made exclusively for Apple II, TRS-80, Atari, and custom-built computer systems; and generic interfaces made for any computer. Some interfaces are also designed to either switch (or "flip") back and forth from the computer's video output to the videodisc image or "key" the text/graphics from the computer directly onto the NTSC video. (p. 53)

The interface is probably not as much of a concern as the computer, but it is important because it adds an additional cost to the level three and four design.

The last two areas of concern in the production of a videodisc are cost and time. The amount of time it takes to produce an interactive videodisc is related to the level of difficulty. The cost of producing a videodisc may be the biggest reason why a large percentage of producers have not produced videodiscs. The cost of the hardware alone is often prohibitive as noted in the $8,000 cost of the Terak 8510/a and the University of Utah's Video Courseware Implementation System.
The problem of "cost" is explained by Winslow (1981):

But it must be realized that this kind of videodisc development—magnificent and exciting as it really is—is strictly for the fortunate few with very, very large program material budgets.

Look at just the below-the-line costs. This kind of videodisc application [referring to level three and four] begins with a player for $2,500 to $3,000, then adds $1,500 and up for the mastering and replication of each 30-minute program side—and all of this is before we get down to the really serious above-the-line costs involved in designing, scripting, computerizing, testing, validating, and installing a given instructional, training and information program of the kind we have been talking about.

Even given the unlimited availability of money, if all this—on a cost/benefit basis—resulted in sufficient quantities of completed, self-pacing, interactive, one-to-one videodisc programs that are useful to large numbers of persons in ways that were more beneficial to all concerned than non-videodisc (videotape, film, AV) programs and techniques we use now, all would be sweetness and light. (p. 38)

In summary there are a great number of problems one may encounter in the production of a videodisc. The problems include pre-production planning, design, scripting, shooting, computer programming, time, hardware, the final mastering and cost. The degrees of difficulty one may encounter in the production of a videodisc relate directly to the level of disc one is producing.
III. METHOD

Procedure

The production problems include pre-production planning, design, scripting, shooting, computer programming, time, hardware, the final mastering and cost. All producers may be facing these same production problems. Therefore, a survey was devised to ascertain what the majority of problems were. This survey was designed to obtain information on why people have or have not produced videodiscs, and what their major production problems were.

The survey was sent with cover letter (see Appendix A) to a randomly selected sample of people who had attended either a symposium or a workshop. The survey sample was a good list to use because it represented the larger population of media producers and users. Since these people not only came from all over the world, and because they had attended either a symposium or a workshop, they were probably the most likely ones who were working on videodiscs.

Overview of Survey Questions

The following presents the survey questions, and discusses the rationale for including these questions.

Question number one, (See survey instrument, Appendix B), "Which Symposium and/or Workshop did you attend?" was intended to establish the number of attendants at both symposia and workshop.
Question number two initiated a branching function with the instrument, and directed the respondents to the section on production questions. If the respondent had not produced, s/he was then directed to the alternate section on why they had not produced any videodiscs.

Question number three, "If yes, were they laser or CED?" established what kind of videodisc the company had produced. This question was important because the majority of problems associated with the production of a videodisc were in the production of a laser videodisc not in the production of a CED disc.

Question number four, "Were your discs successful?" indicated if the respondent had produced a disc that worked upon return from the mastering plant.

The fifth question: "Were your discs designed for: level 1-level 4?" determined the level of disc that was produced.

The sixth question, which dealt with the type of disc that was produced, had some effect on the types of problems encountered in the production. For example, if the disc was produced for educational purposes, it was an interactive disc which was more complicated to produce than an archival disc or an entertainment disc.
Question number seven, "Were your discs pressed at 3M, Sony, Pioneer, Discovision?" was important because the final replication of intermediate material to videodisc is a complicated problem which could determine the success or failure of a videodisc project.

Question number eight, "What was the pressing (turn-around) time for your disc?" was intended to provide information on the time factor which has reportedly been a problem in the past.

Question number nine, "Were your discs developed for: in-house use, public sale, demonstration, other?" determined the most popular applications of interactive videodiscs.

The tenth question, "Which of the following was your disc shot on: 16mm film, 35mm film, 3/4" video, 1" video or 2" video?" determined if the medium that a disc was shot on caused any problems in the final outcome of the project. (see glossary, under field and jitter)

"Did you use slides in your production?", the eleventh question, was related to single frame edits and the possible problems they caused.

Questions twelve through seventeen related to production problems caused by hardware, especially the microprocessor and external computers which can cause computer programming problems.

Question number eighteen, "In developing your videodisc, note the following tasks in terms of causing you difficulty?" pinpointed the tasks that caused difficulty in the production of the videodisc and rated them on a scale of one to five for difficulty.
The nineteenth question, "Please describe the major difficulties or problems you faced in producing your videodisc. How were the problems resolved?" was a catch-all question intended to produce additional information not asked about previously in the close-ended questions.

Question number twenty, "Please comment: What have been your major reasons for producing videodiscs?" was designed to add additional information about the person or company's preference for videodisc.

Question number twenty-one, "Do you plan to produce videodiscs in the future?" helped to assess the attrition rate. If people who have produced a disc had a great deal of difficulty, they may not want to attempt to produce another disc.

Question twenty-two, "At present, are you or your company using or producing: film, video, slide-tape, CAI, interactive video, other?" related the reasons why the company is not producing discs to what other forms of media they are indeed producing.

Question number twenty-three, "Of the previously mentioned media, which do you prefer to work with most?" was intended to ascertain what the respondent's favorite media was if given the opportunity to work with any medium.

The twenty-fourth question, "If you have not produced a videodisc, was it because of:" rated the reasons why people have not produced videodiscs.

The last question, question twenty-five, "Please comment on your major reasons for not using videodiscs?" was a catch-all question and intended to produce additional information not asked about previously in the close-ended questions.
IV. RESULTS AND DISCUSSION

Of the 490 surveys that were mailed out, 213, or 43.4% were returned. This high response rate may indicate that the respondents, who were promised a copy of the results, want more information on the subject of videodisc production. Another interesting fact about the survey was the varied responses. The respondents who replied to this survey work in private industry, education and the Army.

Data Analysis

The data was analyzed in two ways. First, the data was examined in simple percentage results. Second, the open-ended questions were evaluated by a simple content analysis procedure.

Question 1: Which symposium and/or workshop did you attend?

The results to question 1 are indicated in the following table:

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>symposium:</td>
<td>37.5%</td>
</tr>
<tr>
<td>workshop:</td>
<td>45.5%</td>
</tr>
<tr>
<td>both symposium &amp; workshop:</td>
<td>7.9%</td>
</tr>
<tr>
<td>neither:</td>
<td>8.9%</td>
</tr>
</tbody>
</table>

Of the 213 respondents, the 8.9% who responded that they attended neither a symposium or a workshop were individuals who answered a symposium/workshop attendee's survey.
**Question 2:** Have you or your company produced any videodiscs?

The results to question 2 are indicated in the following table:

---

**Table 2**

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<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>yes:</td>
<td>46.9%</td>
</tr>
<tr>
<td>no:</td>
<td>51.9%</td>
</tr>
</tbody>
</table>

---

Of the 213 respondents, the remaining 1.4% were in the process of developing a videodisc.

**Question 3:** If yes, were they Laser or CED?

The results to question 3 are indicated in the following table:

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**Table 3**

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<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser:</td>
<td>98.0%</td>
</tr>
<tr>
<td>CED:</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

---

The fact that more laser videodiscs were produced than CED by such a large margin indicates the importance of the laser videodisc for its interactive uses. The proof of this is seen in the results of question number six in which the majority of laser videodiscs were produced for education/training.
A CED disc has no interactive capability. Therefore, its uses for interactive education are minimal. It can, however, be just as effective as a videotape in the linear presentation of educational material. For instance, the RCA CED disc "Complete Tennis From The Pros" does an excellent job of teaching the home viewer how to play tennis. Although its uses are minimal in the corporate world, CED should not be counted out for its share of the home market.

**Question 4:** Were your discs successful?

The results are in table 4:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yes:</td>
<td>92.3%</td>
</tr>
<tr>
<td>no:</td>
<td>1.9%</td>
</tr>
<tr>
<td>other:</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

The significance of these results can not be overstated. With such a high percentage of respondents answering "yes" (in other words their discs worked upon return from the mastering plant) this supports that the videodisc is no longer a questionable or unreliable medium.

It should be noted here that there was some question among the respondents to the meaning of "successful". However, because of the open-ended responses to the above question, there was no likely effect on the outcome of the results.
A lot of credit should be given here to the mastering plants. When the technology was brand new, there were a number of problems at the pressing or mastering stage of videodisc production. This is not to say that there are no problems today (refer to questions 18 & 19 for further response). Of the two responses to the "no" category, one wrote, "they were never completed without significant errors in them so we finally (after two years) cancelled our order." All of these plants face the same potential problem—the plants must be dust free. If one particle of dust is stamped onto the disc, the disc will be ruined. However, the excellent response to this question should be good news for those who planned to develop videodiscs but did not because of the fear of mastering problems.

Of those who commented on the "success" of their discs, six said that their discs worked upon return from the mastering plant, as best noted by one respondent's comment, "They worked correctly, came in on budget and on schedule."

The importance of the authoring system, as noted earlier in the text, can not be understated. It was encouraging to read that the production of videodiscs have helped in this area. One person indicated, "They were done for R & D purposes and were successful in helping us develop authoring systems."
The success or failure of any videotdisc is often not only determined by the technical fact that it does indeed work, but also by the response of co-workers and clients. Three responses indicated the following:

Received wide acclaim in training community for setting standards in interactive, hands-on training.

Our clients came back for more.

Produced one disc - interactive - for a point of purchase display - extremely well received. Produced 2nd for our Consumer Division - very well liked. 3rd for a continuous 4 screen show for an amusement park "video exploratorium" learning center - again - excellent reception.

Finally, the "success" of the disc project can also be based on its use after completion. For example this respondent wrote, "Have been used for the video component of our entire product line."

Question 5: Were your discs designed for level 1, 2, 3, or 4?

The results are indicated in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>level 1:</td>
<td>11.5%</td>
</tr>
<tr>
<td>level 2:</td>
<td>22.3%</td>
</tr>
<tr>
<td>level 3:</td>
<td>43.1%</td>
</tr>
<tr>
<td>level 4:</td>
<td>23.0%</td>
</tr>
</tbody>
</table>
Each of the four levels of design represents a degree of interactive sophistication. The higher the degree of sophistication, the more interaction a person has with the disc. Judging by the number of responses to the 2nd (22.3%), 3rd (43.1%) and 4th (23%) levels as compared to 11.5% for the first level, it is quite apparent that the respondents want the higher levels of sophistication.

Even with the additional cost of an external computer, the 3rd level of design was the most popular. There are a number of reasons for this popularity. One, the addition of the external computer allows for a greater degree of flexibility in the computer programming of the disc. Two, the computer program can be changed after the disc returns from the mastering plant. Third, any errors in the computer programming can be changed; whereas, with the level two design, in which the computer information must be placed directly on the disc, any problem which occurs in the computer programming after the disc has returned from the plant is unchangeable.

Although the majority of responses were to level "3", level "2" offers a good deal of interactivity without the added expense of an external computer. Level 4, on the other hand, offers the highest level of sophistication with such things as multiple disc players and touch-sensitive screens. This level of design is for those who want the best and have a great deal of money to spend. It is the most costly level of design, and for this reason it
was somewhat surprising to see such a high level of response (30.7%). Some respondents indicated that they did not understand the meaning of the 4th level, but because the respondents wrote in their own definition, this ambiguity did not affect the results.

**Question 6:** Are your disc archival, educational, entertainment or other?

The results of the sixth question are listed in table 6:

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>archival</td>
<td>6.0%</td>
</tr>
<tr>
<td>educational/training</td>
<td>73.4%</td>
</tr>
<tr>
<td>entertainment</td>
<td>6.8%</td>
</tr>
<tr>
<td>other</td>
<td>13.6%</td>
</tr>
</tbody>
</table>

Educational/training was the highest category because of the disc's interactive learning capabilities.

Although the responses of 6% and 6.8% for "archival" and "entertainment" are minimal, a point should be made in favor of the disc's use for archival storage in that it is a marvelous storage medium with the capability of storing 54,000 slide shots. As an entertainment medium, its limits have hardly been touched; especially when one considers all the interactive possibilities of combining an interactive videodisc and a joystick or computer keyboard for all those eager arcade wizards.
Of those who responded to "other", eight responses were "marketing/point of sale", three were "demonstration", two were "developmental" and two were "technical manuals". These responses clearly indicate the wide variety of applications for interactive videodiscs.

**Question 7:** Were your discs pressed at 3M, Sony, Pioneer, Discovision, or other?

The results to question 7 are listed below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pioneer:</td>
<td>32.6%</td>
</tr>
<tr>
<td>Discovision:</td>
<td>25.0%</td>
</tr>
<tr>
<td>3M:</td>
<td>24.3%</td>
</tr>
<tr>
<td>Sony:</td>
<td>13.5%</td>
</tr>
<tr>
<td>Other:</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

The basic stipulation in choosing where one presses a disc depends somewhat on which machine the disc will be played. The percentage of pressings at the old Discovision and new Pioneer plant (57.6%) indicates not only that people previously pressed at one of the first plants, Discovision; but that many people, including the ones that previously used Discovision, have continued to use the plant when it became Pioneer because they own Pioneer or Discovision players.
3M, which can press discs for Sony, Pioneer and Disco-vision players, is a much newer facility, and after working out all the bugs, has a fairly high share of the market with 24.3%. Although Sony only pressed 13.5% of the total responses, this does not mean that Sony is worse than Pioneer or 3M. Some of the reluctance in sending the video material to Sony might be having to wait longer for the discs to return from Japan.

Of the 3.8% who answered "other", these discs were pressed at RCA or for the Thomson player.

**Question 8:** What was the pressing (turn-around) time for your disc?

The results are indicated in the following table:

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 weeks</td>
<td>13.8%</td>
</tr>
<tr>
<td>3-4 weeks</td>
<td>20.4%</td>
</tr>
<tr>
<td>5-6 weeks</td>
<td>19.4%</td>
</tr>
<tr>
<td>6-8 weeks</td>
<td>27.0%</td>
</tr>
<tr>
<td>over two months</td>
<td>18.9%</td>
</tr>
</tbody>
</table>

These percentages indicate that pressing times can vary widely. Although "6-8 weeks" was the most frequent response, "3-6 weeks" would probably be a better average.
Question 9: Were your discs developed for:

The results to question nine are listed below:

```
Table 9

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-house use</td>
<td>43.5%</td>
</tr>
<tr>
<td>public sales</td>
<td>10.8%</td>
</tr>
<tr>
<td>demonstration</td>
<td>29.9%</td>
</tr>
<tr>
<td>other</td>
<td>15.6%</td>
</tr>
</tbody>
</table>
```

In the category "other", five discs were developed for military, three were developed for "point of sale/marketing" and two were for delivery to client.

Question 10: Which of the following was your disc shot on?

The results are indicated in table 10.

```
Table 10

<table>
<thead>
<tr>
<th>Format</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>16mm film</td>
<td>13.4%</td>
</tr>
<tr>
<td>35mm film</td>
<td>11.1%</td>
</tr>
<tr>
<td>3/4&quot; video</td>
<td>19.5%</td>
</tr>
<tr>
<td>1&quot; video</td>
<td>43.5%</td>
</tr>
<tr>
<td>2&quot; video</td>
<td>12.2%</td>
</tr>
</tbody>
</table>
```
One-inch video received the highest response rate of 43.5% because its cost vs. quality ratio is far superior to 3/4" video and is far less costly than 2" video. Editing of 1" video can be done on many computerized editing systems whereas 3/4" video, because of its cassette format, can not be edited the same way. One-inch video is better for single frame edits than 3/4" video because the tape is less likely to stretch (see questions 18 & 19). Film's greatest advantage over video is its ability to be shot in low light levels. Film can be transferred to 1" video for editing, but there is still the likelihood of 3-2 pulldown (refer to glossary) which must be white flagged (see glossary) in order to correct still frame jitter.

Question 11: Did you use slides in your production?

The answers to question 11 are indicated in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yes:</td>
<td>60.1%</td>
</tr>
<tr>
<td>no:</td>
<td>39.8%</td>
</tr>
</tbody>
</table>

Slides work well for static shots and graphics that can not be input from the character generator. Slides are especially oriented for videodiscs because of the player's inherent still frame capability.
**Question 12:** Do you presently own a videodisc player?

The response to question 12 is indicated in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>85.5%</td>
</tr>
<tr>
<td>no</td>
<td>14.4%</td>
</tr>
</tbody>
</table>

Of the 104 responses to this question, the majority of respondents own players because they use them for "in-house" or "demonstrational" purposes. If one is going to produce for videodisc, it is a good idea to obtain a player or several different players. Not only will using a player help one visualize interactivity better, it will help one understand the different applications of the players.

Each player has its own unique characteristics. Inputting computer data differs on most of the players. The decision one makes about the player, although based somewhat on the cost of the unit, should also be based on the level of disc design. If one is going to design a level "3" or "4" disc, where an external computer is necessary, one should keep in mind the cost of the external computer and the cost of the computer interface as they will add to the total cost of the hardware.
If one is going to produce only level "3" (i.e., you need no internal memory from the videodisc player) the Pioneer 1100 and an external computer is the best cost/effectiveness available. Although the search time, the time it takes to find one frame or segment of frames on the disc, is a little slower than the Sony LDP 1000 and Pioneer 8210, the cost is substantially less.

**Question 13:** If yes to number 12, is it a:

The answers to the number and types of players are listed in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Quantity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6 &gt; 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovision PR 7820 Model I</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Discovision PR 7280 Model II</td>
<td>15</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Discovision PR 7820 Model III</td>
<td>28</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Sony LDP 1000</td>
<td>26</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pioneer 1000/similar</td>
<td>17</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pioneer PR 7280 Model I</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pioneer PR 7820 Model II</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pioneer PR 7820 Model III</td>
<td>11</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>21</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

In the category "Other", one player was a Pioneer 1100, four were Pioneer 8210's, two were Magnavox 8010 and one was a Thomson CSF Transmissive.
The response to this question indicates that the old Discovision, now Pioneer, players are the most popular. There are two reasons for this finding. One, the Discovision company is one of the oldest. Two, the early problem of having to press one's discs at the same plant that the player came from meant that more people were inclined to have their discs pressed in America than in Japan.

**Question 14:** Are you happy with your machine?

The results are listed below in table 14.

---

### Table 14

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>85.0%</td>
</tr>
<tr>
<td>no</td>
<td>2.2%</td>
</tr>
<tr>
<td>sometimes</td>
<td>11.4%</td>
</tr>
</tbody>
</table>

---

Although most of the responses (85%) indicate that the people are happy with their machines, there were some differing opinions, such as the following:

60-70% happy - some problems can not be repaired locally.

VP 1000 (Pioneer) are unreliable; PR7820-III very fast; Sony LDP 1000 - fine; PR8210 - so far so good but slow.

Would appreciate more software flexibility such as auto-reverse which is available in manual control but not when connected to an external computer.
Amazingly durable.

DVA reliability has been good. Sony has a good record also.

Sometimes we have to move it [DVA 7820-III] often and it doesn't like moving.

Very durable - they [DVA 7820-III] travel a lot.

**Question 15**: Do you own an external computer?

The responses to question 15 are indicated in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yes:</td>
<td>86.5%</td>
</tr>
<tr>
<td>no:</td>
<td>13.4%</td>
</tr>
</tbody>
</table>

Judging by the number of level 3 and 4 disc designs, it is easy to understand why so many respondents have external computers.

**Question 16**: If yes to number 15, is it a:

The results are noted in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple 2:</td>
<td>42.3%</td>
</tr>
<tr>
<td>Apple 3:</td>
<td>4.6%</td>
</tr>
<tr>
<td>IBM Personal:</td>
<td>13.8%</td>
</tr>
<tr>
<td>Radio Shack:</td>
<td>3.8%</td>
</tr>
<tr>
<td>Other:</td>
<td>35.3%</td>
</tr>
</tbody>
</table>
Choosing an external computer is probably a far harder decision to make than choosing a videodisc player. There are by far a great deal more computers to choose from than there are videodisc players.

The highest percentage of responses went to the Apple 2 computer. Perhaps this is because the Apple 2 was one of the first microcomputers. However, the Apple 2 is not necessarily the best computer, especially when one considers the number of microcomputers on the market today.

In the category "other", many of the respondents have used various brands (see below) to meet their needs. Others have built their own or modified existing models to meet their demands. One does not have to build his/her own computer. However, some of the level 4 designers needed more capability than was offered by the store-bought computers, so they designed their own.

The following table represents the different computers that the respondents use:

<table>
<thead>
<tr>
<th>Computer</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atari</td>
<td>4</td>
</tr>
<tr>
<td>Atari 800</td>
<td>3</td>
</tr>
<tr>
<td>CDC 110</td>
<td>1</td>
</tr>
<tr>
<td>CDC Plato</td>
<td>1</td>
</tr>
<tr>
<td>Company Product Line</td>
<td>1</td>
</tr>
<tr>
<td>Company Built</td>
<td>2</td>
</tr>
<tr>
<td>Commodore 64</td>
<td>2</td>
</tr>
<tr>
<td>Cromemco</td>
<td>1</td>
</tr>
<tr>
<td>Cromemco System 3</td>
<td>2</td>
</tr>
<tr>
<td>Data General Nova III</td>
<td>1</td>
</tr>
<tr>
<td>Franklin Ace 1000</td>
<td>1</td>
</tr>
<tr>
<td>Kapro II</td>
<td>1</td>
</tr>
<tr>
<td>Matrox MACS 10</td>
<td>1</td>
</tr>
<tr>
<td>Motorola 6800</td>
<td>1</td>
</tr>
<tr>
<td>Motorola 6809</td>
<td>1</td>
</tr>
<tr>
<td>Osborne</td>
<td>1</td>
</tr>
<tr>
<td>PEI 8032</td>
<td>1</td>
</tr>
<tr>
<td>Prime Mini Computer</td>
<td>1</td>
</tr>
<tr>
<td>Rair 8085</td>
<td>1</td>
</tr>
<tr>
<td>Regency</td>
<td>2</td>
</tr>
<tr>
<td>Sony SMC-70</td>
<td>5</td>
</tr>
<tr>
<td>Sony PC</td>
<td>1</td>
</tr>
<tr>
<td>TI Professional</td>
<td>1</td>
</tr>
<tr>
<td>Vax-II/80</td>
<td>1</td>
</tr>
</tbody>
</table>
Question 17: If yes to number 15, what kind of interface do you use?

One interface is not necessarily better than the other. Of the large number available, each has its own strengths and limitations. Table 17 indicates the responses regarding the types of interfaces:

Table 17

<table>
<thead>
<tr>
<th>Interface</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIO:</td>
<td>1</td>
</tr>
<tr>
<td>Allen Communications VMI:</td>
<td>21</td>
</tr>
<tr>
<td>Allen Communications Universal:</td>
<td>5</td>
</tr>
<tr>
<td>Company Built:</td>
<td>6</td>
</tr>
<tr>
<td>Coloney VAI 1:</td>
<td>3</td>
</tr>
<tr>
<td>Coloney VAI 2:</td>
<td>2</td>
</tr>
<tr>
<td>Coloney VAI 3:</td>
<td>2</td>
</tr>
<tr>
<td>Disc Master 1000:</td>
<td>1</td>
</tr>
<tr>
<td>EIA/51A:</td>
<td>1</td>
</tr>
<tr>
<td>IEEE88:</td>
<td>1</td>
</tr>
<tr>
<td>Hitachi VIP 9500 (built into player):</td>
<td>1</td>
</tr>
<tr>
<td>Media Graphics:</td>
<td>1</td>
</tr>
<tr>
<td>Omniscan:</td>
<td>1</td>
</tr>
<tr>
<td>Parallel:</td>
<td>1</td>
</tr>
<tr>
<td>Pioneer UEI:</td>
<td>1</td>
</tr>
<tr>
<td>Serial:</td>
<td>1</td>
</tr>
<tr>
<td>Sony RS 232:</td>
<td>11</td>
</tr>
<tr>
<td>Sony RS 232 C:</td>
<td>4</td>
</tr>
<tr>
<td>SSM, Inc.:</td>
<td>1</td>
</tr>
<tr>
<td>Whitney:</td>
<td>1</td>
</tr>
</tbody>
</table>

Again, one can note that some of the interfaces that have been used are not directly off the shelf. Some interfaces didn't serve the purpose of the designer, so they built their own.
Question 18:  In developing your videodisc, place a check appropriately to describe the following tasks in terms of causing you difficulty.

The results to this question are reported in table 18:

<table>
<thead>
<tr>
<th>task</th>
<th>very simple</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>very difficult</th>
<th>5</th>
<th># of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>scripting:</td>
<td>14.2%</td>
<td>14.2%</td>
<td>40.4%</td>
<td>23.8%</td>
<td>7.1%</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>shooting:</td>
<td>16.4%</td>
<td>24.0%</td>
<td>40.5%</td>
<td>17.7%</td>
<td>1.2%</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>editing:</td>
<td>15.1%</td>
<td>21.5%</td>
<td>32.9%</td>
<td>27.8%</td>
<td>2.5%</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>test transfer:</td>
<td>24.6%</td>
<td>24.6%</td>
<td>33.8%</td>
<td>12.3%</td>
<td>4.6%</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>film transfer:</td>
<td>28.3%</td>
<td>15.0%</td>
<td>41.5%</td>
<td>11.3%</td>
<td>3.7%</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>computer programming:</td>
<td>13.1%</td>
<td>17.1%</td>
<td>27.6%</td>
<td>30.2%</td>
<td>11.8%</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>single frame edits:</td>
<td>21.2%</td>
<td>25.7%</td>
<td>19.6%</td>
<td>22.7%</td>
<td>10.6%</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>final transfer to video:</td>
<td>26.0%</td>
<td>14.4%</td>
<td>34.7%</td>
<td>18.8%</td>
<td>5.7%</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>fields:</td>
<td>31.3%</td>
<td>26.8%</td>
<td>34.3%</td>
<td>7.4%</td>
<td>0.0%</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>mastering or pressing:</td>
<td>28.3%</td>
<td>24.3%</td>
<td>27.0%</td>
<td>13.5%</td>
<td>6.7%</td>
<td>74</td>
<td></td>
</tr>
</tbody>
</table>
For the purpose of illustration, selected responses to question number 19, "Please describe the major problems or difficulties you faced in producing your videodisc. How were the problems resolved?" have been combined with the percentage data from question number 18.

**Scripting**

The most common response (mode) to the level of difficulty was "3" and the average response was 2.96. Judging, however, by the percentage of responses in the 3rd and 4th levels of difficulty, scripting is one of the harder tasks in the development of a videodisc. Scripting an interactive videodisc, because of its non-linear format, can be considerably more difficult than scripting a slide/tape or videotape production. Here are some comments on the difficulty of scripting:

- Scripting is time consuming because of branching . . .
- Scripting exactly what we wanted the disc to play back.
- Script approvals. Too many people had input into the final script.

Because interactive videodiscs are non-linear, a major problem was thinking interactively or visualizing interactivity as noted by the following responses:
One major problem was the readjustments necessary by the staff - who were used to producing linear programs. The solution: daily reminders for them to think segment by segment.

We had to stop thinking in a linear fashion and look at our disc as though it was a book (divided into chapters) with logical starts and stops.

Person writing script was not innovative in use of random access capabilities of videodisc - (solution) rewrote script.

Getting the executive producers to understand the philosophic and aesthetic differences between linear and non-linear formats. This problem has not been solved, only obscured by the cost of lv [laser videodisc] utilization.

**Shooting**

The mode was "3" and the average response was 2.97.

Shooting an interactive videodisc is pretty straightforward. In fact, it can often be easier than a straightforward videotape since many of the segments in an interactive disc, because they end with multiple choice questions rather than cut or dissolve into another segment, don't have to be edited together. The one problem a respondent commented about was whether to "shoot on film or tape".

**Editing**

The mode was "3" and the average was 2.81. Editing for videodisc can cause a number of problems that don't normally occur in the editing of film or videotape. The biggest problem with editing is making sure that the editing
system operator knows which field the editing system starts on. (For comments see "fields" in this section). Within a videotrack there are two fields per frame. If the editor starts on the wrong field, the entire disc will be off by one field. If the disc was off by one field, all the still frames would also be off by one field. Therefore, the viewer would see half of one still frame and half of the other still frame. It is very important to have the proper editing equipment as one respondent noted:

> All internal problems due to lack of sophisticated computer editing equipment and trying to make use of film editing equipment which is a carry-over from the past [sic]. However with the use of video applications with videotrack the necessary editing equipment will be provided.

In most of the major production houses that either use a computer editing system or have previously edited for videotrack, the system operator should know which field the editing system starts on.

**Text Transfer**

Number "3" was the mode and the average response was 2.7. Text transfer rated lower on the difficulty scale than most of the other tasks. The reason for this being that it is not the most complex task, but it is one of the most time consuming, as one respondent comments, "... slow process of inputting character generator material for text." If one has pages of text in his/her script, inputting this information will be time consuming and could
be very costly depending on how much the character generator operator charges per hour.

**Film Transfer**

The average response was 2.47 and the mode was "3". Film transfer was not really a major problem. The number of responses to this question was low partly because so many respondents shot their videodisc on videotape.

**Computer Programming**

Number "4" was the mode and 3.10 was the average response. Computer programming also scored the highest percentage in the number "5" or "most difficult" category. Computer programming should be placed as a priority in the pre-production stage, as one respondent comments on related difficulty:

Getting a computer programmer/designer to develop the computer program to do what we want. We got lucky and accidentally connected with a program designer. But we wasted 8 months of work until then.

The computer programmer must understand each of the script segments and know how to program each and branch. Just as the designers had trouble thinking and scripting interactively, so too might the computer programmer. One respondent wrote, "Original programmer could not be used. Had to make several trips to explain layout and design and instructions to new programmer."
Reviewing the program content with the programmer is especially important if the disc is a level 2 design and the computer program must be placed directly on the disc. Level 2 discs have a limited amount of computer space; therefore, the programmer must be concise, as one respondent noted, "Biggest limiting factor is the computer programming capability for our interactive systems."

If there are any mistakes on the level "2" disc when it returns from the plant, they will be uncorrectable. One respondent indicated this problem with, "programming/encoding [which was resolved by] additional revised proof disc." Problems in computer programming could be very costly in the time it takes to correct the mistakes, the cost of making the corrections and the cost of having the disc pressed again.

If the disc is a level 3 design (with an external computer) any computer programming can be corrected on the floppy disc; but corrections also cost time and money.

**Single Frame Edits**

Number "2" was the mode and 2.75 was the average response. Single frame edits ranked both low and high. They were second to computer programming in the number of responses in the "most difficult" category, yet they were most common in the number "2" category. One reason why "single frame edits" ranked both low and high could be that
problems in this area are more likely to occur depending on the number of still frames in the disc.

Single frame editing, or the ability for the editor to place information into one single frame of the videotape, is difficult. For instance, if the single frame has to be re-edited several times, the videotape will stretch. As one respondent indicated, many problems can occur with still frames:

Most problems center around still frames: image quality, still storage, editing, field dominance after 30fps transfer, font size, font style. Solutions are the series of compromises you make during production as budgets and deadlines winnow the alternatives to remaining choice.

Final Transfer to Video

Here, "3" was the mode and 2.63 was the average response. The majority of responses in this category indicate that final transfer to video is not a major problem.

Fields

A "3" was the mode and 1.83 was the average response. The majority of responses indicate that "fields" are not really a problem. As stated earlier under "editing", "fields" are only a problem if the editor does not know which field the editing system starts on. Again, one respondent noted that his/her problem stems around the editing hardware:
The major problem involved our lack of equipment, in-house, capable of performing frame accurate odd field edits. Therefore we use U. of Nebraska for editing and consultation.

Mastering or Pressing

The average response to this question was 2.43 and the mode was "1". The results to this question can be deceiving. Although 21 responses indicated that mastering is the "least difficult" part of the production, 20 indicated number "3" and 5 indicated "most difficult".

One can have problems in the mastering or pressing stage, but the percentage of successful discs (discs that will operate correctly upon return from the factory) have improved tremendously over the years. In comparing the number of successful discs to the number which failed, a large part of the problem could have been the Discovision plant which has since been closed and is now owned and operated by Pioneer.

All plants have their problems, and blaming all unsuccessful discs on the Discovision plant would be unfair. One thing to remember is that these plants operate under "class A" clean-room conditions. There can be no dust in the room.

Although the plants are better today than at their formative stages, there are still a few problems, as illustrated by the following representative quotes:
... time delays because of mastering problems.

We produce a lot of level 2 discs with multiple digital dumpst. The major problems with many dumps on a disc is the transportation between dumpst. Sometimes that's a programming problem, sometimes it is a mastering problem. The mastering process is still not as efficient as it should be, i.e., multiple dumpst.

Discs technically flawed causing rejection by the machine.

Major problem on the first disc was poor documentation from disc manufacturers on format (film, cue codes, etc.) for disc pressing. Time and more experience on both sides of the problem have alleviated this problem.

It is possible that tasks differ in difficulty among the different levels of production. Therefore, it is important to re-analyze the data in question number "18", and break the tasks down by the 2nd, 3rd and 4th levels, as indicated in tables 18 A-18 J.

---

**Table 18 A: Scripting**

<table>
<thead>
<tr>
<th>Level #</th>
<th>Very Simple</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Very Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9.0%</td>
<td>9.0%</td>
<td>36.3%</td>
<td>27.2%</td>
<td>18.1%</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6.4%</td>
<td>16.1%</td>
<td>51.6%</td>
<td>22.5%</td>
<td>3.22%</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20.0%</td>
<td>6.6%</td>
<td>33.3%</td>
<td>26.6%</td>
<td>13.3%</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
Although the mode for all three levels was "3", the average response was slightly higher in level 2 (3.3) than both levels 3 and 4 (3.0). The difficulty in scripting a level 2 disc, as opposed to a level 3 disc, is that the computer information must be placed on the level 2 disc. The amount of computer information one can place on the disc requires scrutinizing every branch for proper placement. This scrutiny makes the scripting more difficult.

Table 18 B: Shooting

<table>
<thead>
<tr>
<th>level #</th>
<th>very simple</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>very difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number of cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10.0%</td>
<td>40.0%</td>
<td>30.0%</td>
<td>20.0%</td>
<td>0.0%</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>16.6%</td>
<td>33.3%</td>
<td>46.6%</td>
<td>16.6%</td>
<td>0.0%</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>21.4%</td>
<td>14.2%</td>
<td>42.8%</td>
<td>21.4%</td>
<td>0.0%</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

The mode for level 2 was "2", levels 3 and 4 were "3". The average response was so similar in each of the levels (level 2- 2.36, level 3- 2.63 and level 4- 2.64) that "shooting" seems to require the same level of difficulty in each of the levels.
Table 18 C: Editing

<table>
<thead>
<tr>
<th>level #</th>
<th>very simple 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 very difficult</th>
<th>number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>10.0%</td>
<td>10.0%</td>
<td>50.0%</td>
<td>20.0%</td>
<td>10.0%</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>13.3%</td>
<td>10.0%</td>
<td>46.6%</td>
<td>16.6%</td>
<td>0.0%</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>14.2%</td>
<td>21.4%</td>
<td>28.5%</td>
<td>28.5%</td>
<td>7.0%</td>
<td>14</td>
</tr>
</tbody>
</table>

The average response to "editing" was very similar in all three levels: level 2-3.1, level 3-3.0, level 4-2.92. "Editing" for any level requires the same operation. Therefore, there should not be any discrepancy in the difficulty.

Table 18 D: Text Transfer

<table>
<thead>
<tr>
<th>level #</th>
<th>very simple 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 very difficult</th>
<th>number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>22.2%</td>
<td>55.5%</td>
<td>11.1%</td>
<td>11.1%</td>
<td>0.0%</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>13.0%</td>
<td>21.7%</td>
<td>52.1%</td>
<td>8.6%</td>
<td>4.3%</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>40.0%</td>
<td>20.0%</td>
<td>40.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>10</td>
</tr>
</tbody>
</table>
"Text transfer" is not a complicated procedure. It is, however, a lengthy one. "Text transfer" was not difficult in any of the levels, as supported by the average responses: level 2-2.1, level 3-2.82 and level 4-1.8.

Table 18 E: Film Transfer

<table>
<thead>
<tr>
<th>level #</th>
<th>very simple 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>very difficult</th>
<th>number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>11.1%</td>
<td>22.2%</td>
<td>44.4%</td>
<td>11.1%</td>
<td>11.1%</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>20.0%</td>
<td>15.0%</td>
<td>40.0%</td>
<td>25.0%</td>
<td>0.0%</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>50.0%</td>
<td>12.5%</td>
<td>37.5%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>8</td>
</tr>
</tbody>
</table>

The average response to "film transfer" was below "3" in every level. Level 2 averaged 2.5, level 3 averaged 2.6 and level 4 averaged 1.62. The reason why the average was so low in this category was that most people used video as an intermediate material.
"Computer programming" is the first category in which the average response changed considerably from level 2 (2.4) to levels 3 (3.31) and 4 (3.23). "Computer programming" increases in difficulty according to the level of design because the levels increase in programming sophistication.
The 4th level of design is the most complicated. The average response (2.92) in this category indicated that 4th level producers had more difficulty with "single frame edits" than level 2- 2.4 and level 3- 2.67. The reason for this could be that level four designers have used more single frame edits than the other 2 levels.

Table 18 H: Fields

<table>
<thead>
<tr>
<th>level #</th>
<th>very simple</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>very difficult</th>
<th>number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>30.0%</td>
<td>30.0%</td>
<td>10.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>18.1%</td>
<td>18.1%</td>
<td>40.9%</td>
<td>22.7%</td>
<td>0.0%</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7.1%</td>
<td>28.5%</td>
<td>35.7%</td>
<td>14.2%</td>
<td>7.1%</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

The average response to "fields" also rose according to the level of design. This increase in response from 2.4 for level 2 to 2.68 for level 3 and 2.84 for level 4 can be accounted for by the increase in design difficulty.
The "final transfer to video" was not a significant problem for anyone. Level 3 scored the highest average response of 2.48. Level 2 scored 2.1 and level 4 was 1.57. The explanation for this being there were more cases to take an average from.
The three levels averaged under "3" with 2.1 for level 2, 2.76 for level 3 and 2.8 for level 4. This response is understandable because all three levels require the same type of replication. The response to level 2 replication might have been higher if there had been more cases.

**Question 19:** "Please describe the major problems or difficulties you faced in producing your video-disc. How have the problems been resolved?"

The answers to question number 19, which have been placed into 14 categories, had the following frequencies, as indicated in table 19.

Table 19

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>computer programming</td>
<td>8.4%</td>
</tr>
<tr>
<td>visualizing interactivity</td>
<td>5.66%</td>
</tr>
<tr>
<td>covering all production bases</td>
<td>7.54%</td>
</tr>
<tr>
<td>design</td>
<td>23.5%</td>
</tr>
<tr>
<td>scripting</td>
<td>5.66%</td>
</tr>
<tr>
<td>mastering</td>
<td>6.60%</td>
</tr>
<tr>
<td>frame accurate odd field edits</td>
<td>9.43%</td>
</tr>
<tr>
<td>time delays</td>
<td>3.77%</td>
</tr>
<tr>
<td>turn-around time</td>
<td>3.77%</td>
</tr>
<tr>
<td>client</td>
<td>2.83%</td>
</tr>
<tr>
<td>material</td>
<td>3.77%</td>
</tr>
<tr>
<td>group production</td>
<td>1.88%</td>
</tr>
<tr>
<td>no major problems</td>
<td>8.49%</td>
</tr>
<tr>
<td>no response</td>
<td>12.2%</td>
</tr>
</tbody>
</table>
The above frequencies indicate that the majority of production problems that the respondents commented about were in design, frame accurate odd field edits and computer programming. Six of the above categories - computer programming, visualizing, interactivity, scripting, mastering, and frame accurate odd field edits - have been discussed in the previous section. The remainder of the open-ended responses to number nineteen have been placed in the following eight categories:

1. **Covering All Production Bases**

   Videodisc production, no matter what level of design, can be a very lengthy process. There are so many steps in designing a disc that sometimes it is difficult to cover all of them, as the following comments indicate:

   Instructional design techniques (branching techniques) trial and error resolution.

   Time allocation (production process slow) integrating computer graphics, film, video, etc.

   Record keeping - tracking the various components from script through programming. Resolved by assigning script frames to the computer, and inventing a special notation for tracking.
2. Design

The design of a videodisc, because it is interactive, provides the designer with a new way of looking at and presenting his/her material, as represented by the following quotes:

The major problems in any videodisc production is the design - stop videodisc is not linear video. There is no beginning, middle, end to it. Pre-planning and pre-scripting solved this problem.

Innovative technology. This technology, as with previous "new" educational technology, presents designers/developers the challenge of using the medium to its fullest capability in achieving the instructional objectives.

There are many different applications for videodiscs, and the designers must often resolve their own design problems. Two comments cover this area:

Many applications needing different components - standard system is not available — always waiting for the next invention to become available.

Our application is storing digital data - no video - solved with circuitry to decode digital from analog.

Conflicts, in the design stage, occur that are often the cause of many problems, as these two respondents indicate:

Format shouldn't have been 16mm, but couldn't use slides because security clearances not available.
Reducing material to 27 minutes was biggest problem. Resolution required absolute ruthlessness and improved the program segments.

3. Material

Often, the hardest decision is deciding what to put on the disc. This problem is often compounded when deciding where to put the textual information, as one respondent wrote:

The major design problem was deciding what would be on the disc and what on the computer. This was first resolved by looking at the learning required and then examining the practical aspects.

4. Turn-Around Time

The numerical response to "turn-around time" varied considerably. The following comments are helpful in assessing this problem:

Major problems have been encountered with disc mastering turn-around time. There needs to be a much speedier process than is currently available. Maybe 3M's claim of 2 week turn-around time will satisfy the problem.

The problems weren't resolved. The vendor was consistently unavailable to answer questions, did not ever meet a production deadline, did not follow up on promised actions, and couldn't get a disc to work satisfactorily.
5. **Time Delays**

There are so many steps in videodisc production that each and every step can take longer than expected. Two respondents commented:

- On location in power plants with significant delays. Resolved by simply spending more time and money.

- The major annoyance was in the number of delays in getting the "check-disc" back from the disc producer. Resolution has been to look at another disc designer in the future.

6. **Client**

Videodiscs are so complex that explaining all the potential possibilities and problems to the client is often difficult. The next three comments describe this problem:

- Client doesn't understand what's involved- give 'em itemized proposal.

- Most difficult thing was determining what my client wanted (meant). The next by comparison is easy.

- Client conservatism: PR- you keep trying.

7. **Group Production**

Designing a videodisc requires a good group of people working together in order to make the project flow as smoothly as possible. Two respondents commented:

- Major problem was assembling a multi-disciplinary team that could communicate with each other. Never fully resolved.

- Getting people in the design group to work together and stay on track. Group work extremely important.
8. **No Major Problems**

Nine respondents said that they had "no major problems".

**Question 20:** What have been your major reasons for producing videodiscs?

The responses to this question have been categorized below in table 20 according to interactive training potential, commitment, simulation, keeping technologically up to date, training/education, storage, product use, r & d, no response and other.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive training potential:</td>
<td>15.9%</td>
</tr>
<tr>
<td>Commitment:</td>
<td>3.53%</td>
</tr>
<tr>
<td>Simulation:</td>
<td>10.6%</td>
</tr>
<tr>
<td>Keeping technologically up to date:</td>
<td>9.73%</td>
</tr>
<tr>
<td>Training/education:</td>
<td>22.1%</td>
</tr>
<tr>
<td>Storage:</td>
<td>3.53%</td>
</tr>
<tr>
<td>Product use:</td>
<td>5.30%</td>
</tr>
<tr>
<td>R &amp; D:</td>
<td>7.07%</td>
</tr>
<tr>
<td>Client/contract:</td>
<td>5.30%</td>
</tr>
<tr>
<td>Cost-effective:</td>
<td>3.53%</td>
</tr>
<tr>
<td>No response:</td>
<td>9.73%</td>
</tr>
<tr>
<td>Other:</td>
<td>3.53%</td>
</tr>
</tbody>
</table>
The frequencies listed in table 20 clearly indicate that the highest response was to "education/training" followed by "interactive training potential". These two categories along with all the others except "no response" are discussed in the following paragraphs.

1. Interactive Training Potential

The interactivity that the videodisc provides is unrivaled by the other teaching media available today. CAI, which provides the viewer with a good deal of interactive videotape, which can provide both textual and visual information, is not nearly as fast in searching from one sequence to the other as the videodisc, nor does it have the inherent still frame capability of the videodisc player. Videodiscs, on the other hand, can combine textual and visual information, either in still frame or motion sequences or they (videodiscs) can overlap both text and visual. Therefore, the interactive videodisc is unmatched for its interactive training potential, as three respondents noted:

We feel that it is the training/informational media of the future for technical training and sales situations where interaction is needed. We also find students/customers like going at their own pace without peer pressure or the fear that they may "ask a dumb question". This helps a great deal.
To establish alternative methods to instruction driven training to alleviate high costs, etc. Produced videodiscs (interactive) to provide consistent, cost-effective, self-paced training both for internal use but also for our customers.

To establish self-paced training on products and skills. Provide an alternative method to instruction driven training that is cost-effective and as or more effective than instructor training.

2. **Commitment**

With the advent of any new media, skepticism is sure to follow. The videodisc, because of the potential number of problems that can contribute to the success or failure of any videodisc production, certainly has had its number of skeptics. However, along with the skeptics, others exist that are committed to the new media called "videodisc". The following comments represent this feeling of commitment:

- Corporate commitment for our new delivery system.
- It's what we can do best and we believe in the technology and applications.

3. **Simulation**

Certain situations would not be possible to simulate without using a videodisc. The cost of hardware and software in a videodisc production is often so prohibitively expensive that it can make producing a videodisc impossible. However, there are situations where the cost of both the hardware and
software is far less expensive than the cost of training on
the actual piece of equipment. Therefore, the videodisc
is an excellent device for simulation, as these respondents
commented:

To simulate expensive equipment; to
allow students to practice procedures
before using actual equipment.

To simulate counseling and leadership
situations to standardize military
training and because of the personal
interactive requirement of role playing.
Military also uses videodisc to simulate
practical exercises in the area of
operation and maintenance training.

Visual simulation of job experience
can not be done otherwise.

4. Keeping Technologically Up To Date

In today's fast-paced technical world, one can easily
fall behind in keeping technologically current. The following
respondents indicated that they are producing videodiscs just
for this reason:

We need to keep technologically
up to date.

Research the technology for
practical use in the future as a
product to be sold.

To do basic research to determine
how the technology might contribute
to the efficiency and effectiveness
of learning.
5. Training/Education

The videodisc is primarily used for education, as seen in question number "6". The following comments back up the high percentage response:

As a test of the effectiveness of interactive training for leadership training.

Educational future—prove it can be done. Solve instructional delivery problems for areas of declining enrollment.

Explore potential of disc to support educational/marketing effort.

Super educational tool. Very effective and efficient tool for delivering multiple levels and pieces of instruction.

6. Storage

A single side of a videodisc can hold 54,000 slides. Three respondents indicated that they use videodiscs for the disc’s high storage capacity:

The large storage, freeze frame and random access features of the videodisc.

Develop capability to store digital data (1.2 gigabytes) and sound over still.

It's tremendous storage capability, long life span . . .
7. **Product Use**

The tremendous success of the Sears Shopping Videodisc Catalog proved that videodiscs are excellent for showing product lines, as these comments indicate:

- Future training for product line will need to be in videodisc format.
- As an excellent tool for in-store point-of-purchase display demonstration.
- Best way to give shopper the product information s/he needs, instantly and more accurately and completely than a live demonstration could.

8. **R & D**

Some respondents indicated that they produce videodiscs for research and development:

- For Army r & d office . . .
  disc technology.
- Experimentation and gaining experience.
- To do basic research to determine how the technology might contribute to the efficiency and effectiveness of learning.

9. **Client/Contract**

As the videodisc industry has matured and become more reliable, the demand has grown. The following quotes represent this demand:
We have a contract with the Navy that specifies we produce discs.

Client demand - programmed instructional need.

We organized an Advanced Instructional Systems (Videodisc) Group to market our videodisc course-ware development and our studio production capabilities. We want to sell discs!

10. **Cost-effective**

As noted earlier in this section under "simulation", videodiscs can be very cost-effective, as indicated in the following comments:

Cost-effective vs. expensive equipment to train students - in addition, a safe training environment for students - they can make errors without injury due to high voltage equipment.

... Also will prove to be more cost-effective and reliable than tape or film.

We found training discs far cheaper than training simulators.

11. **Other**

In the category "other" four respondents indicated that they produce videodiscs for hardware-support, demonstration, to learn to do it well and fun.
Question 21: Do you plan to produce a videodisc in the future?

The results to question 21 are indicated in the following table:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>67.7%</td>
</tr>
<tr>
<td>no</td>
<td>8.8%</td>
</tr>
<tr>
<td>uncertain</td>
<td>23.5%</td>
</tr>
</tbody>
</table>

If over 2/3 of the 204 responses to this question indicate that they are going to produce, this response can only be a good sign for the future of the industry. Of the remaining 1/3, only 8.8% said they are definitely not going to produce and the other 23.5% are still unsure. The answers to why people are going to produce have been answered in the previous question. Why people have not produced and why people may not produce in the future will be answered in question 25.

Question 22: At present are you or your company producing/using:

The following table indicates the response to question 22:
Table 22

<table>
<thead>
<tr>
<th>Medium</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>film</td>
<td>43.1%</td>
</tr>
<tr>
<td>video</td>
<td>76.0%</td>
</tr>
<tr>
<td>slide/tape</td>
<td>53.5%</td>
</tr>
<tr>
<td>CAI</td>
<td>48.3%</td>
</tr>
<tr>
<td>interactive video</td>
<td>49.2%</td>
</tr>
<tr>
<td>other</td>
<td>17.8%</td>
</tr>
</tbody>
</table>

Each of the figures represents a percentage of the 213 respondents who use or produce each of the above media. This question was asked to ascertain what types of media are still being used today along with videodiscs. It was interesting to see that two of the most interactive methods of instruction, CAI and interactive video, scored such high percentages. This response could mean that producers are turning to more individualized instruction.

**Question 23:** Of the previously mentioned media that you use, which do you prefer to work with most?

The results to question 23 are indicated in the following table:
Table 23

<table>
<thead>
<tr>
<th>Medium</th>
<th>Least 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Most</th>
</tr>
</thead>
<tbody>
<tr>
<td>film:</td>
<td>2.0%</td>
<td>19.0%</td>
<td>16.0%</td>
<td>16.0%</td>
<td>29.0%</td>
<td>18.0%</td>
<td></td>
</tr>
<tr>
<td>video:</td>
<td>5.4%</td>
<td>4.7%</td>
<td>6.1%</td>
<td>19.8%</td>
<td>21.2%</td>
<td>42.4%</td>
<td></td>
</tr>
<tr>
<td>slide/tape:</td>
<td>2.7%</td>
<td>17.5%</td>
<td>25.9%</td>
<td>25.0%</td>
<td>12.9%</td>
<td>15.7%</td>
<td></td>
</tr>
<tr>
<td>CAI:</td>
<td>7.7%</td>
<td>12.6%</td>
<td>12.6%</td>
<td>16.5%</td>
<td>27.1%</td>
<td>23.3%</td>
<td></td>
</tr>
<tr>
<td>interactive video</td>
<td>4.1%</td>
<td>6.6%</td>
<td>10.0%</td>
<td>12.5%</td>
<td>13.3%</td>
<td>53.3%</td>
<td></td>
</tr>
<tr>
<td>other:</td>
<td>22.5%</td>
<td>3.2%</td>
<td>19.3%</td>
<td>9.6%</td>
<td>9.6%</td>
<td>35.4%</td>
<td></td>
</tr>
</tbody>
</table>

Question number 23 is the same as number 22 in order to ascertain which of the media was preferred by the individual respondent if given the opportunity to work with the media of his/her choice. Unfortunately, the question was poorly worded as many of the respondents wrote comments that it depends on the job they are doing. The results of this question are not intended to reflect that one medium is better or worse than the other; it simply states a preference for using one over the other.

The average responses were: film (3.41), video (4.74), slide/tape (3.75), CAI (4.12), interactive video (4.84) and other (3.87). Again, these responses indicate a preference for the individualized methods of training.
Question 24: If you have not produced a videodisc, was it because of:

The results to this question are indicated in the following table:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Least 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 Most</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost:</td>
<td>11.2%</td>
<td>3.2%</td>
<td>17.7%</td>
<td>14.5%</td>
<td>53.2%</td>
</tr>
<tr>
<td>time:</td>
<td>18.3%</td>
<td>8.1%</td>
<td>22.4%</td>
<td>18.3%</td>
<td>32.6%</td>
</tr>
<tr>
<td>player discrepancies:</td>
<td>28.5%</td>
<td>26.1%</td>
<td>16.6%</td>
<td>7.1%</td>
<td>21.4%</td>
</tr>
<tr>
<td>hard storage:</td>
<td>66.6%</td>
<td>20.0%</td>
<td>3.3%</td>
<td>3.3%</td>
<td>6.6%</td>
</tr>
<tr>
<td>technical considerations:</td>
<td>23.2%</td>
<td>16.2%</td>
<td>25.5%</td>
<td>18.6%</td>
<td>16.2%</td>
</tr>
<tr>
<td>no need at this time:</td>
<td>9.2%</td>
<td>1.5%</td>
<td>20.0%</td>
<td>4.6%</td>
<td>64.6%</td>
</tr>
<tr>
<td>other:</td>
<td>3.7%</td>
<td>0.0%</td>
<td>3.7%</td>
<td>7.4%</td>
<td>85.1%</td>
</tr>
</tbody>
</table>

In evaluating the data from question 24, selected open-ended responses from question 25 have been added for illustration where appropriate.

Cost

One of the limiting factors of this survey was that it did not have a question about the average cost of a videodisc production. The cost of any videodisc production is extremely high as I indicated earlier in the text. The high percentage of responses (53.2%) in the number "5" or "most" category, which was also the mode, clearly supports this point, as do the following comments:
Most of the companies who use videodisc are large corporations which receive their paybacks by distributing thousands of discs per pressing (GM, Ford, etc.). Although we are part of a large corporation, our distribution numbers in the hundreds, and the program will need to be updated periodically. Therefore, the inability to edit a disc, and partly the cost, are the main reasons for not producing discs.

Interactive video is primarily an individual use medium, thus expensive for schools. The cost of development and time are other drawbacks...

Cost is prohibitive. My university is in the process of cutting 1.5 million from the budget.

Given the first disc cost—design, production premastering, mastering and pressing—discs are too expensive for us at the moment.

Time

Again the number "5" category was the most common response and 4.6 was the average response. The time it takes to produce a videodisc was a large limiting factor in the number of responses to "have not produced". Unfortunately, another shortcoming of this survey was the lack of a question about the average length of time for a disc production. Of the two, the author has been directly involved with, one took three years and the other is still going on after almost a full year.
Scripting, single frame edits and computer programming are only three of the production steps in a videodisc that make a videodisc production take longer than in a normal slide/tape or videotape production would. Therefore, time does become a big factor in videodisc production, as noted in the following comments:

Cost, time involved. Interactive disc are very involved, not much in the way of help availance to the average person.

Time, the company does things on impulse, videodisc takes careful planning.

Other priority projects have prevented start of disc production. Cost is no problem . . . interest is no problem. Timing has been the main problem. Once other projects (pending) have been completed, disc will begin. As a matter of fact, the design stage begins in June. Once begun, time (as a factor) will not be a consideration since my company is willing to invest time and money toward disc production.

**Player Discrepancies**

In the category, "player discrepancies", number "1" was the mode and 2.67 was the average. Although videodiscs will not play on different brands of videodisc players (i.e., a Sony disc will not play on a Discovision player) the response to this question varied so widely that it is hard to tell just how important a reason this was for "not producing".

One respondent noted, "compatability at this point is a big deterrent."
Hard Storage

Although one person commented, "Discs . . . can not be readily updated," the majority of responses (66.1%) were in the "1st" column. Judging by the average response which was only 1.63 "hard storage" was not a big factor.

Technical Consideration

Number "3" was the mode and 2.88 was the average response. There are a great deal of technical considerations in the production of a videodisc such as "computer programming", "fields", and "single frame edits" which are a definite deterrent to videodisc production. Although number "3" was the mode the percentages vary all across the spectrum, as do these comments:

We already have a videotape distributing network of 400 distributors. A change in format would entail expense and confusion.

. . . Technical applications for original video is also a problem. Very few production houses could possibly fulfill all the technical requirements for original video.

No record capability.

The technology is too new. Phobia over brand new technology. We have had an interactive computer network for over seven years and some users still have a fear of the computer terminal.
No Need At This Time

This category scored as heavily in the most common column, "5", as did "cost", and with the highest average response of 4.7. This high percentage contrasts with the respondents (who had produced videodiscs) that indicated that they did in fact have clients. However, many of the respondents who have not produced videodiscs because they had no clients had the following comments:

At this point we are without a client who wants disc.

We are a Gov't contracted and they decide not to produce at this time. . . .
No firm outlet for product.

We are a commercial training producer and therefore need to make a profit on what we produce. As yet, our market research does not indicate that enough customers own hardware and would be willing to buy the software.

Other

In the category, "other", number "5" was the most common response and 4.7 was the average.

Question 25: Please comment on your major reasons for not producing videodiscs?

The comments to question number 25, which have been inserted where appropriate in question 24, had the following frequencies, as presented in table 25:
Table 25

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>client:</td>
<td>13.6%</td>
</tr>
<tr>
<td>developing expertise:</td>
<td>5.68%</td>
</tr>
<tr>
<td>no funding:</td>
<td>6.81%</td>
</tr>
<tr>
<td>cost/benefit:</td>
<td>6.81%</td>
</tr>
<tr>
<td>not type of organization:</td>
<td>7.95%</td>
</tr>
<tr>
<td>leadership:</td>
<td>2.20%</td>
</tr>
<tr>
<td>cost:</td>
<td>13.6%</td>
</tr>
<tr>
<td>time:</td>
<td>9.09%</td>
</tr>
<tr>
<td>changing technology:</td>
<td>5.68%</td>
</tr>
<tr>
<td>no response:</td>
<td>26.1%</td>
</tr>
<tr>
<td>player discrepancies:</td>
<td>1.1%</td>
</tr>
<tr>
<td>hard storage:</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

All of these categories have been discussed except "other".

Other responses people gave for not producing at this time included such areas as lack of funds or skill, no need, management uncertainty and lack of awareness, and lack of commitment, as indicated by the following:

Still developing expertise. Little demand.

Lack of r & d funds.

The cost/benefit is simply not there at this time.
We have no faculty who have yet identified instructional need.

Leadership. Need management support to keep things moving. Management also needs "educating" on videodisc benefits.

We are the world's largest commercial printer and due to the technological and electric advances see, perhaps a reason to consider videodisc as another area of endeavor. We are looking at the sources, the art, and the potential market for a go-no-go decision soon.

We have made a recent commitment to a VHS distribution network and it would be difficult to change format. Also we have not fully investigated the use of videodisc in our operation. Important factors to us- cost of producing, speed of producing, updating material, program design, ROI analysis on training dollar.

Our organization has made a major commitment to satellite earth station and videocassette equipment. Videodisc will have to wait its turn.

Insufficient need to justify expenditure of time, money and effort.
V. SUMMARY AND CONCLUSIONS

Of the 213 respondents, 46.9% have produced videodiscs and 51.6% have not produced a videodisc. The majority of videodiscs (98%) were laser videodiscs and of the 92.3% of discs that were "successful", the largest percent were produced for education/training.

The "level" of videodiscs rated higher in the 2nd-22.3%, 3rd-43.1% and 4th-23% than in the first level-11.5%. This indicates the respondent's preference for interactive videodiscs.

There was a varied response to the "difficulties" in producing a videodisc. The most difficult areas in terms of the average responses were: computer programming (3.10), shooting (2.97), scripting (2.9), editing (2.81), and single frame edits (2.75). Breaking down the degree of difficulty by the individual levels of design suggested that the more sophisticated the level of design, the more problems were likely to occur. Although computer programming requires more care in its level 2 transfer to videodisc, computer programming is more complex with the 3rd and 4th levels because of the larger, more detailed computer program. Both "editing" and "single frame edits" seemed to be more difficult in the advanced levels (2, 3, 4), not only because of the technical nature of editing for videodisc but also because of the complexity of the program material in the various projects.
Cost and the time involved in producing a videodisc were the two biggest factors for not producing a videodisc. The cost of the hardware alone is $3,000 and up. Add the cost of software and the total production cost is often prohibitive. Although videodisc projects vary in length, their design, depending on the level of production, can take years.

Based on a thorough study of the data in this survey, the future of videodiscs looks very positive. The potential of interactive videodisc in education-training has barely been touched. Responses to the "success" and varied uses of videodisc, from education/training to simulation and point-of-sale, supports the belief that as media designers learn more about the variety of videodisc applications and how to solve the production problems they will begin to utilize the videodisc to its fullest potential.

As stated earlier in the text, two weaknesses of this survey were the lack of questions on the amount of time it takes to produce a videodisc and the average cost of producing a videodisc. It is possible that these two questions would have provided some enlightening data. Another weakness of the survey was the response to "solving the production problems". Although the responses that were given were clear-cut, more information is needed on the solutions to problems in "computer programming" and "single frame edits".
This survey, because it taps the problems associated with producing a videodisc, will heighten the awareness level of producers and designers to the major production problems. In heightening the awareness, some of the pressure on future designers and developers has been alleviated. Although tomorrow's designers may be faced with the same production problems, at least they will know which ones could cause them the most difficulty. They now have some of the answers on how to alleviate these problems.

This survey, through the thoughts and comments of producers, has also removed a lot of the skepticism involved with videodisc production. At the very least, the survey suggests that videodiscs do work, are beneficial, and can, in certain cases, be more cost-effective than other media available today.

Future research should be conducted in the areas of computer programming, script design, single frame edits and mastering. If solutions about the production difficulties in these areas are found, more people may produce videodiscs than are producing them today.
VI. APPENDICES
Appendix A: Cover Letter
Dear Sir/Madam:

I am a graduate student in the Corporate Media Program at Ithaca College in Ithaca, New York. The enclosed questionnaire is part of a survey I am conducting for my Master's thesis to ascertain the nature and potential problems of videodisc production. Your name was selected at random from a list provided by the Nebraska Videodisc Design Production Group.

This survey is confidential and neither your name nor your company's name will appear in any part of the results. The survey has been coded in order to send you a free copy of the results.

I would greatly appreciate your willingness to spend a few minutes filling out this questionnaire. Please mail the questionnaire back to me using the enclosed stamped envelope.

Thank you so much for your cooperation.

Sincerely,

J. Taylor Klotz

Enclosure
Appendix B: Survey Instrument
VIDEODISC QUESTIONNAIRE

1. Which Symposium and/or Workshop did you attend?
   ( ) Symposium #1, 1980
   ( ) Symposium #2, 1981
   ( ) Symposium #3, 1982
   ( ) Workshop #1, June 1-5, 1981
   ( ) Workshop #2, June 22-26, 1981
   ( ) Workshop #3, December 14-18, 1981
   ( ) Workshop #4, March 21-25, 1982
   ( ) Workshop #5, July 11-15, 1982
   ( ) Workshop #6, December 5-9, 1982

2. Have you or your company produced any videodiscs? ( ) yes ( ) no
   If no, skip to #21.

3. If yes: Were they ( ) Laser ( ) CED

4. Were your discs succesful? ( ) yes ( ) no
   Please explain:

5. Were your discs designed for:
   ( ) level 1
   ( ) level 2
   ( ) level 3
   ( ) level 4

6. Are your discs
   ( ) archival
   ( ) educational
   ( ) entertainment
   ( ) other________

7. Were your discs pressed at:
   ( ) 3M
   ( ) Sony
   ( ) Pioneer
   ( ) Discovision
   ( ) other________

8. What was the pressing (turn-around) time for your disc:
   ( ) 1-2 weeks
   ( ) 3-4 weeks
   ( ) 5-6 weeks
   ( ) 6-8 weeks
   ( ) over two months

OVER
9. Were your discs developed for:
   ( ) in-house use
   ( ) public sale
   ( ) demonstration
   ( ) other__________________________

10. Which of the following was your disc shot on:
    ( ) 16mm film
    ( ) 35mm film
    ( ) 3/4" video
    ( ) 1" video tape_______
    ( ) 2" video tape_______

11. Did you use slides in your production?  ( ) yes  ( ) no

12. Do you presently own a videodisc player?  ( ) yes  ( ) no

13. If yes to #12, is it a:  

   Quantity
   ( ) Discovision PR 7820 Model I  ( )
   ( ) Discovision PR 7820 Model II  ( )
   ( ) Discovision PR 7820 Model III  ( )
   ( ) Sony VLP 1000  ( )
   ( ) Pioneer 1000 or similar  ( )
   ( ) Pioneer PR 7820 Model I  ( )
   ( ) Pioneer PR 7820 Model II  ( )
   ( ) Pioneer PR 7820 Model III  ( )
   ( ) other (specify)______________________________ ( )

14. Are you happy with your machine:
    ( ) yes
    ( ) no
    ( ) sometimes

    Please comment:

15. Do you own an external computer?  ( ) yes  ( ) no

16. If yes to #15, is it a:

    ( ) Apple 2
    ( ) Apple 3
    ( ) IBM Personal
    ( ) Radio Shack Model ______
    ( ) other (specify)______________________________

17. If yes to #15, what kind of interface do you use:

OVER
18. In developing your videodisc, place a check appropriately to describe the following tasks in terms of causing you difficulty:

<table>
<thead>
<tr>
<th>Very Simple</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 Very Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>scripting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shooting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>editing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>text transfer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>film transfer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>computer programming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>single frame edits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>final transfer to video</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mastering or pressing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Please describe the major problems or difficulties you faced in producing your videodisc. How were the problems resolved?

20. Please Comment:
What have been your major reasons for producing videodiscs?

21. Do you plan to produce videodiscs in the future?
( ) yes
( ) no
( ) uncertain

22. At present, are you or your company using or producing:
( ) film
( ) video
( ) slide/tape
( ) CAI
( ) interactive video
( ) other (please indicate)________________
23. Of the previously mentioned media that you use, which do you prefer to work with the most? Rank in order 1-6 (most).

( ) film
( ) video
( ) slide/tape
( ) CAI
( ) interactive video
( ) other (specify) __________________

24. If you have not produced a videodisc, was it because of:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Least</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 Most</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>time</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>player discrepancies</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>hard storage</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
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<tr>
<td>technical consideration</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td></td>
</tr>
<tr>
<td>no need at this time</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>other (specify)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

25. Please comment on your major reasons for not producing videodisc:

THANK YOU
Appendix C: Glossary of Terms
GLOSSARY

This glossary is reprinted from the June 1982 Byte Magazine.

AUTHORING: a structured approach to developing all elements of an interactive videodisc program with emphasis on preproduction.

BRANCH: an instruction to diverge from one sequence in a program to another.

CAPACITANCE DISC: a videodisc system that uses capacitance signals embedded on the disc and a stylus that touches the surface of the disc to read encoded information.

CED: capacitance electronic disc developed by RCA.

CHAPTER: a consecutive sequence of frames.

CHAPTER STOP: a code embedded in the vertical interval of the videodisc that enables certain videodisc players (mostly level one) to locate the beginning of chapters.

COMPRESSED AUDIO: sometimes called still frame audio, compressed audio describes a method of digitally encoding and decoding several seconds of voice-quality audio per individual disc frame, resulting in a potential for several hours of audio per disc.

CONSTANT ANGULAR VELOCITY (CAV): a CAV disc revolves continuously at 1800 rpm, one revolution per frame, making each frame of a CAV disc addressable, a basic requirement for interactive videodiscs.

CONSTANT LINEAR VELOCITY (CLV): a CLV or extended-play disc maintains a constant length for each frame, thus enabling longer playing time per side, but sacrificing individual frame addressability. Reference to locations on CLV discs are basically useless for interactive videodisc applications.

CUE: a pulse entered onto one of the lines in the vertical blanking interval (VBI) that results in frame numbers, picture codes, closed captions, white flags, etc., on the disc.
DIRECT-READ-AFTER-WRITE (DRAW): a record-once optical-disc technology primarily used for mass storage of digital data.

FIELD: a scan of 262 lines on the screen at 1/60 second constituting one-half of a complete video frame. See frame.

FLICKER: sometimes known as "interfield jitter" or "jitter", flicker is a phenomenon that occurs in a videodisc freeze frame or still frame when both fields are not identically matched, thus creating two different pictures alternating every 1/60 second.

FRAME: two complete scans of the video screen at 1/30 second. A frame is composed of two fields (at 262 lines) and a retrace; a single frame is a standard CAV videodisc reference point. There can be as many as 54,000 addressable frames on one side of a CAV videodisc.

FREEZE FRAME: a single frame from a motion sequence that is stopped.

FULL FRAME TIME CODE: otherwise known as nondrop frame time code, full frame time code is a standardized SMPTE (Society of Motion Picture and Television Engineers) method of address-coding a video tape. It gives an accurate frame count rather than an accurate time clock.

INTERACTION: a reciprocal dialogue between the user and the system, interactivity.

INTERCHANGEABILITY: a videodisc design strategy that includes information readable on consumer, industrial and computer-controlled videodisc systems.

INTERLACE: in NTSC video, half the horizontal scanning lines are laid down. After retrace, the other half are laid down so that they fall in between the previous lines.

INTERMEDIATE MATERIALS: all media selected for assembly onto the videodisc premaster (i.e., 16mm film, video tape, 35mm slides, etc.).

JAGGIES: a tearing phenomenon around the edges of NTSC images. Research at MIT has effectively solved this problem. By so doing, it has created a new way of thinking about displays, computer graphics, and NTSC video. See soft fonts.
KEYER: it cuts a hole in the background video and fills in the hole from a different video source, i.e., computer-generated text and graphics keyed over NTSC video. See video processing; overlay.

LANDING PAD: a range of frames within which a player can locate a frame or frame sequence. Landing pad (LPD) is also a command that modifies the number of times a player attempts to locate a frame following an unsuccessful search.

LEVEL OF INTERACTIVITY: the potential for interaction prescribed by the capabilities of videodisc hardware.

LEVEL ONE: usually a consumer model videodisc player with still/freeze frame, picture stop, chapter stop, frame addressability, and dual-channel audio, but with limited memory and less processing power.

LEVEL TWO: an industrial-model videodisc player with the capabilities of level one, plus on-board programmable memory and improved access times.

LEVEL THREE: level-one or level-two players interfaced to an external computer.

LEVEL FOUR: a theoretical configuration with more advanced equipment wherein all things are possible.

MASTERING: a real-time process in which the premaster video tape is used to modulate a laser beam onto a photosensitive glass master disc.

NTSC: the American television standard set at 525 lines by the National Television Standards Committee.

OPTICAL DISC: a videodisc that uses a light beam to read information from the surface of the disc.

OPTICAL MEMORY: digital data encoded on an optical disc used for mass data storage. It is estimated that one side of an optical disc could store up to 10 billion bits.

OVERLAY: a term used to describe the keying of computer-generated text/graphics onto NTSC video.

PICTURE STOP: an instruction encoded in the vertical interval on the videodisc to stop the videodisc player on a predetermined frame.
POSTPRODUCTION PREMASTERING: sometimes called video processing. This is the process of editing, assembly, evaluation, revision, and coding of intermediate materials. A premaster is a fully coded video tape.

PRE-PRODUCTION: all design tasks, e.g., flowcharting, storyboarding, scriptwriting, software design, etc., prior to videot disc production.

REFLECTIVE (OPTICAL) DISC: method by which the laser beam reads data encoded on an optical videot disc. In the case of a reflective disc, the laser beam is reflected off the shiny surface of the disc.

SCAN: to transverse the surface of the disc with the video displayed.

SEARCH: to rapidly access a single frame or a sequence of frames on a disc with video off.

SEQUENCE: two or more frames forming one unit, e.g., motion sequence, still-frame sequence.

SLOW MOTION: in videot disc technology, the controlled movement of the laser from frame to frame at a variable rate of less than 30 frames per second.

SOFT FONTS: a gray-level scheme developed by MIT for high-quality fonts in NTSC video. This adds legibility, removes scintillation, and enhances encodability, which results in a display with more than 80 characters per line on a color television receiver.

STEP: to advance one frame forward or reverse.

STILL FRAME: still material, including photographs, line drawings, pages, etc., designed and presented as a single videot disc frame.

THREE-TWO (3-2) PULLDOWN: a means of transferring film shot at 24 frames per second (fps) into video (30 fps). The first film frame is actually exposed on three video fields, and the next film frame is exposed on two fields.

TRANSMISSIVE DISC: method by which the laser beam reads data encoded on an optical videot disc. In the case of the transmissive disc, the laser beam passes through the transparent surface of the disc.
VERTICAL-BLANKING INTERVAL (VBI): 21 blanked lines during field 1 and 21 blank lines during field 2, where in frame numbers, picture stops, chapter stops, white flags, closed captions, etc., are encoded.

VHD: video high density. See capacitance disc.

VIDEO REPROCESSING: the process of keying video from the computer over NTSC video.

WHITE FLAG: a code that identifies a new film frame.
Appendix D: Videodisc Systems
The two types of videodisc systems are best described in a pamphlet produced by the Nebraska Videodisc Design Group (1980). The following is an excerpt:

Optical

With optical systems, a laser beam strikes microscopic pits on the disc's surface, which interrupts the beam. This interrupted beam is then translated into both video and audio information which is played back on a television receiver or monitor.

Some optical systems use reflective discs with the light beam bouncing off the disc's surface, while others use a transmissive disc with the light passing through to a detector on the other side. Each frame on the disc has its own reference number, or address, much like the pages of a book. The disc can be played either forward or reverse. Tracks can be repeated—producing variable slow motion. The rate of slow motion is determined by the number of times each frame is repeated. When a single frame is played continuously a still picture results.

A single frame can be played indefinitely for detailed study or the user can step through the sequence one frame at a time. Single frame information can be placed on the disc as only one frame, thereby saving valuable disc space which require motion. If tracks are skipped over rather than repeated, the result is fast foward or scanning.

Several of the optical systems use players with built-in microprocessors. With the microprocessor, one can search out individual frames by calling up a specific frame number. On some players, frame addresses can be stored in a memory register and called up by entering the registry number. The microprocessor also allows the player to be programmed in advance to play, search, stop and so forth. This allows such functions as "branching"
based on user input. Although the inherent memory capacity of the players is somewhat limited, it can be expanded by placing computer programs directly onto the disc. The disc can thus program the players memory one or more times to carry out various operating sequences. In addition, some optical disc players can be interfaced to more powerful computers.

Capacitance

The capacitance approach to videodisc technology exchanges the optical disc's endurance and versatility for technically less complex, and therefore less expensive equipment.

There are two types of capacitance systems, one built by JVC and the other one developed by RCA. On both types of capacitance videodiscs, picture and sound information are encoded as microscopic pits, much larger than the pits on the optical discs. A stylus electrode picks up the information in the form of capacitance variations between it and the surface of the disc.

The JVC system uses a stylus that glides across the surface of the disc without making actual contact. JVC has also demonstrated ancillary equipment that would increase their capacitance system's capabilities. One add-on device makes variable fast and slow motion, still framing and random access possible, another increases the audio fidelity.

In the RCA system, the pickup stylus is in physical contact with the disc causing some wear. The RCA discs are, however, capable of hundreds of plays without noticeable degradation of picture or sound. Initially, the RCA system will not have variable slow motion or freeze capabilities, nor will it have stereo audio.
Appendix E: Computer Programs
Listings 1a and 1b: Comparison between programs for the DVA PR-7820 and the Sony LDP-1000. Both programs perform the same function, but the Sony program is shorter because of its more efficient management of memory. (Daynes 1982, p. 52)

1a

A DVA PROGRAM:

```
00 0
01 1
02 RECALL
03 2
04 STORE SET 2 IN REG 1
05 1
06 2
07 8
08 5
09 6
10 SEARCH QUESTION 1
11 5
12 INPUT
13 0
14 1
15 1
16 BRANCH 0. DEFAULTS 0
17 2
18 9
19 BRANCH 1. TO CORRECT ANSWER
20 3
21 6
22 BRANCH 2. TO REMEDIATION
23 3
24 6
25 BRANCH 3. TO REMEDIATION
26 3
27 6
28 BRANCH 4. TO REMEDIATION
29 STP FWD CORRECT ANSWER
30 1
31 0
32 WAIT WAIT 1 SECOND
33 5
34 0
35 BRANCH TO MUSIC
```
A SONY PROGRAM DESIGNED TO DO THE SAME THING:

SEGMENTS:
01  13016-13016
02  13017-13017
03  06931-07740
04  13032-13431

PROGRAM:
00  REG 0= SET REGISTER
01  002
02  STOP
03  S001  QUESTION 1
04  000  WAIT INDEFINITELY
05  INPUT
06  1-016  1. (A) TO CORRECT ANSWER
07  2-010  2. (B) TO REMEDIATION
08  3-010  3. (C) TO REMEDIATION
09  4-010  4. (D) TO REMEDIATION
10  J=0  JUMP IN REGISTER 0
11  021  JUMP IN REMEDIATION
12  PLAY
13  S003  (PLAY WHEN REG 0=0)
14  GOTO
15  025  TO MUSIC
16  STOP
17  S002  CORRECT ANSWER
18  001  WAIT 1 SECOND
19  GOTO
20  025  TO MUSIC
21  PLAY
22  S003  REMEDIATION
23  GOTO
24  002  TO QUESTION 1
25  PLAY
26  S004  MUSIC SEGMENT (NEXT QUESTION)
27  END
36    6
37    8
38    0
39    1
40  SEARCH
41    7
42    3
43    1
44    0
45 AUTOSTOP
46    1
47 DEC REG
48    5
49 BRANCH
50    1
51    2
52    8
53    7
54    0
55  SEARCH
56    1
57    3
58    2
59    7
60    0
61 AUTOSTOP
62 HALT
Appendix F: Bibliography
BIBLIOGRAPHY


Bejar, Dr. Issac I. "Videodiscs in Education: Integrating the Computer and Communications Technologies," Byte, June 1982, pp. 78-104.


