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GRAPHIC DESIGN EDUCATORS AND PRACTITIONERS IN
TRANSITION: FROM TRADITIONAL TOOLS AND APPLICATIONS TO
THE COMPUTER-BASED TOOLS OF INTERACTIVE MULTIMEDIA DESIGN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of the Ohio State University

By

Brenda Smith Faison, B.A., M.P.D.

* * * * *

The Ohio State University

1995

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In memory of my loving parents
Claude Calvin Smith and Ruby Geer Smith

For Gilbert, Valerie, and Joyce Faison

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I thank God for all things.

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TABLE OF CONTENTS

DEDICATION	ii
ACKNOWLEDGMENTS	iii
VITA	iv
LIST OF TABLES	ix
LIST OF PLATES	xi
CHAPTER	
I. INTRODUCTION	1
1. Background to the Problem	1
2. Statement of the Problem /Research Questions	6
3. Review of Related Literature	8
4. Purpose of the Study	9
5. Relationship to Art Education	11
6. Definition of Terms	11
II. METHODOLOGY	14
1. Design of the Study	14
2. Participants/Location of the Research	15
Criteria for the Selection of Participants	16
Graphic Design Educators	17
Graphic Design Practitioners	17
3. Methods of Data Collection.....	18
4. Methods of Data Analysis	21
5. Significance of the Study	22
III. INFORMANT PROFILES	24
1. Graphic Design Educators.....	24
Mary Ann Frye	24
Isaac Victor Kerlow	30
Daniel Boyarski	35
Matthew S. Gaynor	41
Karen Woods Monzel	45

2. Graphic Design Practitioners	50
James Anderson	50
Paula Scher	54
Aaron Marcus	59
Loretta Staples	65
Sherie Bauer	70
IV. ANALYSIS OF DATA	75
1. Generalizability	75
2. Introduction to Analysis	76
3. Participants' Introduction to Computer Technology	76
Year of Introduction	76
Platforms and Software	77
Environment	78
Participants' Courses of Action	81
4. Current Hardware and Software	82
Currently Used Hardware	82
Currently Used Software	83
5. The Early Road to Transition	86
6. Hindrances and Accelerants to Computers in Graphic Design	90
Hindrances	90
Accelerants	92
7. The Effects of Equipment Costs	94
8. Motivation for Transition	96
Motivating Factors	97
9. Economic Effects on Educators and Practitioners	97
10. Learning Curve and Time Commitment	99
11. Perceived Benefits of the Transition	103
12. Perceived Disadvantages of the Transition	106
13. Portents: Education, the Educator, and the Profession	109
Graphic Design Education	110
Graphic Design Educators	110
The Profession	111
14. The Transfer of Prior Knowledge	115
15. Interactivity Defined	118
16. Fostering the Development of Interactive Multimedia	121
Toward the Development of Multimedial Technology	121
17. Controlling All Components of Multimedia	123
18. Designers Spanning A Number of Disciplines	124
Justification for General Knowledge	124
19. Implications for the Interdisciplinary Process	126
20. Sensitivity to New Issues	128
21. The Graphic Designer On the Interactive Media Design Team	130
Possible Roles for the Graphic Designer	130

22. Having Our Say	132
Recommendations to Practitioners from Educators	132
Fortify the Alliance	132
Work Habits	133
Hiring Practices	133
Professional Development.....	133
Recommendations to Educators from Practitioners	134
Deflation of Technology in the Classroom	134
Additions to the Curriculum - New Content	135
Approaches to New Content	136
23. The Driving Force Behind Computer Technology	136
V. SUMMARY AND CONCLUSIONS	138
1. Summary	138
The Purpose of the Study	138
Procedures	139
Summary of Findings	141
2. Conclusions	145
Limitations	149
Implications	150
3. Recommendations for Further Research	153
Other Related Research Topics	156
APPENDICES	
A. Interview Transcriptions	158
Mary Ann Frye	159
Isaac Victor Kerlow	186
Daniel Boyarski	209
Matthew S. Gaynor	236
Karen Woods Monzel	256
James Anderson	271
Paula Scher	293
Aaron Marcus	302
Loretta Staples	321
Sherie Bauer	342
B. Sample Human Subjects Release Form	360

C. Participant Search Letter	362
D. Two Samples of Participants Acceptance Letter	364
E. Reminder and Notice of Submission of Question Outline.....	367
F. Interview Questions	369
G. Thank you and Follow Up Letter	373
REFERENCES.....	375

LIST OF TABLES

TABLE	PAGE
1. Educators' Introduction to Computers	80
2. Practitioners' Introduction to Computers	81
3. Hardware and Software Currently Used by Educators	84
4. Hardware and Software Currently Used by Practitioners	85
5. Actions Fostering Transition	89
6. Factors Hindering the Use of Computers in Design Education	91
7. Factors Hindering the Use of Computers in Design Practice	92
8. Factors Accelerating the Use of Computers in Design Education	93
9. Factors Accelerating the Use of Computers in Design Practice	94
10. Equipment Costs and the Decision to Change to Computer-Based Media	96
11. Transition Types	97
12. New Economic Considerations	99
13. Positive Results of Computer Technology	105
14. Negative Results of Computer Technology Among Graphic Design Educators	107
15. Negative Results of Computer Technology Among Graphic Design Practitioners	109
16. Future Projections Concerning Graphic Design Education	113

TABLE	PAGE
17. Future Projections Concerning Graphic Design Educators	114
18. Future Projections Concerning The Graphic Design Profession	115
19. Processes and Principles Traditionally Used in Graphic Design That Transfer to Interactive Design (Educators' Responses)	117
20. Processes and Principles Traditionally Used in Graphic Design That Transfer to Interactive Design (Practitioners' Responses)	118
21. Explanations for Interactivity	120

LIST OF PLATES

PLATES	PAGE
I. Mary Ann Frye	24
II. Issac Victor Kerlow	30
III. Daniel Boyarski	35
IV. Matthew S. Gaynor	41
V. Karen Woods Monzel.....	45
VI. James Anderson	50
VII. Paula Scher	54
VIII. Aaron Marcus	59
IX. Loretta Staples	65
X. Sheri Bauer	70

CHAPTER I

INTRODUCTION

Background to the Problem

In 1984, I received my master's degree in Visual Design from the School of Design at North Carolina State University in Raleigh. During the years of my study (1982-1984), although the school had a computer lab, the Visual Design Program did not focus on the impact that computers would have on the field, nor on the transitions it would cause. This was primarily because the use of computers for graphic design was in its infancy, and traditionally educated professors were still apprehensive about the idea of abandoning traditional tools and methods.

Any exploration the student made in this area was self-motivated, because at that time, no computer-focused visual design courses had been established there. My introduction to computers as tools for design and production came through on-the-job experiences which I received prior to, and during my master's study. In Research Triangle Park, North Carolina, I worked with the IBM Corporation. At IBM, I learned programs such as IPG (Interactive Presentation Graphics) and worked with hardware such as the CADAM (Computer-graphics Augmented Design and Manufacturing) workstation.

After graduate school, I worked in the Graphics and Presentations Department (M49) of the Manassas, Virginia IBM site (1984). Although my first design projects were performed with traditional tools and methods, I was soon assigned

to a team whose goal it was to conduct research and prepare a proposal (including necessary hardware and software) aimed at shifting the department's modalities from standard tools and methods to the computer-based technologies that were taking hold in the early eighties.

Exposure to these transitional processes helped to clarify for me the significance of such technologies, and their potential in the design arts. From 1981 to the present, I have found that converting to newer media is a task that requires continuous monitoring, and a steady upgrading of knowledge and skills. These transitions to improved technologies were occurring simultaneously, though at different levels, all over the United States. The computer inevitably took its current and ever-emerging place as the ultimate design tool. However, this transition from time honored tools (T-squares, templates, technical drawing pens, etc.) to computer-based media is still an issue in design programs and in the designer's workplace.

My study investigates the transition the graphic designer makes from the use of traditional tools to those made available through the emergence of computer hardware and its supporting software. Other vital aspects of transition, such as education and training, and software and hardware implementation are also addressed in this research.

Emerging technologies have had a significant effect on the processes, methods, and materials of the graphic designer. The design educator, practitioner, and the industry, have been faced with the necessity either to adopt new tools, or to exist in a less productive, less competitive academic environment or practice. John Walters is creative director of the New York-based Walters Design Associates and a national board member of The International Design by Electronics Association. In an interview with Steve Blount of Print magazine, Walters

(1992) states: "When I started my studio in 1977, all you needed to go into business was a T-square and a telephone. Today, I don't see how you can become a major player without computers" (p. 26). Patrick Coyne (1992) supports this idea saying: "Graphic design used to be one of the least expensive businesses to start. Today, the high cost of computer equipment can be a real barrier" (p. 224).

This reality has also reverberated throughout design education with programs encouraging the implementation of the computer and its components into the learning processes of prospective design professionals. Graphic Design educational programs that do not make this shift can no longer claim to adequately prepare students for opportunities in the present or future job markets which require the knowledge and skills of the well-rounded graphic designer.

Along with an array of new technological developments, the following changes have occurred: revised job descriptions for graphic designers, a new crop of entry-level designers with advanced computer skills, and new applications for the technology. The January/February 1993 issue of Communication Arts (CA) magazine's "Technology" column contained a panel discussion with five well-known graphic designers who participated in an exchange on the role of computers in design. It was organized by Seybold Seminars and held at its 1992 Seybold San Francisco meeting. This panel discussion, which was later published in CA, was entitled "Design in Transition: The Impact of Technology." These designers had all started with a traditional education including its tools, projects, and processes, but had transformed their knowledge and skills by adding emerging technologies, including the incorporation of interactive media into their repertoire of design services. The panelists included Lance Hidy, type and poster designer; Clement Mok, former Creative Director at Apple Computer, and now the founder of Clement Mok Design in San Francisco;

Wendy Richmond “Design Technology” columnist for CA magazine, Co-Director of the WGBH (Boston) Design Lab, and graphic design faculty member at Northeastern University; Greg Samata, a partner in Somata Associates, Inc., of Dundee, Illinois; and Leslie Smolan, a principal and partner in New York-based Carbone Smolan Associates.

The insights of these five panelists are important because they briefly discuss some of the issues addressed in my study. They spoke historically about what once were the standard tools and practices of graphic design. They also mention technology’s impact on the role of the designer. The panelists even offer a few projections for the future with respect to graphic designers.

Once traditionally vended out to specialized firms, services such as typesetting and color separations can now be done internally by the designer or by someone on staff. One of the panelists, Lance Hidy and his firm have brought typesetting, pre-press, and other computer tasks in-house. These additions have eliminated about four or five different vendors, and reduced the duties of tracking schedules, observing deadlines, and general orchestration of the project. According to panelist Lance Hidy, clients are spared both the “overhead and hassle” (1993, p. 132). Through the implementation of computer-based media, some services which were once vended out are performed in-house. Panelists like Hidy and Mok are now able to pass some savings on to the client.

On the other hand, panelist Greg Samata vows never to do color separations in his office, because he feels an engraver or a vendor with more advanced equipment, craftsmen, and technology can better perform tasks such as these. Likewise, panelist Leslie Smolan feels that typesetting and separations are jobs best left to the specialists who have traditionally performed them. She explains, “I already know how to delegate those perfectly” (p. 134). Although design firms

and departments have gained as a result of technology, Smolan indicates that much of the design firm's "bread and butter work" (p. 134), such as the application of identity systems, has been lost or is now performed internally by the client. However, Smolan insists that the client historically, currently, and in the future, will be "buying our creativity and our thinking" (p. 131).

The panelists also discuss the transition's impact on students. The effect of computers is reflected in the knowledge and skill level of recent graduates of today's design education system. When trying to fill a design position within her firm, Smolan sought to hire someone with traditional drawing skills, but was told that "anyone who graduated after a certain year can't draw anymore, because they went right to the computer" (p. 129). She described this comment as "a horrible thought" (p. 129).

Similarly, when Samata needed two new production people for entry-level positions at his firm, he had in mind persons who would be talented, and creative, in addition to possessing computer skills. He hired two people who fit this description. All of the pieces in their portfolios were very high resolution Iris printouts (about \$40.00 per 8.5" x 11" print). Samata notes that although they had "beautiful portfolios" (p. 129), he later discovered that they had no hand skills at all. "Even flapping a board is a big deal" (p. 129). Because graphic design is a concept-focused field, the ability to do preliminary drawings is still an essential skill. Samata feels much vital time can be wasted "looking for the answer in a machine" (p. 129).

On the topic of the future role of the designer, the panelists note that due to its increasing, technology is redefining the field of graphic design, particularly with respect to interactive multimedia. Mok (panelist) has managed a career which spans a broad range of media including print, video, computer-based

multimedia, event marketing and environmental design. He foresees shifting the position of his studio to focus on executive producers, and assembling teams for interactive digital demos, titles, book covers, etc. Mok envisions and describes his firm as a "system integrator for design" (p. 134). Richmond (panelist) offers future applications and she forecasts more of the multiversioning process that she is now involved in at the station (WGBH-Boston). This process involves taking one idea and producing from it several different products in assorted media (i.e., CD ROM titles, videos, interactive books, audio cassettes, etc.).

Because of transitions such as these, Hidy credits computer technology for allowing designers to position themselves for a variety of career paths in education and in practice. He says, "one of the good things about the computer is that it allows you to customize your own job descriptions" (p. 134).

I have sought to make my research act as a sounding board for documenting, discussing, and analyzing the issues involved in making the transition from standard tools with predominately paper-based results, to a computer-based medium yielding an end product based on interactivity. There are many voices and disciplines involved in the emergence and practice of interactive media design. My study focuses on the perspective of the graphic designer. This examination has included the various positions of some of the field's educators and practitioners.

Statement of the Problem/Research Questions

My research explores a component of the graphic arts industry known as graphic design as one of the many disciplines vital to interactive media design. The study focuses on the graphic design educator and practitioner whose fields continue to change rapidly due to the introduction of the computer and its com-

ponents as tools in the designer's education, training, and practice. My investigation centers on the transition to interactive multimedia design (which will include user interface design). The participants include graphic design educators and practitioners who not only made the transition from traditional tools, but who have also switched from using basic paint, draw, and layout software primarily used for print communication and signage, to authoring programs (i.e. HyperCard, Macromedia Director, Authorware, Linkway), and the related hardware of interactive media design. Essentially, their tools and final applications changed from print-based output, to digital, interactive media products. Other related issues that my research addresses include academia's response to the teaching of multimedia, and the graphic designer's role in the collaborative effort which interactive media design most often requires.

Newer technological developments have redefined what a graphic designer does, and have fostered the need to take responsibility in developing new uses for the technology. The graphic designer has invested much in terms of time, money, education, and training in an effort to become oriented, and to keep up with evolving technologies. The results have been both positive and negative.

Mary Ann Frye is head of the Graphic Design Program at Northeastern University in Boston, Massachusetts. In seven years of teaching, she implemented and watched computer technology as it grew in importance to design education and to the profession. In her article, "Keep Your Eye on the Ball," Frye (1994) comments: "I feel like a veteran player in a team sport that hasn't been described yet. . . . I don't know what technical skills a designer will need in five

years, or even if what they do will be called design. I am certain that words and images, and increasingly, interactivity and moving images, will communicate information" (p. 24).

I suspect many other educators and practitioners as well share the same feelings about the changing role of the designer, and the future of newer media and its applications. My research attempts to clarify the changing role of the graphic designer in education and practice. My study focuses on designers who are actively engaged in the evolution of the teaching and the practice of graphic design with technological tools. The basic questions of my research are:

1. What are the critical issues faced by traditionally educated and trained graphic design educators and practitioners in transition from standard tools and methods to computer-based media?
2. What type of preparation did these traditionally educated graphic designers undergo in making the transition to newer media?
3. What design processes and principles learned from their traditional education and training do these graphic design practitioners and educators now use in their work involving interactive media design?

Review of Related Literature

In my literature search, I found most books addressed visually creative approaches to technology which are directed at the fine artist. These books focus primarily on the creation and exhibition of fine art and art installations made possible via computer media. However, few books addressed the specific topic of the graphic designer and technology.

Additional literature in book form appears as subtopics listed under titles such as: Laurillard's (1987) Interactive Media: Working Methods and Practical

Applications; Norman's (1988) The Design of Everyday Things; Card, Moran, and Newell's (1983) The Psychology of Human-Computer Interaction; and Laurel's (1990) edited work, The Art of Human Computer Interface Design. These books and others may assist in revealing the designer's position and function on multimedia teams.

I found the columns and articles of design periodicals, conference summaries, and magazines helpful and most specific to graphic designers, design education, and technology. An excellent example is CA's "Design Technology" column, which is written by Wendy Richmond. This bimonthly column has been a staple in each issue of the publication since 1984. Other such publications include: Print; Graphis; How; Step-By-Step; Journal of Art and Design Education; Design World: The International Journal of Design; Design Management Journal; and Innovation: The Quarterly of the Industrial Designer's Society of America.

Additionally, literature collected from the participants will be used. These documents will include catalogs, bulletins, brochures, resumes, articles, etc.

Purpose of the Study

The goal of my research is to investigate the process by which graphic designers have made the effective transition from traditional tools and projects, to computer-based tools and applications. The study shows how graphic design practitioners and educators have combined the concepts and principles of traditional design, with the emerging computer technologies that make interactive multimedia design a viable path in the transition of these professionals.

Also, my study elaborates on how these professionals have changed not only their choice of tools, but how they have adapted these tools to new applications. My assumption is that the examination of the transitional experiences of

the participants in this study will reveal the principles, concepts, and strategies that aided them most in making the switch, and that the documentation of such data will assist others in the process of transition.

In my study, I will examine the current involvement, practice, and interest required of graphic designers in making the transition from traditional tools to those which are computer-based. I will focus on designers who have made interactive multimedia part of their design efforts. In so doing, other related issues may surface and will be documented and discussed.

My investigation hopes to uncover the skills needed, as well as how they can be applied in educational programs that prepare future designers for careers in the field of interactive multimedia design and education. Its intent is to give indications as to how "design-world skills and expertise can become more effectively integrated into the world of interactive media" (IDCA, 1994, p. 13).

By including educators and practitioners, my research hopes to provide a more holistic future resource which may be referenced in the educating of future graphic designers. This research will also serve as a record of previous shifts that have occurred in the wake of an inevitable future of transitions involving newer media.

The technology now used by these educators and practitioners is still emerging. My inquiry will discuss the transition from traditional to technological tools, and assumes that current users will move from one transition (hardware and software) to another as future releases are marketed. My study will document some of the ways these transitions have been made by the participants, as well as the methods, principles, concepts, and experiences that made such transitions possible. These data may prove helpful to design educators and practitioners as newer technology-based design tools continue to emerge.

Relationship to Art Education

My topic is related to art education because it focuses on graphic design, which is one of the many art disciplines encompassed by the visual arts. Meggs (1983) defines the graphic designer as “an artist who specializes in the design of visual communications” (p. 494). My research is connected to art education because it essentially views the graphic design educator as an art educator who prepares artists for a variety of opportunities in the teaching and practice of visual communication design.

I will also focus on those practitioners who are actively involved in the practice which these educators prepare students to work within. The views of the educator and the practitioner may bring contrasting perspectives to the study. They have been connected historically through cooperative education programs (which provide hands on experience and role models), school campus job fairs, lectures, literature, field trips, etc. Basically, each component serves and supports the other in an exchange of information, ideas, and technologies. Additionally, I would say that both educator and practitioner play an important part in the education of future graphic designers.

Definition of Terms

The following are definitions of relative terms and concepts that will be used in the context of this work. The word authoring will refer to the practice of designing multimedia programs. This activity usually requires an authoring team or an interactive design team which may include, but is not limited to a producer, a graphic designer, and a programmer (Roberts, 1994). Authoring calls for expertise in human cognition, social interaction, the particular content area to be supported, and the various technologies to be used (Norman, 1993).

Authorware Professional is a multimedia authoring program (Cotton and Oliver 1993). Other such programs include Macromedia Director, HyperCard, LinkWay, etc.

According to Wiener (1993), a system which is distributed is one in which the components are not all in one physical box. As used in this report, distributed production will refer to various aspects of production for a single interactive design project being produced at different sites or locations, and involving professionals with varying areas of expertise.

Graphic designer is a term that was initially used to identify designers of typography, print materials, signage and displays. The evolving profession of graphic design now involves a wide range of information (Meggs, 1993) and communication design activity. Through computer-based media, graphic design has been expanded to include design for human-computer interaction. It is among the various disciplines involved in the development of user interfaces.

Nelson (1987) describes interactive as "not just connected, but responding to you. Interactive systems and programs can respond to your choices and requests, and clarify what they want from you" (p. 9). The term interaction involves control and feedback between the user and the computer system (Cotton and Oliver). Interactive Multimedia employs the use of a wide variety of media (text, graphics, sound, video, etc.) within a computer interface (Cotton and Oliver, 1993). It is one of the computer-born interactive disciplines which utilizes the expertise of graphic designers.

Other interactive media design disciplines mentioned include interactive multimedia design, user interface design, human-computer interface design, software design, home page design, etc. These interactive design disciplines will

be used interchangeably in this document. Each of these interactive disciplines may employ the expertise of the graphic designer in the development of projects.

Use of the term interface is short for, and refers to human computer interface (Cotton and Oliver, 1993). The latter is the software (and hardware) through which a user may interact with a computer system. A user interface is "the portion of the system that presents information to the user, and accepts input from the user -- the console, the buttons, or what you see on the display" (Wiener, 1993, p. 222).

CHAPTER II

METHODOLOGY

Design of the Study

My research employed a qualitative approach based on a series of case studies. Such an approach lends itself well to a detailed study of a few individuals (Fraenkel and Wallen, 1993): I selected ten participants for my study. The case study approach helps in discovering individual differences, variations in program settings and experiences (Patton, 1990). Such methods have also been used by Freedman and Relan (1992) as they explored the use of computers in the art education classroom, and by Lorenz (1992) in his investigation of the extensive use of product designers by five major corporations.

Patton (1990) describes open-ended interviews as “the data from interviews consisting of direct quotations from people about their experiences, opinions, feelings, and knowledge” (p. 10). This was my primary vehicle for gathering new data for this study. This raw data, combined with the literature submitted by participants, provided me with a rich source of quotations, and passages from school and/or company literature. The intent in using these methods is simply to allow the case study participants to describe their own transitional experiences regarding access to digital and interactive media devices, related education and training, and the implementation of these technologies into their classrooms and businesses.

Participants/Location of Research

Through a three month search, I was able to secure a rich and diverse group of graphic design professionals, each of whom brought their vast and noteworthy experiences in education and practice to bear on my questions.

My goal was to concentrate on graphic design educators and practitioners. Through peer recommendations, I compiled a suitable list. Professor Susan Roth of the Visual Communication Design Program in the Department of Industrial Design at The Ohio State University helped me initiate my search for participants. Roth recommended possible participants, and suggested literature that would promote the search effort. The literature referenced included the American Center for Design's (ACD) directories: 1994 Membership Directory and 1991 Design Resource guide, and The American Institute of Graphic Arts (AIGA) 1993 Membership Directory. Additionally, I contacted both the ACD and AIGA by phone and asked them to recommend participants based on a brief description of the study. Each organization was helpful in referring potential participants.

From these sources a list was made, and I began making contact by letter and telephone. The designers from this initial list also suggested the names of likely participants. Using the suggestions of prominent educators and practitioners, I narrowed down my list to the ten final participants.

With respect to sample size, five graphic design educators and five practitioners were chosen. In an effort to obtain depth of information and a more open range of experiences, a small sample of designers representing the two aspects of the profession seemed in order (Patton, 1993). According to Patton (1993) "in-depth information from a small number of people can be very valuable, especially if cases are information rich" (p. 184).

I pursued a small purposeful sampling, rather than the larger groups of probability sampling. I used this technique, because I believe that the selected individuals had the information needed: (a) to address the problems identified, (b) to answer the questions posed, and (c) to achieve the goals of the study.

This group of case study participants includes some of the trendsetters in the profession who are involved with academic institutions, or are members of private firms that are leaders in the area of graphic design and technology. Many of them are pioneers in the development and/or use of emerging technologies in the classroom, and in the workplace. The criteria used to select and identify the participants are listed below.

Criteria for the Selection of Participants

1. They must have received early education and training in graphic design with traditional tools and methods;
2. They must have made the transition to computer-based tools;
3. They must have successfully incorporated interactive multimedia or at least one of the other interactive design disciplines in the classroom, or in a design firm; and
4. They must currently be teaching or practicing interactive design today in an established academic institution (as educators), or within a viable design firm (as practitioners).

Below I have listed the participants by name, academic institution, program or department, location with respect to city and state, and the date on which each interview was conducted.

Graphic Design Educators:

1. Mary Ann Frye, Northeastern University, Head, Graphic Design Concentration, Boston Massachusetts, April 14, 1995
2. Isaac Victor Kerlow, Pratt Institute, Chair, Computer Graphics Department, Brooklyn, New York, April 19, 1995
3. Dan Boyarski, Carnegie Mellon University, Director, Graduate Studies, Communication Design Program, Pittsburgh, Pennsylvania, April 25, 1995
4. Matthew S. Gaynor, University of Cincinnati, Assistant Professor, Graphic Design Program, Cincinnati, Ohio, April 28, 1995
5. Karen Woods Monzel, University of Cincinnati, Assistant Professor, Graphic Design Program, Cincinnati, Ohio, April 28, 1995

Graphic Design Practitioners:

1. Jim Anderson, Senior Designer/Manager of Technical Design Services, Pentagram Design, Inc., Manhattan, New York, April 17, 1995
2. Paula Scher, Partner/Graphic Designer, Pentagram Design, Inc., Manhattan, New York, April 17, 1995
3. Aaron Marcus, President/Founder, Aaron Marcus + Associates, Emeryville, California, April 20, 1995
4. Loretta Staples, President/Founder, U dot I, Inc., San Francisco, California, April 26, 1995
5. Sherie Bauer, Director, User Interface Group, Fitch, Inc., Columbus, Ohio, April 30, 1995

Of the ten interviews conducted, eight were face-to-face interviews, and two were performed by telephone. The face-to-face interviews were conducted by travel to four states including: New York, Massachusetts, Pennsylvania and Ohio. The cities I visited included Manhattan, Brooklyn, Boston, Pittsburgh, and Cincinnati. The telephone interviews were conducted from Ohio (Columbus) to California (San Francisco and Emeryville).

Methods of Data Collection

I requested an hour-long interview session with all case study participants. Once the dates and times for the ten interviews were secured, the outline of questions was nearing completion.

Open-ended questions are said to be more of a challenge to work with due to the variety of responses, and the difficulty in scoring and interpretation. Yet, the majority (16 out of 21) of my questions were open-ended questions, and were selected because they are also said to yield more specific and individualized responses (Patton, 1990). The outline included 21 questions. Five questions were closed-ended, and yielded responses such as yes or no. Yet, the closed-ended questions were always followed up with a prompt such as "please explain." Patton (1993) states: "the basic thrust of qualitative interviewing is to minimize the imposition of predetermined responses when gathering data" (p. 295). I achieved this goal by taking an open-ended approach to asking all of the questions on the outline.

Just before the outline was complete, I received a call from one of the participants Mary Ann Frye of Northeastern University. She wanted to know if I could send her a copy of the questions to review before the interview. I agreed,

and consequently sent a set of questions to each of the 10 participants, three weeks ahead of the first scheduled interview. This preview of questions was helpful in that it: a) allowed all participants the opportunity to carefully consider how they might respond, b) assisted in keeping the interviews within the one hour time slot allotted, c) reduced the pre-interview anxiety of responding to unexpected questions, and finally, it d) probably increased the overall quality of the responses or data collected.

The questions were placed in story-like sequence. This sequence contained four sections or types of questions:

1. Introduction to computers -- here participants were asked about their initial introduction to computer-based tools, the environment in which the introduction took place, and the tools they used.

2. General technology and graphic design -- these questions covered some basic issues concerning graphic design and technology.

3. Interactive Multimedia-specific questions -- these dealt with issues of interactive media design.

4. Recommendations/Speculation -- these asked educators for any suggestions they had for practitioners, and vice versa. They also allowed for exploration of the driving forces behind computer-based design and art technologies.

Before starting the interview, I briefly introduced myself and the study. I explained that there were no right, wrong, nor definitive answers. Further, I explained that I sought a response to each question, based on each participant's individual experiences (in the classroom, or on the job); and that the responses

should be constructed in their own words. Patton (1993) indicates that the ideal questions are those that “permit respondents to respond in their own terms” (p. 295).

I found that half of the participants had prepared notes and often referred to them in the course of the interview. While the other half had no visible notes, their responses still seemed fluent and well thought out.

All of the interviews were recorded on audio cassette tape. The taped conversations were later transcribed. As much as possible, I transcribed all the recorded interviews verbatim, seeking a full transcription of each interview. According to Patton (1993) “full transcriptions are the most desirable to obtain” (p. 349).

Once I transcribed all the tapes, I made laser printouts, proofed the material, then made the necessary changes to the file. As a means of following up on the initial interview, each participant received a hard copy of her/his interview. This procedure gave the participants a chance to check their responses for accuracy; and to make changes in terms of miscommunicated information, the correct spelling of names and places, etc.

As post interview rules for proofing, respondents were asked not to change sentence structure nor to aim to make their responses grammatically perfect, but to focus on accuracy of content. Again, this opportunity was extended to all respondents. Any post interview alterations were screened for these post interview criteria, and updates were made to the initial transcript files. Of the ten participants, only four sent their copies back with changes. And the changes made by these four participants were minimal.

Methods of Data Analysis

To analyze the collected interviews, I chose a cross-case analysis approach (Patton, 1990). I began by writing a case description of each person based on all of the data collected on and/or from them. The case study was also based on observations I made during the interview.

The intention of these descriptive studies is to introduce the reader to the participant on an individual basis. I also included a photograph and background information. Additionally, by including quotations from the raw data, I aimed to illustrate a sense of the person's attitude or position on emerging technologies and their use of new media in their particular area (education or practice). For instance, if there was an issue that one participant felt particularly strong about, it was mentioned and supported by her/his quotations.

From the ten transcribed interviews, I then grouped the data creating two categories: information received from educators, and that received from practitioners (Patton, 1990). This procedure was done to assess how the two groups of designers compared and contrasted in terms of individual experiences, perceptions, and ideas when given the same set of questions. The responses to each question were cut out, grouped, and placed in a folder marked: #1, #2, etc.

For example: in folder number one, I could readily locate all of the responses to question one with the educators appearing first, in the order that they were interviewed. Practitioners' responses followed those of the educators; in the same folder. All twenty-one questions were handled in this manner. This system for organizing the collected data provided an effective tool for extracting similarities and differences between individual groups, while highlighting patterns, themes, and categories.

Significance of the Study

My research is vital because it seeks to document the graphic designer's successful transition from traditional tools to interactive multimedia technologies. It is important because it makes available individual experiences with this type of transition to the many designers who currently find themselves either in the process of transition, or facing the need to make the change. My study is noteworthy because it seeks to demystify this transitional process, and shed light on the multimedia development process in the graphic designer's new digital environment. I hope to apprise graphic designers of the new possibilities as well as problem areas, and to encourage them to take advantage of multimedial technologies. My study points out the benefits and drawbacks of transition in education and practice.

Due to the fact that new technologies change exponentially, "people in production industries, design businesses, and schools are finding that there are no sidelines" (Frye, 1994, p. 124). Design educators and others will find the investigation resourceful as they struggle to keep pace, discover the rules, and find time for experimentation and the refinement of skills.

According to Richmond (1988), "creative professionals are always eager to know what their colleagues are doing with computers" (p. 15). Practicing graphic designers in design studios and corporate design departments will benefit from this data which approaches graphic design as a multimedia discipline that uses computers to assist "in realizing the opportunities in other media" (Richmond, 1989, p. 162). My research is meaningful because it may aid in the effort to increase the services offered by design offices, and may expose the designer to innovative methods for offering clients and consumers fresh ways of identifying, understanding, and accessing information.

My study will also offer educators and practitioners a glimpse of their colleagues' thoughts and experiences. This will give them a clearer perception of what other graphic design professionals are currently doing, and the potential that computer technologies have made available.

CHAPTER III
INFORMANT PROFILES

Plate I
Mary Ann Frye



Mary Ann Frye: Northeastern University

Mary Ann Frye is Head of the Graphic Design Concentration in Northeastern University's Art and Architecture Department in Boston, Massachusetts. Frye received her BA from the University of New Mexico, and her MFA from Rhode Island School of Design (RISD). She has headed the program at Northeastern since 1988 (Departmental brochure, corporate author).

Before accepting her current position at Northeastern, Frye was on the graphic design faculty at RISD and headed an experimental program involving graphic designers and fine artists at the Massachusetts College of Art.

As an independent, exhibition and graphic designer, Frye's clients have included Warner Records, Urban Arts, Inc., Harvard University, Cornell University, etc. Frye was also design director at Krent/Paffett Associates (departmental brochure, corporate author).

Her awards for print, exhibit, and package design are numerous, and she has been successful in developing and securing several grants toward the acquisition and furtherance of computer-based media in design education.

Frye is Education Chair for the American Institute of Graphic Arts, the Boston chapter. Together with colleagues Julia Curtis and Cynthia Baron, Frye "organized the first in a series of conferences on the role of visualization and design in culture" (Frye, 1994, p. 2).

Between 1993 to 1994, Frye has had her work and articles on design education published in Communication Arts, Print, other journals, and in the volume Inside/Outside by Malcom Grear. In 1994, she organized and chaired the spring conference for New England college and university design faculty members which was called "Design Pedagogy and Computer Technology" (brochure, corporate author, 1994).

From the inception of Northeastern's (seven year old) graphic design concentration in 1988, Frye has been charged with implementing new technologies. Frye's research interests are graphic design education and computer technology.

In her 1994 Communication Arts article entitled "Keep Your Eye on the Ball", and her 1994 AIGA/Boston Newsletter piece entitled "Is Design Education

Doing the Job," Frye suggests that there might be a new criteria for those who desire to become graphic designers, and the programs that prepare them. Her thinking is that these prospective designers "should have the best possible grounding in, and the most ravenous possible appetite for the liberal arts and sciences" (Frye, 1994, p. 124). Essentially, the graphic design student's interests should be varied.

However, due to the constant technology-driven changes occurring in design education, Frye suggests a few specialized skills that a design program should encourage (Frye, 1994). The first four are obvious and have been long-established within design education. The remaining four have become increasingly significant with the onset on interactive technologies. These components are as follows:

Traditional/Standard:

1. Clarity
2. Depth
3. Fundamental Visual and Verbal Language
4. Fundamental Principles and Processes Specific to the Discipline, such as the study of:
 - Form
 - Typography
 - Semiotics (pragmatics, semantics, and, syntactics)
 - Problem Solving Methodologies
 - Design History

More Recent (within the past 7-8 years)

5. Sound
6. Motion

7. Symbolic Coding

8. Math and Science

In the AIGA/Boston article, Frye published her “personal short list” (p. 4) of things that educational programs should provide. They are as follows:

1. Time-based and Interactive Communication
2. Writing Skills
3. A Strong Liberal Arts Approach
4. The Maintenance of Interests Outside of Design
5. Interaction with Professional Societies which Include:
 - Organizations like the AIGA, the ACD, etc.
 - Co-op Jobs and Internships
 - Faculty with a Variety of Professional Interests and Approaches

Frye believes the design student should focus on making connections and applying shape to information that may be presented in various levels of complexity (Frye, 1994). The concentration in graphic design at Northeastern focuses on getting “students to: a) become confident, accustomed to, and combative in the electronic environment, b) become familiar with change -- a given in this setting, and c) keep their own objectives in view” (Frye, 1994).

The correct way to use technology in a graphic design education environment has not yet been established. Frye (1994) admits “Frankly, I don’t know how to teach with technology” (p. 124). Existing design programs seem to be the testing ground for conducting experiments and making such determinations.

Frye’s approach involves:

- Sparking Interest
- Getting Different Kinds of People (from different disciplines)

to Focus on a Concept or Problem

- Widening the Discussion
- Eliciting Creative Interaction in a Group Setting
- Group Critique

Frye states:

I teach by watching, taking in the absolutely new interactions that happen student to student, to machine to teacher, and all the combinations thereof. To teach in this constantly changing field, you have to keep raising the level of the game. It takes fierce confidence in process—and the presence of mind to mostly watch (Frye, 1994, p. 124).

I interviewed Frye on April 14, 1995, at her office on the campus of Northeastern University. She further discussed the role of design education in light of new media, as did other participants. But what was unique about my interview with Frye was her response to the question concerning the idea that educators should make recommendations to practitioners.

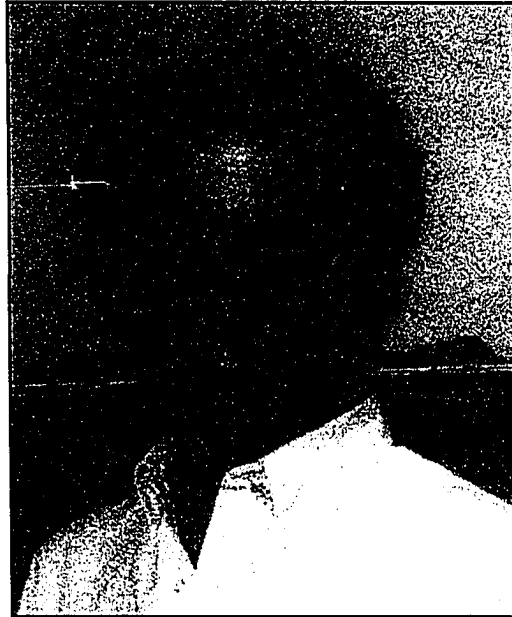
Frye feels that design practice should have more of a vested interest in the educating of the people who will one day become their staff. Frye suggests that the profession should include:

- Models for Technical Training and Equipment Support
- The Partnership Concept (greater cooperation between practice and education)
- A Change in the Design Practice's Perception of the Role of Design Education

Frye's input was in-depth and informative. Issues such as the ones listed above, she discussed in great detail, and assisted in rounding out the study. As a result, the interview proved to be a forum for hashing out some of the important issues in design education today.

Frye's transition from standard tools to computer-based appliances began in 1976.

Plate II
Isaac Victor Kerlow



Isaac Victor Kerlow: Pratt Institute

At the New York-based Pratt Institute, Isaac Kerlow is the founding Chair of the Computer Graphics Department, which was organized in 1988. Associate Professor of Computer Graphics, Kerlow is an educator, designer, and artist (Kerlow, 1995).

Kerlow pursued studies in Sociology at the National University in Mexico City, Mexico from 1975 to 1977. He continued his study in Art and Design in 1977 at the Eina School of Design in Barcelona, Spain; where he received his Diploma in Art and Design in 1979. In 1981, he received his BFA in Graphic Design and Animation from the School of Visual Arts in New York City. Two years later, he completed his graduate studies receiving his MS in Communication Design from Pratt Institute (1983).

From 1992 to 1994, Kerlow was a visiting lecturer at the Eastman Kodak Center for Creative Imaging (CCI) in Camden, Maine. Prior to his work at Pratt and CCI, Kerlow was a visiting Assistant Professor for three years at the Maryland Institute of Fine Arts in Baltimore. He taught in the university's Visual Communications Department (1985-1988).

At the School of Visual Arts in New York, Kerlow taught in the Department of Sciences and Humanities. He was a Visiting Instructor there from 1985 to 1987 (Kerlow, 1995).

Kerlow is a prolific author and editor, having published several books and articles with some of the industry's leading publishers. Among Kerlow's published books are Computer Graphics for Designers and Artists, which he coauthored with Judson Rosebush in 1986 (Van Nostrand Reinhold). In 1990, Kerlow authored A Tutorial Guide to Aldus PageMaker 4.0 (Addison-Wesley/Aldus Corporation), and A Student Edition of PageMaker 4.0 (Addison-Wesley). In 1991, working with the Association for Computing Machinery (ACM), he edited Computer Graphics in Art and Design. In 1994; collaborating again with Rosebush, Kerlow coauthored the second edition of Computer Graphics for Designers and Artists (Van Nostrand Reinhold).

Scheduled for release in the Fall of 1995, Kerlow is currently working on another book entitled The Art of 3D Computer Animation. The publisher will again be Van Nostrand Rheinhold (Kerlow, 1995).

Kerlow is recognized as an authority on the use of computers in design and art. His articles have been published in international magazines and journals such as SCAN Magazine, The Netherlands; Visual Computer, Germany; Idea, Japan; Design, and Leonardo, United Kingdom; Cimal, and On, Spain; and Mexico and el Arte, and El Obelisco, Mexico. He has also published articles with

well known American journals. Some of them include Computer Graphics World, Byte, How, and PC Magazine (Kerlow, 1995).

Between 1985 and 1992 Kerlow held six one man exhibitions. They were held at: Museo Nacional de la Estampa, Mexico City (1992); the Fine Arts Museum of Long Island, Hempstead, NY (1988); the University of Delaware, Newark, Delaware (1988); the Museum of Modern Art, Mexico City (1986); the Galeria Azul, Guadalajara, Mexico (1985); the Joan Miro' Foundation (1985), and the Galleria Eina, Barcelona, Spain (1980).

Kerlow participated in more that 34 group exhibits over a ten year period between 1984 and 1994. A few of the museums where he exhibited include the Instituto de Estudios Norteamericanos, Barcelona, Spain (1991); The Smithsonian Institution, Washington, DC (1990); and the Isetan Museum of Art, Tokyo, Japan (1989).

He has been honored with many awards and distinctions. Some of them include Chair of the SIGGRAPH '95 Interactive Entertainment Show in Los Angeles for the Summer of 1995, a two-year term appointment to the Pratt Institute Board of Trustees; and the Medal of the President from the School of Visual Arts in New York; 1981 (Kerlow, 1995).

Headed by Kerlow, the Computer Graphics Department at Pratt is set up to offer both a BFA and an MFA in Computer Graphics. In the MFA program a student may also choose to minor in any of the fine arts disciplines offered at the school, such as painting, printmaking, etc. Within the department there are four areas of concentration (school bulletin, 1993-1994). They are:

1. Interactive Systems (multimedia, interface design)
2. Experimental Media (fine arts)

3. Computer Animation (mostly three-dimensional techniques)

4. Print-Oriented Media (two-dimensional techniques)

According to the art, design, and architecture undergraduate bulletin,

the computer graphics department also acts as a resource to the traditional and fine arts programs. Non-major students can enroll in the introductory and intermediate computer graphics courses. On the other hand, computer graphics students can cross-register in design, video, fine arts, and architecture courses to enrich their training (1994-1995, p. 107).

As previously discussed, this program is not exclusively concerned with graphic design. However, Pratt's computer graphics department offers many computer-based courses which may have direct application to students interested in graphic design, because they deal with computer-based print communication (two-dimensional design) issues. The following is a list of some courses which may interest students of Pratt's Communication Design Program (graphic design, illustration and advertising):

- Artists' Books in the Electronic Age
- Two-Dimensional Computer Graphics Workshop
- Advanced Electronic Pre-Press
- Advanced Two-Dimensional Electronic Imaging

The Computer Graphics Department is also the home of various multimedia courses which may also be accessed by communication design students and others (school bulletin, 1994-1985). Some of them are:

- Interactive Multimedia
- Interactive Multimedia II
- Computer Graphics Programming Workshop
- Video Editing and Special Effects

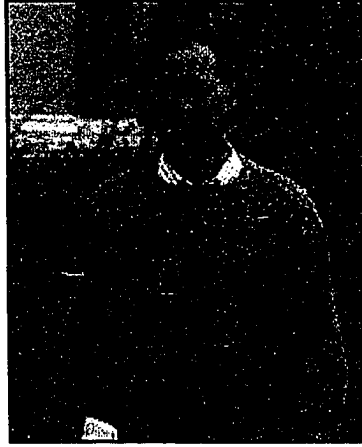
The perspective which Kerlow brought to this study was the idea of concentrating on the student as an individual in the educational process, as opposed to primarily focusing on team efforts or projects. However, he values the experiences gained through group strategies and interactions, and there are opportunities for such projects at Pratt.

Ultimately, Kerlow is an advocate of individual attention to each student. Through an individual focus, he feels educators can best help students find their own creative voices. He contends that team, or group processes are best left to be learned on-the-job. Kerlow states,

This has to do with the fact that yes, we have to teach students to work in teams. But, should we force them to work in teams, or should we focus on them as individuals? Because that's the reason why they came here [to Pratt, for individual focus] to discover who they are, and their voices as designers. Or, should we let them pick up the aspect of teamwork in the workplace? So, I'm just presenting it to you with a lot of contrast: focus on the individual, or focus on teamwork (Kerlow, April 19, 1995).

Kerlow began his transition from traditional to computer-based media in 1980 (Kerlow, 1995).

Plate III
Daniel Boyarski



Daniel Boyarski: Carnegie Mellon University

Dan Boyarski is Director of Graduate Studies, and Professor of Graphic Design at Carnegie Mellon University's (CMU) Department of Design. He received his BA degree from St. John's University in Collegeville in 1968, and his MFA from Indiana University in Bloomington in 1973. Boyarski completed two years of postgraduate study in graphic design and film animation at the Kunstgewerbeschule (School of Design) in Basel, Switzerland, in 1979 (Boyarski, 1995).

For 24 years Boyarski has been involved in the teaching and practice of graphic design. During this time, he has taught at three major universities. From 1984 to 1994, Boyarski was Head of the Graphic Design Program at Carnegie Mellon, and was promoted to Director of Graduate Studies in May of 1994. Prior to his work at CMU, he was an Associate Professor of Graphic Design and

Foundational Two-Dimensional Design at the University of Louisville (1973-82). Also, Boyarski spent two years as an Associate Instructor of Graphic Design at Indiana University (1970-1972).

He is a partner in Boyarski/Boyarski, a graphic design consulting firm based in Pittsburgh, Pennsylvania (Boyarski and Buchanan, 1994). Some of the firm's clients have included: Sony, Westinghouse, Alcoa, Mitsubishi, Apple Computer, Herman Miller, The Australian Tax Office, Princeton University, etc. (Boyarski, 1995).

His research interests involve how words, pictures, sound, and motion may be combined for effective communication. Boyarski teaches courses in typography, kinetic information design, and human computer interface (HCI) design. HCI design is "concerned with the modes and methods of interaction between a person and a computing device" (Boyarski, 1995, p. 1).

Boyarski is a pioneer with respect to making both the computer and interface design part of the graphic and product design curricula. He incorporated the first computers in CMU's design department as early as 1985, and encouraged faculty and students to make them a part of their processes. The first HCI design course was offered in 1989, and was the first course of its kind offered at Carnegie Mellon University.

Not only was the course unique to the university, but it was one of the first HCI courses in the United States or abroad to reside in a design department (department literature, 1995, p. 1). Boyarski and other faculty members are involved in extensive professional consulting with corporations, as well as with interface design work on campus (department literature, 1995).

As former Head of the Communication Design Program at CMU, Boyarski has been a key player in the development of HCI courses in the design depart-

ment. He has been a ground floor participant in the evolution of such courses, and has worked toward curriculum development, the securing of corporate sponsors, and project creation and development with other CMU departments outside of design.

Boyarski taught the first HCI course in 1989. Below is a brief overview of the course. The following description has been included to give insight on the processes taken in the teaching of such a course.

The first offering of the course involved a department-wide registration and attracted eight graphic design students. It was presented as one of several senior project options. The students had the choice of working in teams of two or individually (Boyarski and Buchanan, 1994).

The concept-focused project for this introductory course involved the design of what Boyarski and Buchanan (1994) call "a user-interface for self-service terminals" (p. 26), an automatic teller machine (ATM). NCR sponsored the semester-long project which offered students a chance use their creativity within constraints such as minimal interaction time and a conceptual model that was simple and consistent (Boyarski and Buchanan, 1994).

To allow the students to push the project beyond that of any typical ATM, students were allowed to select the content topics which included an encyclopedia searching tool aimed at high school students, an on-line florist, and a real estate browser.

As with any real world design project, several things had to be considered. Boyarski and Buchanan (1994) included the following: a) explicit goals and milestones, b) careful consideration of the audience, c) periodic progress evaluations, and e) client-participation in the process.

In the initial offering of the HCI course, the client was instrumental in doing several things such as:

1. Setting the stage for the project
2. Supplying objectivity
3. Providing knowledge of client needs
4. Providing knowledge of corporate culture
5. Outlining technical constraints
6. Providing mid-project evaluation
7. Giving review of the final presentation

One might argue that such parameters might restrict the student's creative input, or their flow of ideas. However, Boyarski and Buchanan (1994) indicate that these variables were not considered limitations, but an integral aspect of solving interface design problems. They report that both students and client enjoyed the exchange, and found it a pleasant break from standard day-to-day classroom and/or business activities.

Once each group developed a problem statement, user profile, and clear goals, a transaction map (flow chart) was developed to figure out what a typical transaction might consist of. This chart was done by diagramming on large sheets of paper attached to the wall. The transaction allowed the following:

- Storyboarding (a visual frame-by-frame representation of the transaction)
- Screen building (begun in the final four weeks)
- Final sequences (using the beta version of Macromind Director)
- Final product: kinetic storyboards (animated sequences to show the look, sound, and feel of each interface)

This early, fundamental course, introduced six years ago would become the model which Boyarski and other CMU design faculty would use for the teaching of human-computer interface (HCI), and human-machine interaction (HMI) design courses. The following year, the course was opened to the entire university and attracted sixteen students. Among these were graduate and undergraduate students from areas such as Information Management, Computer Science, English (professional and technical writing), and Architecture.

In the second offering of this HCI course, teams of three or four students represented the multidisciplinary collaborative model that Boyarski wanted to try out. According to Boyarski and Buchanan,

The mix of disciplines provided the teams with differing perspectives on the problem to be solved and a more holistic approach to the solution. As expected, team dynamics were at times a problem - an accurate reflection of the challenges posed to any multidisciplinary team. But having to resolve conflicts and to respect and build on each other's differences were important lessons learned. Team work is proving to be an important skill for a designer, one we should be teaching and fostering throughout a student's career (Boyarski and Buchanan, 1994, p. 94).

Boyarski's program continues to do projects with NCR and others. Other project sponsors include Apple Computer, Hewlett Packard, etc. (Boyarski and Buchanan, 1994). Though the design department was the first at CMU to offer HCI design in 1989, by 1994, 12 interface design courses were being offered on the campus in seven different departments (Boyarski, 1994).

Boyarski is a big proponent of collaborative, interdisciplinary team work in education and practice. In his article "Everything is Changing: The New Face of Interface Design" published in the American Center for Design Journal, Boyarski (1994) states:

No one individual has the experience or the knowledge to answer all the questions that arise. The solution is in multidisciplinary collaborative work with experts from various fields participating in the conception and design of how a person and a computing device might communicate with each other, in the context of software that supports work and play (Boyarski, 1994, p. 83).

Boyarski began his transition from traditional tools to computer-based appliances in 1984.

Plate IV
Matthew S. Gaynor



Matthew S. Gaynor: University of Cincinnati

Matthew Gaynor is an Assistant Professor of Graphic Design at the University of Cincinnati. He teaches at the School of Design within the College of Design, Architecture, Art, and Planning. In 1982, Gaynor received his BA in Art from Yale University. In 1988, he received his MFA in Graphic Design, also from Yale University.

Gaynor started his career by becoming involved in a variety of visually creative projects. These involved print communication for the City of New Haven, and animation and commercials for national television at Wardell Animation Photography, Inc. (Gaynor, 1995).

After two years with Wardell, Gaynor worked as a senior designer for the Angelica Design Group Ltd. Here, he became involved in art direction and design, and was responsible for book, and publication design, the production of direct mail, and other promotional materials.

He began his teaching career in 1988 as an Assistant Professor of Graphic Design at the University of Kansas. In Kansas, Gaynor taught beginning, inter-

mediate, and advanced level graphic design courses. He was also active in the development of curriculum specifically involving the implementation of computers. He also worked toward the acquisition of computer-based technologies in the department.

At Bath College in England, Gaynor was an instructor at the 1989 Bath Summer Program in Graphic Design. There, he served as a faculty liaison, for the University of Kansas.

Gaynor moved west in 1991, and began teaching at California State University (CSU) in San Bernardino. Teaching a range of design courses at CSU, he also developed and implemented two new courses into the existing curriculum. They are known as "Computer Graphics," and "The History of Graphic Design." He was further involved in ongoing curriculum development; he focused on the installation of new media in the graphic design curriculum, and sat on various design department faculty and university committees.

I met Gaynor at the University of Cincinnati where he presently teaches graphic design. His teaching again focuses on graphic design and computer technologies. Gaynor is involved in developing courses for a new program in the university's School of Design called the "Electronic Media Design Program" (Gaynor, 1995).

Gaynor has free-lanced since 1983, for clients based in New York, California, and the Midwest. Some of them are listed below:

- NeXT Computer, Inc.
- The American Institute of Architects
- Conde Nast Publications
- Deutsche Bank Capital
- Institutional Investor

Gaynor is the recipient of numerous fellowships and awards. Some of his fellowships include the Ford Foundation (1986), Carl Rollins (1987), and the Alice Kimball Fellowship in English (1988). Between 1992 and 1995 he received four university research grants for travel, and for the production of multimedia computer animated short videos (Gaynor, 1995).

In 1991, when Gaynor was at the University of Kansas he received the UCDA Design Excellence Award for the design of the brochure "100 Years of Engineering". Twice he has exhibited his work in two-person shows at The University of Kansas' Fine Arts Gallery. In 1991, the series of pieces was entitled "Over Night to Many Distant Cities." These compositions were comprised of images with text and photographs. The 1990 exhibit consisted of a series of photographs exclusively. This selected work was simply entitled "Untitled Photographs."

Currently, Gaynor is Vice President of the Art Director's Club of Cincinnati. He was a member of the Board of Directors of the Cincinnati Artist Group Effort (CAGE) from 1994 to 1995. During that same year, Gaynor was Chair of the Education Committee at the Cincinnati Art Director's Club.

Gaynor and other design educators are confronting the evolving definition graphic design. For Gaynor, the definition of design and design education are broad and far reaching. He explains:

The question of how best to educate a graphic designer is made difficult to answer by the lack of a precise definition of what it means to be a graphic designer. The scope of the profession has been continuously expanding since its inception and shows no signs of ever fitting neat categories. It's safe to say that the designer is and always will be involved in the communication of ideas....Furthermore, the designer most often employs visual means to communicate these ideas. Given the breadth of the

designer's options for specialization, it becomes increasingly important to give the designer a solid foundation in the basic principles of form and the fundamental tools and technologies he is most likely to encounter (Gaynor, 1995, p. 1).

To my study, Gaynor brought his unique perspective as to how to approach the introduction of computer-based media into the curriculum. He thinks that in design education, there is a strong delineation between traditional tools and those that are based on the computer. He wants to strive for a more harmonious blending of the variety of media available to today's graphic designer.

In my interview with Gaynor on April 28, 1995, he responded to a question dealing with the computer becoming a standard tool of design, and the designers' investigation of emerging media:

Well, I'm not sure that I ever really recognized that they [computer technologies] would be the standard tools of design. In the same way, I didn't necessarily recognize that plaka was a standard tool of design. I mean, you just used it. And the computer was a different kind of plaka. To some degree, I think it had to do with the time that I was introduced to it. It wasn't any different than learning any other new thing. As I say, when I got to grad school, not only did I have to learn how to use the Mac, I was also learning how to use the letterpress machine. I was learning how to use the Compugraphic typesetting machine, and the Linotype machine. So all these things were essentially strange technologies to me anyway. And it wasn't any more of a different tool than any of those other things. To some degree, I try to take that attitude to the classroom in terms of introducing it to my students. That it's really no more powerful, or more scary, or whatever, than any of the other tools that the students are going to learn (Gaynor, April 28, 1995).

Gaynor began his transition to computer based media in 1986.

Plate V
Karen Woods Monzel



Karen Woods Monzel: University of Cincinnati

Karen Monzel is an Assistant Professor of Graphic Design at the University of Cincinnati (UC). She teaches in the School of Design in the College of Design, Architecture, Art, and Planning. In 1977, Woods received her BA in Graphic Design from UC. In 1988, she received her MA in Communication Arts at UC's McMicken College of Arts and Sciences (Monzel, 1995).

Monzel has taught at the School of Design for ten years, where she has maintained a full course compliment. She worked with graduate and undergraduate students, and has continued with a research focus in computer technology in the design arts.

Monzel's involvement with the School of Design has gone far beyond teaching. She has worked as a primary force in the development and implementation of the School of Design's strategic plan, particularly with the unfolding of its emerging design program called "Electronic Media Design" (Monzel, 1995).

At UC, Monzel was given the responsibility of developing some computer-based courses within the School of Design. One such course is "Computer Graphics Fundamentals". This interdisciplinary course addresses the needs of design and fine arts students, and has become a requirement for students within these majors. It deals not only with computer-based media, but speaks to the related issues of aesthetic considerations, critical thinking, writing, as well as the use of technology. The journal Computer Graphics World selected one of her student's projects from this course for national publication.

Another course developed by Monzel is for upper level students, and is called "Advanced 2-D Imaging". It is a course that explores advanced techniques in raster and vector image processing, and uses graphics-based applications to support computer visualization. The student is expected to gain significant expertise in the art of creating computer graphics, and its various means of output for professional use. In this course, an equal emphasis is placed on issues of communication and aesthetics. Problems presented require the use of critical thinking skills, and students are asked to communicate their thought processes verbally and in writing.

A third course developed by Monzel is called "Computational Design Media Lab I: Introduction to Interactive Design". This course was developed in response to the school's interest in interactive media design. It is structured to provide students with an understanding of the fundamentals of interactivity, multimedia, and interface design. With its nonlinear, kinetic features, this type of design requires a different approach to information processing than traditional two-dimensional design. Here, students must not only master the components of motion, sound and, interactivity, but must also understand the importance of how the user interacts with the computer (Monzel, 1995).

Monzel's development of these three courses, and her leadership in establishing a new major focusing on computer-based media within the School of Design, exemplifies her commitment to the appropriate development of computer-mediated technology in the formal design education environment. Also in 1995, she was one of the ten university professors appointed to the faculty of the UC Summer Institute for Instructional Technology. This position carries a two year honorary appointment as a faculty member for the Center for Academic Technology.

Monzel has developed and secured grants in support of new media in the graphic design curriculum. She was recently awarded the Dean's Special Award, a singular, annual award given to a College of Design, Architecture, Art, and Planning faculty member. The aim of the award is to honor significant teaching, research, and service.

Outside of her academic pursuits, Monzel has developed a viable graphic design practice, KWMonzel Design. Her professional work as a graphic designer has continually enhanced her understanding of the elements of the design profession that are essential for students. The computer is used in all elements of her practice, and she credits the knowledge gained through her practice as being instrumental and invaluable in the teaching of computer-based design courses.

Prior to her work with UC and KWMonzel Design, Monzel worked as a graphic designer with several Midwestern design firms. These firms include Fitch, Inc. (formally Richardson/Smith, Inc.) of Columbus, Ohio; The Design Group, Inc. of Indianapolis, Indiana; and GTM Design of Cincinnati, Ohio, where Monzel was a partner.

Between 1992 and 1995, Monzel won 10 merit awards from organizations such as the Art Directors Club of Cincinnati, and the AIGA/Art Center Dayton.

Her 1994 design for the NASA/UC Space Engineering Center was included in a North Light Books publication entitled Fresh Ideas for Corporate Identity.

Outside of design education and practice, Monzel enjoys creating pastel drawings, watercolor paintings, and silk-screening. She has exhibited this aspect of her work, as well as her design work, throughout the state of Ohio.

My interview with Monzel took place in her office at UC's School of Design on April 28, 1995. She brought to this study the importance of technology-based course development, as well as her insight on what has worked within her classroom.

Another unique perspective which Monzel contributed to the study was how this refined, computer-centered knowledge and skill could become the impetus for promotion and recognition within a school and/or university. Monzel candidly articulated this idea in response to a question dealing with the benefits of the shift to computer-based tools and methods. Monzel stated:

I also feel that I can, and hope that I will get a lot in terms of the position my efforts will put me in within the school--being a leader in the use of computer technologies, understanding it, working with it, etc. (Monzel, April 28, 1995).

Monzel stated another interesting view. Although some designers believe that the computer is just another tool used in the process, Monzel's mention of what the computer is, and what it does seemed far reaching and more involved than the simple tool scenario suggests. In response to the question concerning portents for design education and the educator in the future, she responded:

My views on computers are very different from that. I don't view it as just a tool any more. It goes beyond that when you are creating for interactivity. The tool becomes the process which also is the end. It's part of the creative act. In many cases, it is the creative act. And that's where I see it going (Monzel, April 28, 1995).

Monzel also made another interesting point regarding practitioners. While most of the study's participants spoke of projections relative to the student, Monzel focused on practitioners out in the field today. She believes they are not adequately prepared to effectively move into the area of interactive multimedia design. Monzel thinks they have to be reeducated, or extend their professional development to include areas related to the interactive design disciplines (Monzel, 1995).

Monzel started her transition to computer-based media around 1988.

Plate VI
James Anderson



James Anderson: Pentagram Design, Inc.

Jim Anderson is a Senior Designer and Manager of Technical Design Services at Pentagram Design Inc. of Manhattan, New York. Anderson earned a BFA in photography in 1982 from Louisiana Technical University (LTU) in Ruston. Anderson did his graduate work at Pratt Institute in Brooklyn, NY where he concentrated in Communication Design. He graduated from Pratt with his MS degree in 1986 (Anderson, 1995).

After Pratt, Anderson took a job with The Pushpin Group in New York. As a junior designer at Pushpin, Anderson worked for two years designing smaller jobs, collateral material for larger projects, and coordinated all aspects of comprehensives and print production.

Anderson joined Pentagram Design, Inc. as a graphic designer in 1987. At Pentagram, he designed and managed major projects which included national corporate identity programs, sports graphics, annual reports, corporate literature and promotional materials. This position gave him more responsibility, and added more diversity to the type of work he performed. At Pentagram, Ander-

son directed project budgets, acted as the company's primary liaison with clients, and art directed photographers and illustrators (Anderson, 1995). This work was done for such companies as:

- CBS
- World Cup USA 1994
- Champion Paper
- The NFL
- Nieman Marcus
- Cowen & Company
- The Empire Hotel
- The Hotel Hankyu International

Anderson also took on a supervisory role, directing assistant designers, computer production staff, and free-lancers. He was the first designer in Pentagram's Manhattan office to use the computer as a production tool. His interest in using computer technology in the workplace eventually lead him to develop a Macintosh-based design and production facility for this office (Anderson, 1995).

In 1991, Anderson was promoted to his current position of Senior Designer, and Manager of Technical Design Services. In this new post, he has been responsible for the further development of Pentagram's expertise in computer-born design technologies. He also began providing technical consulting services. Anderson still provides such services to the Pentagram staff and various clients (Anderson, 1995). Below is a list of some of the companies for which he worked as a technical consultant:

- Disney
- Hoechst-Celanese

- Northrop
- United Technologies
- Ammirati & Puris/Lintas

Anderson supervises all office computer, data network, and communication systems and support at Pentagram (New York). He has also been instrumental in automating many of the office's accounting and job costing systems and procedures. He also developed and implemented more efficient methods to facilitate design, production, and communication between staff, clients, and vendors.

Pentagram Design is noted for its connections within the design, arts, and academic communities, and both partners and staff members are involved in one or more of these arenas. From 1989 to the present, Anderson has been an Adjunct Professor at Pratt Institute in the graduate Communications and Packaging Design program. Anderson has taught the following courses: "Graphic Design on the Macintosh," which focuses on digital design and production techniques, "Visual Communications II," which emphasizes the development of cohesive design programs for specific clients, and "Thesis," a research and development course which allows for the development of the final thesis (Anderson, 1995).

Anderson has exhibited his work in the Type Director's Club Show in 1990 and 1991, as well as in the New York Art Director's Club Show in 1991. His work has been published in the 1989 Print Regional Design Annual, and Print's Best Logos and Symbols III (1993).

In 1994, he cochaired the American Institute of Graphic Arts' Technology in Design Special Interest Group (NY Chapter). Currently, Anderson serves on the Executive Committee of the American Institute of Graphic Arts (NY Chapter).

Anderson attributes his interest in computers to his undergraduate days at LTU between 1978 and 1982 (Anderson, 1995). "When I was an undergrad, I lived with a bunch of electrical engineers [students]. So, computer technology was always the perennial topic of discussion with my roommates" (Anderson, April 17, 1995).

This interest in computers led him as a graduate student, to the Computer Science (CS) Department at Pratt Institute, though he was registered in the Communication Design Program there. In this CS department, he was exposed to a crude computer graphics course which used algorithms to draw simple images on a VAX minicomputer, a process which Anderson found frustrating.

Later (around 1984), he took a PageMaker (a page layout program) course taught on the Macintosh platform at the School of Visual Arts in New York. This course offered Anderson exposure to the beta version of the software. It was then taught by Isaac Victor Kerlow (Anderson, 1995).

The rest of Anderson's education and training with respect to technology in design came through professional, on-the-job experiences (Anderson, 1995). With all of his technical know-how, and related professional responsibility, Anderson still believes that core graphic design subject matter, including thinking skills should be emphasized in design education. He stated: "I think what design educators need to concentrate on is providing students with [only] basic computer skills, enough to be able to get hired You need conceptual skills to advance beyond that" (Anderson, April 17th, 1995).

Anderson began his transition to computer-based media around 1983.

Plate VII
Paula Scher



Paula Scher: Pentagram Design, Inc.

Paula Scher is a graphic designer and partner at the New York-based Pentagram Design, Inc. Originally from Washington D.C., Scher received her BFA from the Tyler School of Art in 1970. From 1972 to 1982 Scher served as an Art Director for CBS Records where she produced ads, posters, and approximately 150 record covers a year. In 1984, she joined forces with magazine designer Terry Koppel to found their own firm: Koppel & Scher. She consulted independently for one year before joining Pentagram as a partner in April of 1991 (corporate author, 1995).

Scher's graphic design work includes packaging, identities, editorial layout, promotional material, and advertising for a broad range of clients. She has personally headed the teams developing projects for such firms as:

- RCA Consumer Electronics
- The Children's Television Workshop

- The New York Times Magazine
- Champion International Corporation
- Estee Lauder
- The American Museum of History

She has received more than 300 design awards from national and international design associations. Scher's work has been widely published, and is represented in the permanent collections of the following institutions:

- The Museum of Modern Art
- The Library of Congress
- The Zurich Poster Museum
- The Denver Art Museum
- Centre Georges Pompidou (Paris)

Additionally, Scher has authored numerous articles on criticism and the practice of design. Her work has been published in various journals such as: Idea (Tokyo, 1992), Communication Arts (May/June, 1986), Design (London, 1992), Print (January/February, 1989), and Blueprint (London, July/August, 1991).

Books featuring Scher's work include: New American Design (New York: Rizzoli, 1988), American Typography Today, (New York: Van Nostrand Reinhold, 1989), Contemporary Graphic Design (New York: Van Nostrand Reinhold, 1991), and International Women in Design (Washington: Supon Design Group, 1993) (corporate author, 1995).

Scher authored The Graphic Design Portfolio; (New York: Watson-Guptill Publications, 1992). This volume was inspired by a portfolio class which she taught for eight years at the School of Visual Arts (SVA) in New York. The students' work was used as illustrations in this publication. Scher was also recently

appointed Chairman of the Graduate Program in Graphic Design at SVA where she is in the process of developing a new department and curriculum.

From 1980 to 1983, Scher served on the National Board of Directors of the American Institute of Graphic Arts (AIGA). She cochaired the 1991 National Conference in Chicago with Pentagram partner Michael Bierut. She is a member of the Alliance Graphique Internationale, the AIGA and the editorial board of *The Journal of Brands Management* (London).

Scher takes full advantage of computer technologies for print, television, and interactive work. However, my interview with her on April 17, 1995 was filled with caution concerning new media. However, she kept her tone upbeat and humorous. Humor is a trademark of Scher's work. In Pentagram's 301-page visual anthology entitled *The Compendium* (1993), Scher states:

For as long as I can remember, I've been obsessed with making jokes. I've been told that humor is a form of hostility, or a method of relieving tension. Regardless of this, I have always found the need to point out the absurd, punch holes in pomposity and generally disrupt all solemnity. I confess that I often do it when it is not requested or appreciated; I can't seem to contain myself. The act is involuntary, but it is my way of giving. (Scher, 1992, p. 296).

Scher seemed to bring this sense of humor to the interview. She used it to point out the foibles of technology, and their impact on students and young professionals. She emphasized the continued importance of teaching graphic design students to be experts in design, and not to lose sight of the importance of such skills as planning, sequencing, etc. When asked for her recommendations to design educators, Scher replied: "Forget about the technology, and teach them how to think. Teach them how to reason. Teach them how to draw conclusions. Teach them how to make analogies. Teach them how to be visually literate" (Scher, April 17, 1995). I gathered that Scher does not want to see the computer

become the primary focus of the graphic design curriculum. And she felt that the needed computer skills could be gained on the student's own time, or on-the-job.

Pentagram Design, Inc., which was founded in 1972, is an international design firm with offices in London, New York, San Francisco, Austin, and Hong Kong. The firm provides services in graphic, product, and environmental, and interactive media design. Pentagram employs 14 partners and 110 staff members worldwide. Each partner has her or his own areas of expertise, and all have professional connections within the design, arts, and academic communities.

Every project undertaken by Pentagram is headed by at least one partner or associate and is carried out by this partner's team. This process provides a high level of creativity and insures effective lines of communication and administrative control (corporate author, 1995). According to its company literature:

The individual partners are totally responsible for their own team of designers, technicians, and administrators. This ensures that every client has the attention of a partner throughout the process of a commission. Ours is not the classic pyramid where the originator develops the business, and by so doing is forced up and away from detailed knowledge of the skill that he is selling. Ours is a collection of smaller pyramids each headed by those who have given Pentagram its reputation (corporate author, 1995, p. 4).

Pentagram's international clients may be served by two or more of their offices. This enables the most appropriate Pentagram talent worldwide, to participate in the project (corporate author, 1995). Some of Pentagram's current and past clients include:

- American Standard
- Art Center College of Design
- Audubon

- Bausch & Lomb
- Disney Development Corporation
- Godiva Chocolatier
- Hallmark Cards
- Hilton International
- Lloyd's of London

Scher began her transition from traditional to computer-based media around 1986.

Plate VIII
Aaron Marcus



Aaron Marcus: Aaron Marcus and Associates, Inc.

Aaron Marcus is president and founder of Aaron Marcus and Associates (AM+A) of Emeryville, California. Marcus received his BA in Physics from Princeton University in 1965. He went on to receive both his BFA and MFA degrees in Graphic Design in 1968, from Yale University.

Marcus is an internationally recognized authority on the design of user interfaces, interactive multimedia, presentations, and printing/publishing documents such as charts, forms, icons, and screens. Marcus's research interests include metaphor design and information visualization.

He founded AM+A in 1982, and believes that it was one of the first, if not the first fully computer-based design firm in the country. When Marcus set up his firm in 1982, he was supported by a three-year grant from the US Defense Department's Advanced Research Projects Agency (DARPA), the Pentagon's advanced research and development agency. DARPA was interested in ways of displaying computer information more effectively (Cowan, 1995).

In 1993, AM+A was cited as one of the fastest growing companies in Northern California by the San Francisco Business Times. Developing products, documents, and presentations, AM+A is a full service firm offering planning, analysis, design, implementation, evaluation, and training (corporate author, 1994).

AM+A has four basic areas of activity. They are: 1) design of user interfaces, 2) multimedia, 3) documents, and 4) training. The training component grew out of a tutorial which Marcus gave at the 1980 SIGGRAPH conference. Similar material is now taught by Marcus and his associates in a variety of courses at conferences, and on location at various corporations.

Marcus coauthored Human Factors and Typography for More Readable Programs with Ron Baeker (1990), a professor of computer science at the University of Toronto. This volume discussed "better display of computer programs and documentation" (Cowan, 1995, p. 20). According to Cowan (1995),

In what must have been a software designer's dream project, for Motorola's Envoy personal communicator, AM+A wrote the user manual first, and Motorola worked backward from that to create the user interface. AM+A has also done document design work for NASA, NCR, Xerox, and 3M (Cowan, 1995, p. 20).

Marcus also coauthored the Addison-Wesley publication The Cross-GUI Handbook for Multiplatform User Interface Design with Nick Smilonich (1994), Chief Applications Services Architect and Technologist at Unisys Corporation, and Lynne Thompson (1994), a Senior Technical Staff Engineer also of Unisys Corporation.

This book examines the features, capabilities, and strengths of the following six environments: a) Microsoft Windows, b) Windows NT, c) IBM OS/2

Presentation Manager, d) OSF/Motif, e) Apple Macintosh, and f) NeXTSTEP. It compares and contrasts these GUI environments, along with making recommendations for handling conflicting and incomplete style guides. "The Cross-GUI Handbook lays the foundation for designing an object-oriented user interface, incorporating new technologies such as multimedia and pen interface" (corporate author, 1994, p. 1).

Marcus wrote the ACM publication Graphic Design for Electronic Documents and User Interfaces in 1992. This publication is the first in an ACM Press Tutorial Series, and has been translated into Japanese. It "provides practical advice on how to communicate information effectively" (corporate author, 1993, p. 1). Additionally, there are more than 100 articles by and/or about Marcus in human-computer interface, computer graphics, and design journals and magazines.

Since 1980, Marcus has given tutorials on metaphor usage, design, and information visualization to more than 3,000 people at academic institutions, and at conferences throughout the world. Some of the conferences include the Association for Computing Machinery's (ACM) Special Interest Groups (SIGs) including SIGGRAPH (Computer Graphics), and SIGCHI (Computer-Human Interaction), as well as National Computer Graphics Association (NCGA) sponsored meetings.

In the graphic design industry, Marcus is known as a pioneer in technology and design; he has established a list of firsts and onlys. Marcus was the world's first professional graphic designer to be involved full-time in computers graphics (1967), and the first graphic designer to program a desktop publishing system (for the AT&T Picturephone, 1969-71). He was also the first graphic

designer to design virtual realities (1971-73). As previously mentioned, Marcus is believed to be the first graphic designer to establish an independent computer-based graphic design firm for the purpose of designing computer interfaces, electronic documents, and multimedia in 1982 (corporate author, 1994).

Marcus is the only graphic designer to be co-awarded a research grant (\$500,000 for three years) by DARPA to develop new document design standards for programming languages (1982-85), and the only graphic designer to receive the National Computer Graphics Association's (NCGA/USA) Industry Achievement Award for his contributions to computer graphics in 1992 (corporate author, 1994).

AM+A has always been a five to ten person operation. This team is supplemented by five to ten part-time associates. The firm also uses free-lance specialists with expertise in areas such as human factors, technical and music editing, animation, etc.

The clients who use the services of Marcus's interactive design component, are varied and noteworthy. Some of the companies that have taken advantage of AM+A's expertise include:

- American Airlines
- AT&T
- Consortium
- Intellimation
- Linotype/Hell Graphic Systems
- Microcomputer Technology
- Motorola
- Oracle
- Prodigy

Over the years, Marcus and his team at AM+A have developed their own interface design principles. In a recent article in Micro Publishing News Magazine, Cowan (1995) gave an overview of these principles: The list starts with an assessment of user needs and objectives; it then continues with what AM+A refer to as the five components of the interface:

1. **Metaphors**--these are the terms, concepts, and images that compose the concrete elements of the interface. The "trash can" and the "desktop" (on the Apple interface) are both examples of the process whereby one image or thing is applied to another idea or process in an explicit comparison.

2. **Mental Model**--is the cognitive model representing "the way in which the user will encounter your multimedia product's function and data" (Marcus 1995). It determines how the user cooperates with the computer.

3. **Navigation**--is a system for getting around within the mental model; this system "should make data and functions appear simple" (Marcus, 1995). It includes items like menus, submenus, and commands (Cowan, 1995).

4. **Appearance Characteristics**--this refers to what Marcus calls the "look and feel" of the interface. They include what languages the interface uses, its visual aspect, and any sound it makes.

5. **Interaction**--these are the devices, and sequences of steps applied via those devices, through which navigation will be accomplished (Cowan, 1995).

From Columbus, Ohio, I interviewed Marcus by telephone at his office in Emeryville, California. The interview was held on April 20, 1995. He brought to the study insights regarding the types of machines and software that were available in the sixties. He was also able to paint the most comprehensive picture of the evolution of design technologies from his initial introduction to computers to the present.

In doing so, he also discussed his early experiences with AT&T Bell Labs. These discussions occurred in response to the first question which asked the participants about their introduction to computer-based technology for their work.

Of all the participants, Marcus had been involved with computer based technology the longest. He started his transition in the mid sixties.

Plate IX
Loretta Staples



Loretta Staples: U dot I, Inc.

Loretta Staples is founder, president, and Director of Design at U dot I, Inc., a San Francisco-based design studio specializing in interfaces for computer software and interactive media. She founded the company in 1992. Staples received her BA in Art History from Yale University in 1979, where she also completed a suite of graphic design courses. In the Graphic Design program at Rhode Island School of Design, Staples continued her studies in 1981 (corporate author, 1995).

Staples' professional background spans seventeen years of visual communication and design. In 1988, she began to focus exclusively on interface design. Her first opportunity to further develop her expertise in this area came from her experience as a free-lance user interface designer with Clement Mok Designs of San Francisco. As a free-lancer in Mok's firm, she was instrumental in the design of some of Apple Computer's first comprehensive CD-ROM/laser-disk marketing tools such as "Apple by Apple," and "Multimedia Reference and Learning."

She was later recruited by Apple, where she was instrumental in the design of such widely used interfaces as "Quick Time Apple Seminar," the "Desktop Seminar Toolkit", and "DeskTop Networking Basics."

Prior to her interest in interface design Staples took on many other professional roles. She worked as a graphic designer at Richard Saul Wurman's San Francisco firm: The Understanding Business; an exhibit developer at The Burdick Group in San Francisco; and as a museum curator at the Yale University Art Gallery (corporate author, 1995), in New Haven.

Staples has lectured at Parson's School of Design, Stanford University, the University of Minnesota, and the Schule fur Gestaltung in Basel, Switzerland. She was a featured speaker at the Organization of Black Designer's (OBD) first biannual conference in Chicago. At INTERCHI '93, she presented a paper on graphic alternatives to the conventions of the "desktop" metaphor. Her paper entitled "Representation in Virtual Space: Visual Communication in the Graphical User Interface," was published in the INTERCHI '93 Conference Proceedings document. She participated in an I.D. (International Design) Magazine sponsored round table discussion called "The I.D. Multimedia Forum." This exchange, which was on the future of interactive media, was later published in the March/April, 1994 issue of I.D. The International Design Magazine. The discussion was moderated by Chee Pearlman, and Janet Abrams (corporate author, 1995).

As a prelude to the products and services offered by the firm, its corporate brochure About U dot I, describes the interface:

While typically associated with graphical operating systems like the Macintosh, the proliferation of computer technology has made the interface a ubiquitous part of our environment. Products as diverse as ATM machines, management information systems, educational software, and multimedia games have in common the interactivity enabled by the

interface. Through it, people and computers are able to communicate—communication that informs, entertains, and educates. Effective interface design ensures successful communication by clarifying user options and system constraints. And in addition, a good interface can affirm product identity by presenting a unique visual appearance and interaction style (corporate author, 1995, p. 1).

Listed below are a few clients of Staples' firm.

- Apple Computer, Inc.
- AT&T
- Bancroft Whitney Publishers
- Bell Northern Research
- Claris Corporation
- Federal Express
- Hewlett-Packard
- Paramount
- Sony

My April 26, 1995 interview with Staples was conducted by telephone to her office in San Francisco. In our one hour session, Staples contributed to, and sometimes echoed the sentiments of the other nine participants.

Her formal education did not involve the computer, but was steeped in the traditional media utilized prior to computer-based tools. These media often involved the once standard practices and methodologies including ruling pens, plaka boards and gouache studies. Most of her informal, computer-centered education, training, and experience occurred in reference to the Apple Macintosh platform in the mid eighties. A similar time frame was not unusual among the participants. However, Staples brought to the study thought-provoking issues, some of which are highlighted below.

When reflecting on the interview, I sensed that to Staples the computer was more than a machine. She indicated that there was "some kind of sentimental attachment" (Staples, April 26, 1995) when referring to the Macintosh platform. Additionally, in describing how she made the transition, she spoke of her interaction with the computer in more intimate terms describing it as a "personal relationship" (Staples, April 26, 1995). The relationship was referred to a second time as a "personal friendship" (Staples, April 26, 1995) and was cited as part of the reason for her natural shift to computer-based tools.

I have heard many graphic designers say that they prefer the Macintosh platform because of the ease with which it can be used. A user-friendly, icon-driven approach was implemented early on by Apple, and has won the approval of many designers. Also, this platform may also have assisted in the ready exploration of computers by a greater number of designers, which led to their discovery of new roles in which to apply their knowledge and skill. Staples suggests the latter in her experience with the transition from traditional graphic design to user interface design.

Staples also brought the issue of management to the study. She discussed the issue in response to the question concerning the need to develop expertise that spans a variety of disciplines. She presents management as a task that needs to be seriously addressed by design educators. Staples states: "Designers need to learn how to manage, and manage with a vengeance" (Staples, April 26, 1995). Staples, who is heavily involved in project management, thinks it should be pursued as an essential skill of the graphic designer.

Later, in reference to the question concerning the recommendations practitioners might make to educators, Staples reemphasized the need to manage, calling for required management courses within design programs. She suggests

that such a course might deal with the supervision or control of the production of a complex piece of software. The importance of the management issue is further illustrated by Staples' statement, "I would say that it is the most important practical skill" (Staples, April 26, 1995).

Another concern illuminated by Staples is the graphic design industry's continual emphasis on style over cognitive issues. As much as graphic designers want to be thought of as more than just stylists, an idea echoed by many of the other participants, Staples contends that the primary focus remains on style. Such a focus according to Staples, is fostered by the design press, long established graphic design organizations such as the American Institute of Graphic Arts, and the academy. She insists that such an emphasis promotes "designers who design for each other, and the creation of style-driven pop stars" (Staples, April 26, 1995).

The concept of shifting roles is not foreign to Staples, as was evidenced in the variation in her previously held positions. She has worked as museum curator, exhibit developer, graphic designer, and interface designer. Her successful evolution from time honored tools to the computer involved further changes. Staples' conversion a) created for her a new position: interface designer b) led to her discovery of new applications for prior knowledge, c) encouraged her to seek new knowledge and skills, and d) eventually led to the founding of her own interface design firm.

Staples' transition to computer-specific media started in 1986.

Plate X
Sherie Bauer



Sherie Bauer: Fitch, Inc.

Sherie Bauer is Director of the Interface Design Group at Fitch, Inc., an internationally know design firm with offices in the United Kingdom, France, Japan, Singapore, and the two U.S. locations: Boston, Massachusetts and Columbus, Ohio. Bauer operates out of the Columbus site. In 1988, Bauer received her BFA degree in Graphic Communications from the Kendall College of Art and Design in Evanston, Illinois.

Bauer spent four years as Creative Director of EPC Multimedia Group, where she worked to insure the firm's establishment of its early interactive design business. At EPC, Bauer instituted innovative processes for the design, development, and management of interactive solutions for technical demonstrations, corporate portfolios, computer-based training products, and CD-ROM titles. Her clients included companies such as Steelcase, and Apple Computer.

In San Francisco, Bauer joined the staff of Clement Mok Design (CMD) as its New Media Project Manager. She was highly instrumental in helping to establish CMD as a leader in the interactive field. The scope of the work at CMD encompassed interactive marketing products, medical titles, and software development. The accounts were with such notable firms as:

- Aldus Corporation
- Apple Computer
- The Mayo Clinic
- Hewlett Packard

Bauer was also centrally involved in the successful launching of another interactive title company called CMcd.

Prior to joining Fitch, Bauer cofounded TopKat Interactive, Inc., an interactive communication firm. TopKat's services included various interactive products, and on-line systems for companies such as Whirlpool, Apple Computer, and General Electric.

As head of the Interface Design Group at Fitch, Bauer brings a wealth of experience and expertise in interactivity to the position. With her substantial experience in design and marketing, Bauer bridges the creative and analytical sides of interactive communications. She applies her expertise in management and marketing to establish and implement the product objectives of each client. Additionally, Bauer uses her creative talents to match the content and design of the particular interface to its target audience (corporate author, 1995).

Throughout its twenty years of design and business consulting, Fitch, Inc. has focused on customer environments, customer interface, and product development (corporate author, 1992). Fitch has also developed a multistep process or approach to user interface design. This approach is tailored to accommodate the

needs and resources of each client (Corporate author, 1995). The process may consist of the following eight steps or phases, yet all eight may not be required for every project. I have listed the eight phases of the process as they are documented in a Fitch, Inc. publication called Fitch + Interface Design (1995):

1. **Team Building & Workplan Design**--Staff from your organization and ours meet to determine project goals, team members, workplans, and schedules. We prefer to work *with* our clients rather than for them. We have found that integrated, interdisciplinary teams yield the best designs and the best transfer of results to your organization. Whenever possible, end-users are directly involved in the design process.
2. **Information Gathering**--Information is collected about your customers, market goals, and competition. We develop a thorough understanding of your product's domain and functionality. We conduct primary research (focus groups, direct observation, informal user interviews) and secondary research (documentation reviews, research of appropriate technologies). Research may take place interactively throughout the design process.
3. **Analysis**--Based on the information gathered, the team identifies and prioritizes opportunities for improvement or innovation. Available and appropriate technologies are evaluated. In the end, a frame for design is constructed, broadly defining the future interface's overall architecture, feature set, and visual character.
4. **Scenario Building**--The team may invent scenarios that describe the use of the new interface in the context of "typical" situations. Scenarios are important when the product or its interface has the potential to dramatically transform the use situation. Scenarios help envision new situations the interface will create and are often used as the basis for animated interface prototypes.
5. **Interface Architecture & Visualization**--The team conducts work sessions to define an interface architecture appropriate to both your customer's needs and the target hardware or graphical user interface (GUI). The visualization of icons, screen or display layouts, and custom hard controls starts here. Work on a formal system specification or style guide may also begin at this point.

6. Rapid Prototyping--Critical interface elements are created using a prototyping tool that will integrate seamlessly into your product development process. For simple icon or screen design, we can create ICO or BMP files with PhotoShop. For LCD design, we can deliver DXF or Gerber files of segment layout. For GUI or multimedia design, we can create interactive titles, prototypes, or product simulations in Visual Basic or Macromedia Director.

7. Usability Testing--Effective rapid prototyping is part of an iterative process in which semi-functional systems are created for testing with potential users. Usability testing is an essential part of this process. As designers, we are most effective when given the opportunity to witness the testing firsthand. As research specialists, we offer comprehensive usability and validation testing services.

8. Transfer--The delivery of animated demonstrations, scenarios, screen layouts, rapid prototypes, architecture schemes, formal product specifications or design guidelines, and test results constitutes the transfer of the interface design to your development team. If necessary, we can continue to fine-tune the design as it moves into production and market launch (corporate author, 1995, pp. 2-3).

Some of the clients of Fitch's user interface development component include:

- AT&T
- Blockbuster Entertainment
- Digital Equipment Corporation
- Harman Kardon
- Microsoft
- Olympus
- Prodigy Service
- Polaroid
- Xerox Corporation

My interview with Bauer took place on April 30, 1995 at Fitch's Columbus office. Bauer has been a part of a two person unit that worked within various companies to create interactive teams, and to get them up and running. The

insight Bauer gained from her experiences as a interactive media trainer were also a valued asset to my study. For example, Bauer differentiated between those who "ramp" quickly and those who don't. Particularly, she was referring to the design disciplines. To "ramp" up means to pick up or catch on to the specifics of interactive software and related hardware. This process includes issues of time, space, and sequencing.

Bauer also touched on how much time it takes to become proficient with interactive media, as well as a number of other issues, including cognition and training. She has been involved in the training of several graphic and product designers in their transitions to interactive media design. In my interview with Bauer, she shared some insights into this process (see Appendix A).

It's interesting that I find a lot of people in the industry [who] tend to draw a very solid line between interactive design and [print] communication design. I tend to draw a more solid line between product design and interactive design (Bauer, April 30, 1995).

Bauer indicated that her transition from traditional to computer-based tools was a natural one. She suggests that there are notable differences between designing for print communication versus designing for interactive media. She states: "you're now appealing to individuals, you're no longer appealing to mass markets for audiences We have the added responsibility of having to design and create for an individual" (Bauer, April 30, 1995).

Bauer began her transition from traditional media to computer based appliances in 1986.

CHAPTER IV

DATA ANALYSIS

Generalizability

My research makes no attempt to generalize its findings beyond the specific literature, participants, settings, and programs included. This formative approach "is limited entirely to a specific context" (Patton, 1990, p. 156). The upcoming analysis, as well the following summary and conclusion, are based predominantly on the data collected through the responses of ten case study participants. Formative approaches "often rely heavily, even primarily on qualitative methods" (Patton, 1990, p. 156) which I have utilized in my study.

Additionally, it does not intend to imply that these results stand for or represent the ideas, goals, or situations, of graphic design educators, programs, practitioners, or firms on the local, regional, or national level. However, these findings are intended to act as a vehicle for "'forming' the thing being studied" (Patton, 1990, p. 156), and to focus on some of the key concerns that the graphic design profession may be facing, in light of computer-based media.

Subsequent research should use a summative approach which will "serve the purpose of rendering an overall judgement" (Patton, 1990, p. 155), and be more generalizable to other educators and practitioners. Due to its goals of structured comparisons, generalization, and large sample size, a summative approach would not rely solely, or primary on qualitative methods (Patton, 1990). For future research, such a study is discussed in Chapter V, page 153.

Introduction to the Analysis

All participants were asked to respond to 21 questions. In this section of the study, I have examined responses of the two groups identified as graphic design educators and graphic design practitioners. Again, I interviewed a total of ten participants, five from each of the groups.

Participants' Introduction to the Computer

Year of Introduction

Question one aimed to find out how the participants were first introduced to computer technology, and specified categories including 1) platform, 2) software, and 3) environment. I also asked for the year of the initial introduction to computer-technologies. I found that the designers questioned received their first introduction to the computer within a 21-year period spanning 1966 to 1987.

Participating graphic design educators started with computers as early as 1976 (one out of five). However, it was not until the early to mid 1980s that the majority (four out of five) of these educators approached the computer. This transition occurred between 1982 and 1987. Similarly, graphic design practitioners can be broken down into early users and late users of the technology. Among practitioners, the earliest user began in 1966 (one out of five), while the remaining four (late users) were introduced between 1985 and 1986.

Predominantly, the eighties (1982 - 1986) was the decade when most graphic designers obtained some form of introduction to computers as a new medium.

Platforms and Software

The computer platforms used for their introduction varied. The earliest users (two out of five) among educators (1976-1982) received their initiation via a Digital Equipment Corporation (DEC) product called the VAX Minicomputer on which simple graphical programming could be done. One educator and two practitioners were introduced on the VAX. Other computer platforms mentioned by educators who were early users included the Apple II, Commodore 64, and the UNIX setting. In the UNIX environment, three-dimensional proprietary software was explored. Later users (1984-1987), representing three out of five of the educators questioned, used products produced by Apple Computer such as the early offerings from the Apple Macintosh line including the Mac Plus and Mac SE. On these Macs, design educators explored and implemented programs such as word processing tools, and beta versions of PageMaker, MacPaint, etc.

Likewise, most practitioners (four out of five) who approached computers in the eighties (1985 - 1986) used the Apple Macintosh platform; again they mentioned the Mac Plus, and the Mac IIs. With this platform, most practitioners used MacPaint, MacDraw, and MacWrite, and beta versions of programs such as PageMaker. However, one early user (1966) among the practitioners was an exception to the trend of using the desktop computer. His initial access to computer technology was on main frame computers used for graphical programming. This user then moved to platforms such as the Atari 600 with word processing programs, the Peras Workstation with bitmapped graphics editing software, and to the Macintosh (1984) and its related programs.

However, not all of the participants accessed new technologies in the same manner. One practitioner gained access to the benefits of emerging technologies through a team of computer savvy designers working within the firm. This particular practitioner was a partner in a major design firm. Her approach to transition, which involved routinely accessing technology through others, was unique among the participants. It illustrated how computer proficiency is not required at every level in design practice. And as I will discuss later, even in design education, some still teach exclusively with traditional tools and methods, and they basically rely on other faculty to convey the specifics of computer-based technologies to students.

Environment

In her 1984 article, "Courses in Computer Graphics," Richmond stated that "few schools offer programs devoted to computer graphics" (p. 182). However, both programs and courses may have been limited at the time of the article's publication. Both graphic design educators and practitioners found ways to access the emerging media. Users in design education and practice have since gained access through three channels: 1) continuing education programs/self-motivated efforts, 2) on-the-job training, and 3) graduate school. Of the five educators, one was introduced through a course taken in a computer science department as a part of continuing education. Three educators received their introduction on-the-job; and one of these three combined continuing education efforts and on-the-job opportunities. A graduate level graphic design program provided the introduction to computers for still another design educator.

With respect to the five practitioners, one received the initial introduction on-the-job. Two practicing designers gained initial access in graduate school:

one through a computer science department, and the other in a university computer center. One became oriented at a desktop publishing learning center, and another became oriented with the computer at home.

In the eighties, Richmond (1984) recommended four possible avenues that designers and artists during this time might take toward learning more about the use of computer-based media. The options she found available in 1984 included:

1. Two-to-three-day Seminars--these involved lectures and demonstrations for the design professional seeking a general overview. They were usually held on college campuses and were conducted by corporate computer graphics professionals.

2. Trade Shows--such exhibitions, provided "eclectic technology in action" (p. 182); they represented hundreds of companies and included a large assortment of related hardware and software. Example: SIGGRAPH (Special Interest Group in Computer Graphics).

3. Type Shops and Printers--businesses like these offered new and informative, time saving, cost reducing ideas on production in the graphic arts field. They usually keep current with the latest equipment, especially regarding such components as "typesetting, color separation and printing" (Richmond, 1984, p. 182).

4. Computer Graphics/Graphic Design Programs--though there were few such programs in 1984, the available innovative programs were either underway, and/or being developed at this time. A student was more likely to find a design department that had computers, than a design-focused computer graphics program. Some of the programs available at that time could be found at the Illinois Institute of Technology, Institute of Design; the California College of Arts and

Table 1
EDUCATORS' INTRODUCTION TO COMPUTERS

Participant	Year	Platform	Software	Environment	Discovery Via
Frye	1976	DEC VAX Mini- Computer	Graphical Program- ming	Continuing Edu. effort (Univ.)	Reading
Kerlow	1982	DEC VAX Mini- computer ----- Unix Environ. ----- Apple II Commodore 64	Proprietary 3-D Software	Continuing Edu. and On-the-job	Computer Sci. course
Boyarski	1984- 1985	Macintosh (Mac Plus) ----- UNIX Environ.		On-the-job	Searching other depts. on campus ----- Campus groups
Gaynor	1986	Macintosh (Mac Plus)	PageMaker Quark Xpress Freehand MacPaint	Grad. School	Introduced in classroom
Monzel	1987	Macintosh (Mac Plus) (Mac SE)	Word Processing Program	< Grad. School On-the-job >	Introduced by another facul- ty member

Crafts, Computer Graphics Support Group; and The Ohio State University,
Computer Graphics Research Group (Richmond, 1984).

Table 2
PRACTITIONERS' INTRODUCTION TO COMPUTERS

Participant	Year	Platform	Software	Environment	Discovery Via
Anderson	1985- 1986	DEC VAX Mini- computer ----- Macintosh	PageMaker	Grad. School	Computer Sci. course Design course
Scher	1987	Macintosh		On-the-job	Coworkers
Marcus	1967	Mainframe computers Atari 600 Peras Work Station Macintosh	Program- ming language	Univ. computing center and On-the-job	Own exploration
Staples	1986	Macintosh	MacPaint MacDraw MacWrite	Desktop Pub. Learning Ctr.	Own exploration
Bauer	1986	Macintosh	MacPaint MacDraw MacWrite	At Home	Teacher gave overview in senior year of college

Participants' Courses of Action

Design educators became interested in developing text and imagery using computers as they referenced trade publications, and/or engaged in exchanges with other faculty members. To gain access and exposure to this medium, some (as students or faculty members) proceeded by searching other departments and computing centers within their schools. Seminars were the means of introduction for one out of the ten participants.

To gain further access and experience, one out of five educators and three out of five practitioners reported buying computers to explore on their own. Still others as graduate students and/or design educators waited for the technology to arrive in the classroom, or in the department. However, by 1987 all participants had been exposed to computer-based media.

Current Hardware and Software

Most graphic design educators and practitioners today continue to refine their computer related knowledge and skills in the classroom and the work place. Question two sought to find out where educators and practitioners are presently, with respect to which products (hardware and software) they used. However, this question did not require participants to provide a complete list of each program and each machine. The tables that follow do not represent a comprehensive listing of the tools used by each school or firm. In terms of software, participants tended to list those that they most frequently used in teaching or practice.

Additionally, question two did not differentiate between software used for traditional graphic design work, and programs used in interactive media design. Participants all interpreted hardware to mean the computer itself (the CPU), as opposed to scanners, laser printers, etc. As such, they listed the computers primarily by the manufacturer's assigned name.

Currently Used Hardware

In 1990, Richmond compiled a series of articles she had written for Communication Arts (CA) and other magazines in a book called Design and Technology Erasing the Boundaries. In this volume, Richmond developed a survey that went out to people primarily involved in graphic design (76%), photography

(6%), illustration (11%), and advertising (15%). Both the survey questionnaire and the responses were initially published in CA, and later in Richmond's 1990 compilation. The first 500 responses received were processed (Richmond, 1990).

In terms of hardware, Richmond's survey showed that computers developed and produced by Apple Computer, Inc. were the overwhelming favorite of these creative professionals (56%). Similarly, my investigation also showed an enthusiastic response to Apple products. All ten of the participants were using some model of computer made by Apple in education and practice.

Five of the ten participants use PCs (two educators and three practitioners), and two of the ten used the Silicon Graphics high-end workstations (both educators). The Amiga platform was used by one educator. The Sun SPARK Station was used by one practitioner (see Table 4).

Currently Used Software

Richmond's 1988 survey also revealed that Aldus PageMaker was the leading page layout program. However in my study, only two out of ten mentioned this program: one educator and one practitioner. Today, four out of ten participants noted that they prefer Quark XPress as the preferred page layout tool (three educators and one practitioner).

Richmond's 1988 survey did not mention the use of authoring programs such as HyperCard and Macromedia Director. It is possible that HyperCard, one of the first of such tools to be released (1987), was still unfamiliar to these professionals.

My research showed that seven out of ten of the design professionals interviewed, stated that they used authoring programs. All seven (four educa

tors and three practitioners) mentioned Macromedia Director, and one spoke of using both Director and HyperCard.

Educators and practitioners seem to agreed on core software for basic graphic design (Quark Xpress, Adobe Photoshop, Adobe Illustrator, etc.), and interactive design (Macromedia Director, HyperCard, SoundEdit, etc.). It is important that there be some fundamental likeness in the types of tools used in

Table 3
HARDWARE / SOFTWARE CURRENTLY USED BY EDUCATORS

Participant	Platforms	Software
Frye	Macintosh (Quadras) PCs	Quark Xpress Photoshop Macromedia Director Illustrator
Kerlow	Macintosh (Various) Silicon Graphics Iris Amiga	Various
Boyarski	Macintosh (various) Power PCs	Quark Xpress Photoshop Macromedia Director Illustrator HyperCard SuperCard Freehand
Gaynor	Macintosh Silicon Graphics Iris	Quark Xpress Photoshop Macromedia Director Freehand
Monzel	Same as above	Same as above

Table 4

HARDWARE / SOFTWARE CURRENTLY USED BY PRACTITIONERS

Participant	Platforms	Software
Anderson	Macintosh	Quark Xpress Photoshop Illustrator Freehand
Scher	Same as above.	Same as above.
Marcus	Hewlett-Packard SUN SPARK Station UNIX Equipment Macintosh (various) IBM PCs	Macromedia Director Authorware Professional Photoshop Illustrator Persuasion Microsoft Word E-mail
Staples	Macintosh (various) PCs	Macromedia Director Studio 32 ResEdit ActStudio E-mail (Apple-Link, America On-line)
Bauer	Macintosh (various) PCs	Macromedia Director HyperCard SuperCard AptWare AuthorWare Illustrator Photoshop Canvas SoundEdit Etc.

both arenas since both segments (education and practice) are somewhat interdependent. Tables 3 and 4 give a full listing of the hardware given by participants.

The Early Road to Transition

With few formal courses and/or programs to choose from in the seventies and early eighties, how did graphic designers proceed in their investigation of emerging technologies? The goal of question three was to find the patterns or combination of tendencies, procedures, or actions designers used in converting to computer-based tools. Here again, no preformed list was given for participants to check options employed. Instead, they gave direct, on-the-spot responses. For example, it seems obvious that such a transition would require some review and study of related literature such as books, magazines, manuals, etc. However, if participants did not directly state or refer to literature or reading, then this information was not noted in Table 5. I assumed the respondents mentioned the actions which they felt most prominently impacted and benefited their individual transitions. These were included in my research.

As a part of formal and informal approaches to the computer in graphic design, reading was cited as instrumental by two educators and two practitioners. Reading proved helpful in staying current with new releases, learning new programs, and becoming familiar with the issues surrounding technology. All of the respondents (10 out of 10) confirmed that both formal and informal approaches to learning must involve hands-on experience utilizing computer hardware and software.

Though computer courses were taught from a technical perspective early on, some participants took these formal classes. While two educators took courses, only one practitioner enrolled in computer graphics related courses.

More educators probably took established courses, because of their situation in an academic environment where new courses and technological approaches to teaching were expanding. Practitioners (one) seemed more likely to attend a seminar or conference as opposed to taking college or university offered courses. Others not attending courses, seminars, or workshops at conferences, learned solely from experiences gained in their teaching (three out of five educators), or practice or free-lancing efforts (two practitioners, two educators).

Collaboration was also mentioned as a catalyst for learning to use and apply newer media, especially in the area of interactive design. Two out of five educators worked together to establish interdisciplinary team projects. These educators also collaborated to secure necessities such as new labs, expanded curricula, and technical support. Only two out of five of the educators questioned mentioned collaboration, though others may have collaborated as well. Practitioners however, had strong convictions concerning group efforts. Four out of five practitioners cited instances where collaboration was vital to learning in the transitional processes. Overall, team efforts were important to the designers interviewed. Seven out of ten participants recalled benefiting from their participation in group exchanges.

One educator and one practitioner recalled campaigning as a part of growing in the academic and business pursuits involving technology. Though not many noted this aspect in question three, designers in both categories have had to lobby, or contend for the acceptance and funding of technologies. As previously mentioned, new courses, labs, and technical support often came out of these efforts.

For educators, course development and teaching fostered knowledge and skill development relative to the computer. Three out of five educators

discussed the impact of both these activities, while these aspects went unmentioned by practitioners. Two out of five educators found consulting with their colleagues within their departments helpful, while only one out of five practitioners spoke of this approach.

Organizations such as those offered by the Association of Computing Machinery and local user groups have assisted educators and practitioners in transition. One design educator and one practitioner discussed the role of such groups.

Free-lancing and/or operating small firms outside of teaching has enhanced the knowledge and skills of two out of five design educators. These two educators credited free-lancing opportunities for having been the initial force that drove the investigation of computer-based tools. This process occurred before the technology was accepted into the design classrooms. Today according to one of these educators, this trend has been reversed. Now that the computer is an important part of design education, the primary motivation currently comes from the classroom.

Similarly, two out of five design practitioners told of how free-lancing situations enhanced their knowledge of computers for design. One practitioner free-lanced to get exposure to interface design, and the another learned from computer-savvy free-lance designers who were often contracted by his firm for special projects.

I observed that of the ten designers interviewed, only one, a practitioner, said she hired someone else as a channel or instrument of transition. The remaining practitioners and educators took a more active role in realizing their transitions.

One of the five practitioners had years of access to highly recognized research and development labs; this experience proved invaluable in his transition. The other four design practitioners did not; neither did the educators who were interviewed.

Table 5
ACTIONS FOSTERING TRANSITION

Actions	Educators	Practitioners
Reading Related Literature	Frye Kerlow	Marcus Bauer
Hands-on with Computer	Frye Kerlow Boyarski Gaynor Monzel	Anderson Scher Marcus Staples Bauer
Took One to Three Courses	Frye Kerlow Gaynor	Anderson
Collaboration	Frye Boyarski	Scher Marcus Staples Bauer
Course Development	Frye Boyarski Monzel	
Using Computers in Teaching	Boyarski Gaynor Monzel	
Campaigning	Frye	Anderson
Consulting Colleagues	Boyarski Monzel	Anderson
Organizations/Users Groups	Kerlow	Staples
Free-lancing	Boyarski Monzel	Marcus Staples
Seminars/Conferences		Anderson Staples
Hired Someone Else		Scher
R&D Groups/Writing and Presenting Papers		Marcus

Also in response to question three, one practitioner seemed to find growth and development opportunities from activities such as writing and presenting papers at conferences. Only one practitioner of the ten design professionals interviewed acknowledged that activities like writing and presenting papers were helpful in transition. Though the educators involved in this study have written and presented related papers at conferences, none mentioned this fact in response to question three.

Hindrances and Accelerants to Computers in Graphic Design

Hindrances

The transition to computer-based tools in graphic design was not met with great enthusiasm in its initial introduction. Both the tools and the users had to undergo growth and development. Question four sought to uncover the critical issues which promoted either a slowing or an increase in the transitions of educators and practitioners. Participants were asked to categorize the issues according to whether they slowed or hastened computer usage in their environments.

I found that some of the issues slowing the transition were specific to one group (either education or practice). Others had to be addressed by both groups. Three out of five educators and one out of five practitioners shared issues such as internal resistance (three educators, one practitioner), a lack of knowledge and skill with the new medium (two educators, one practitioner), and the challenge of funding (three educators, one practitioner). For both groups, the learning curve was exacerbated by a steady stream of upgrades in computer software and hardware (one educator, one practitioner).

Frye's (1994) article discussed a lack of consensus among educators with respect to the role of computers in design education. She stated: "Technology

hasn't made peace with curriculum everywhere. Paul Rand [a highly recognized graphic designer] told students in Boston that computers have no place in schools" (p. 4). Only educators (three out of five) mentioned the negative perception that still persists among faculty and administrators regarding the role of the computer in academia. Also, a lack of interest (one educator) and time (one educator) were highlighted by educators as having deferred the progress of computer technology in the graphic design classroom.

Practitioners alone mentioned the following issues that were more prominent in the early to mid eighties. They were: a) the early lack of adequate facilities for computer-based design education and training (one practitioner), b) the high cost of equipment (one practitioner), and c) inappropriate or crude technological design tools (two practitioners). Also specific to design practitioners was the issue of the increased cost of starting a computer-based design firm (one practitioner), versus the cost it required when traditional tools were used.

Table 6
Factors Hindering the Use of Computers in Design Education

Deceleration Factors	Out of 5 Educators
1. Lack of Interest: Faculty/Administration	1
2. Faculty's Lack of Knowledge & Skill with Computers	2
3. Faculty Resistance	3
4. Administrator/Faculty's Negative View of Computer's Role	3
5. Lack of Funding for Computers	3
6. Constant Upgrades: Software/Hardware	2
7. Learning Curve and Time Commitment	1

Table 7
Factors Hindering the Use of Computers in Design Practice

Deceleration Factors	Out of 5 Practitioners
1. Resistance from Administrators and Designers	1
2. Lack of Knowledge of the Benefits of Computers	1
3. Unavailable Computer-based Education and Training Facilities	1
4. Learning Curve	1
5. High Equipment Costs	3
6. Lack of Financing for New Technologies	1
7. Crude Tools	2
8. Constant Upgrades: Software/Hardware	1
9. Increase Capital Expense to Start Up New Design Firms	1

Accelerants

In terms of increasing and encouraging the transition to use of the computer, graphic design educators (two out of five) and practitioners (one out of five) noted becoming involved in some level of campaigning for the implementation of computers in their prospective arenas. Both recalled a level of eventual acceptance (two educators, two practitioners) by other colleagues, and/or administrators.

Issues that were specific to educators and that were credited with accelerating the shift included: a) the total commitment of a few faculty members (one out of five), b) proposal writing to secure grants (four out of five), and c) students who organized campaigns promoting technology (two out of five) in design education. Computer equipment made possible through donations and/or gifts (one out of five) appeared to be exclusive to education. Also, individual teachers

relied on their own funds (one out of five). This personal purchase was said to have been made to increase this educator's own knowledge and skill at home, in order to then bring this new information to the classroom.

One out of five practitioners saw and stepped up the pace of computer usage due to the realization of the benefits of computer technology, and two out of five practitioners reported the emergence of computer-competent young design professionals as an acceleration factor. Practicing designers gained further skill development through computer-based design firms and corporate design departments (one practitioner). This exposure promoted transition through on-the-job training. Also contributing to the accelerated use of technological tools in design practice were more sophisticated software and hardware (two practitioners), and a gradual decrease in the cost of the computer and its components (one out of five practitioners).

Table 8

Factors Accelerating the Use of Computers in Design Education

Acceleration Factors	Out of 5 Educators
1. The Eventual Acceptance by a Few Faculty	2
2. The Total Commitment of a Few Faculty	1
3. Faculty Campaigning for Computers	2
4. Students Campaigning for Computers	2
5. Proposal Writing: Grants	4
6. Donations/Gifts	1
7. Faculty's Own Money for Training/Equipment	1

Table 9
Factors Accelerating the Use of Computers in Design Practice

Acceleration Factors	Out of 5 Practitioners
1. Realization of Benefits of Computers	1
2. Eventual Acceptance by Administrators and Designers	2
3. Designers Campaigning for Computers	1
4. Competent New Users from Design Schools	2
5. More Sophisticated Tools and Equipment	2
6. Reduction in Equipment Costs	2
7. On-the-job Training Received at Design Firms That Had Computers	1

The Effects of Equipment Costs

According to one participant, "The only critical issue that really slows down the transition is money It's just a question of do you have the cash" (Gaynor, April 28, 1995). Question five directly explored whether or not the cost issue delayed or held up the selected participants' decisions to change to computer-based tools.

Participants in both groups answered yes or no, and most included other influencing factors. In education, three answered no, and two answered yes. One professor who answered no cited the learning curve as more of an obstruction. The cost of hardware and software did not slow the decision to change for another educator who answered no, but it did define much of what could be done in his program. The third educator answered no, and outlined some of the concerns that came with the program's initial purchase, such as maintenance agreements, and the salaries of lab managers/directors and student lab monitors.

In practice, two out of five participants answered yes, while three out of five answered no. One participant answered no and pointed out that acceleration of technology was a matter of setting priorities. Another practitioner answered no, recalling her first exploration with used equipment. The remaining three practitioners agreed that cost factors did play a key role in their decision to implement the computer in their design firm's operation.

One of these three practitioners answering no remembered spending time just campaigning, or selling the idea of newer media to company administrators. Here, money coupled with the administrator's unfamiliarity with the technology had to be overcome. Another of these three practitioners indicated that it was simply a matter of what one could afford at the time. And the last of these three practitioners cited initial high costs, and the need to do careful business planning as factors delaying the decision to change.

According to this sampling, opinions on equipment costs and the decision to change were the same, with three answering no and two answering yes in both groups. Most educators and practitioners interviewed did not allow costs to impact their decision to change.

Table 10

**EQUIPMENT COSTS AND THE DECISION TO CHANGE
TO COMPUTER-BASED MEDIA**

Did Equipment Costs Impact the Decision To Change?

Educators:

- | | |
|-------------|-----|
| 1. Frye | No |
| 2. Kerlow | No |
| 3. Boyarski | No |
| 4. Gaynor | Yes |
| 5. Monzel | Yes |

Practitioners:

- | | |
|-------------|-----|
| 1. Anderson | Yes |
| 2. Scher | Yes |
| 3. Marcus | Yes |
| 4. Staples | No |
| 5. Bauer | No |
-

Motivation for Transition

The purpose of question six was to find out what inspired graphic designers to switch to computer-based technologies. It specifically inquired as to whether or not the shift was natural, or if competition was the motivating factor. Though a competition-inspired move seemed obvious for both groups, only one of the ten designers questioned stated that competition was a factor. This one vote for a competition inspired shift came from an educator who was given the responsibility for developing her program's first computer-based, visual design-related course. She deemed the experience unnatural. Another educator discussed problems in another academic program (not his own) where student dissatisfaction with the lack of newer media became the impetus for change. The students's dissatisfaction related to their inability to be competitive in using the computer for jobs after graduation.

In the business environment, one might assume that competitiveness would be more of a force than in academia. Yet surprisingly, of the five

practicing designers questioned, none indicated that competition drove them to newer media, and all reported a natural transition.

Motivating Factors

Design educators saw such motivating factors as a) wanting to be on the cutting edge of technology, b) seeking to insert the designer's voice in processes fueled by emerging technologies, and c) bringing the graphic design program in line with an already technologically-advanced university.

On the other hand, some of the motivational factors for design practitioners included a) the realization of what technology could provide, b) the practicality of computers, and c) their own curiosity.

Table 11

TRANSITION TYPES

Natural Transition Versus Unnatural or Competition-Induced Transition

Educators:	Practitioners:
1. Frye Natural	1. Anderson Natural
2. Kerlow Natural	2. Scher Natural
3. Boyarski Natural	3. Marcus Natural
4. Gaynor Natural	4. Staples Natural
5. Monzel Unnatural	5. Bauer Natural

Economic Effects on Educators and Practitioners

Computer-based technologies have had a significant impact on graphic design educators and practitioners. Question seven allowed many relative factors to be highlighted and discussed by the participants.

Educators were asked about economic effects on their departments, and funding sources and methods. They also mentioned other related variables that impact them economically. Practitioners were asked about the economic impact on design practice, and were given a list of variables from which they could choose items to discuss. These variables included: justification, cost effectiveness, productivity, and increased and/or decreased profits.

Funding sources in education were identified by four out of five educators as institutional. Four out of five educators secured funds via the writing of proposals to secure grants through such channels as university or corporate initiatives. Four out of five practitioners made more direct, private purchases, or leased equipment. One out of five educators mentioned donations or gifts as a source of funding, albeit a rare source for educators.

Both educators and practitioners spoke of a new level of management that newer media requires. In education, lab managers or directors incurred the responsibilities of systems management and maintenance, and of keeping current with new software releases and other product announcements. Also in education, there was a need for lab monitors to watch over the lab anywhere from 10 to 17 hours per day. Of course, the additional salary support for these individuals also impacted a program's available funds. Practitioners cited these same factors (excluding the lab monitor) as things that increased their overhead, and the overall cost of operations.

The need for ongoing professional development was noted by both educators and practitioners. This factor is due primarily to the steady stream of software and hardware announcements mentioned previously. However, other economic factors discussed tended to be specific to design practice, and included: 1) increased attention to fiscal planning, 2) increased cost of operations coupled

with the need to maintain competitive prices, 3) a reduced number of jobs available to young graphic designers, and 4) additional services offered by design firms, such as interactive media design.

Table 12
NEW ECONOMIC CONSIDERATIONS

Funding Sources	Education	Practice
Donations/Gifts	1	
University Computer Initiatives	1	
Use of University Funded and Operated Labs	3	
Departmental Advisory Committee Support	1	
Proposal Development/Grants	4	1
Direct Purchase or Lease by Individual Firm		4
Factors Impacting Capital		
New Level of Management for Systems Maintenance and Development	2	2
Ongoing Professional Development	1	2
Increased Attention to Fiscal Planning		1
Increased Cost of Operations, while Maintaining Competitive Prices		2
Conceptualizing Time Unchanged, while Production Time Reduced		1
Reduced Number of Jobs Available to Young Designers		1
Added New Component to Curricula and Practice: Interface Design		1

Learning Curve and Time Commitment

Learning curve and time commitment factors were often barriers, and have been used as excuses for not accessing and using new technologies. Question eight sought to determine if these factors were too significant to justify the

shift to computer-based technologies. All participants, both educators and practitioners, answered no to this question. These potential deterrents did not impact them to the point that the justification for transition could not be made.

However, the participants did discuss some of the approaches and issues relative to learning and time restraints. In education, one approach to the learning curve issue is to either hire software specialists as adjunct professors, or to only hire full-time, pre-trained design faculty who are already equipped with the technological media knowledge and skills needed by the program. Two of the five design educators interviewed spoke of these approaches.

In practice, a similar concept is used. Four out of five design practitioners say they now hire designers with related computer skills. They also made the point that computer-based software and hardware becomes obsolete very quickly. As developers continue to create new tools, learning as a life long endeavor is highlighted by emerging technologies. As one participant noted: "we now face newer versions of the same challenge: the learning curve and time commitment to learn new technologies" (Marcus, April 20, 1995). This causes continued professional development to be essential for both educators and practitioners.

Among practitioners interviewed, two out of five said that they contracted work out to those companies with specific media expertise, or hire free-lance software specialists (free-lance designers) to come in on projects when required. This practice supplements the firm's existing expertise as needed. During a three to six month stay at a design firm, permanent staff members may work closely with and/or supervise the free-lance specialist. Two out of five practitioners stated that they learned from their interaction with these free-lancers.

One out of five practitioners noted that design companies look to design education to teach future designers the necessary computer skills. Yet, graphic design educators seemed to reject the idea of only turning out technically trained people. Two out of five design educators said that new media skills training was not the primary goal of design education, but only one aspect of the curriculum.

After seven years of teaching with technology in the design classroom, one out of five educators has resolved to teach transferable computer skills and methods for learning new media. This more universal approach replaced teaching a particular series of software programs just because they were current. It aims to place the responsibility to learn on the student, and includes giving assignments aimed at quickly staking out a new piece of software, and providing relevant workshops outside of class, etc. Two out of five educators try to present computer-based media as a normal part of a student's education, and not as a foreign or distant component.

Practitioners appear to realize that some on-the-job training should be provided. Four out of five practitioners report that their firms allowed and/or provided some fostering of the on-the-job approach through individual exploration by staff members, and workshops or seminars held on-site. Only one out of five practitioners noted company-sponsored classes, conferences, and workshops outside of the company.

Many design educators also operated professional practices outside of teaching. Two of the five educators discussed the reciprocal benefit of this two-fold challenge and agreed that media specifics learned in practice are then taken to the classroom, and vice versa.

One of the design practitioners mentioned another approach to the learning curve and time issues: to access the technology through a team. This

approach might be utilized by many higher ranking design executives who have become partners or principles within the firm, and who have access to teams of well trained designers. Here the designer's role involved conceptualizing and art direction. The particular practitioner interviewed does not see this approach as limiting in any way. This method emphasized the fact that not all practitioners have directly addressed the issues of learning curve and time commitment with respect to computer technologies.

All five of the educators questioned dealt directly with the issues of learning curve and time commitment. However, four out of five design educators discuss those teachers who rejected the technology, and continue to teach with traditional tools and methods. Resisting design educators are said to cite the lack of time and resources as reasons for not taking on newer media. Reluctant design educators also have a team of sorts. Their teams are made up of the teachers that accept, learn, and use the technology, then pass the information on to students. However, unlike the hands off design practitioner mentioned above, nonconforming design educators are also said (by one out of five educators) to be instrumental in holding back the introduction of technology into the design curriculum. One of the five design practitioners noted that using, or not using computer-based technologies is again a matter of setting priorities.

Also in response to question eight, Staples (1995) an interface designer, explained that proficiency in interactive design goes beyond the learning curve and time commitment with respect to using various software. It also includes other skills and the right temperament. Other necessary skills include the ability to analyze, write, conceptualize, and visualize. With respect to temperament, Staples (1995) reported that graphic designers need to be able to deal with a) ambiguity, b) work that may become demanding, and c) their perception of work

involving analysis as dry. By extension, these issues may also present learning curve concerns and the need to secure time in order be to properly addressed.

Perceived Benefits of the Transition

As with any technology, disciplines and users may be affected by both advantages and disadvantages. Question nine prompted participants to contribute what they considered to be positive about computers in design education and practice.

Two out of five graphic design educators credited the computer with having broadened the definition of graphic design, and extending the boundaries of what graphic designers can do. One of the five educators perceived that through this expansion of available resources, technology has brought greater recognition and a higher profile to graphic programs within the university setting. This same educator also observed that graphic design is taken more seriously as a discipline on the campus. Two of the five educators suggested that this increased visibility was created by their deliberate efforts to reach out and establish relationships with other departments and/or groups on campus who were involved in such disciplines as computer science, engineering, and cognitive science.

Though many see the shift to emerging media as problematic, three out of five educators perceive the use of computer technology as a challenge and an opportunity to learn and grow. One out of five educators mentioned that students feel they are more highly valued as designers with computer knowledge and skills, and agreed that such information also promoted the educator's own career advancement.

The results discussed above were those of design educators. However, there was some overlap in a few of the responses given by both groups. For

instance, educators (two out of five) and practitioners (one out of five) both said that the computer allowed them to create work that would be difficult or impossible to do with traditional media. Such work includes the easy interactive editing of text, graphics, and sound in the production phase of a project. Added control of the overall project through the use of computer-based media was also perceived as a plus.

The idea of interactivity and the creation of useful interactive products was noted by an educator (one out of five) and a practitioner (one out of five). In established firms and for free-lancers, computer-based technologies have fostered new business opportunities for one out of five educators and three out of five practitioners.

One out of five graphic design practitioners (one out of five) made note of the fact that the computer can allow some things to be done faster. An example is in user testing where the computer has not only increased the speed of production, but has also increased the efficiency and frequency of testing (Bauer, 1995).

Table 13
POSITIVE RESULTS OF COMPUTER TECHNOLOGY

Benefits	Educators	Practitioners
A Broadening of the Definition of Graphic Design	Frye Boyarski	
A Higher Profile for Design within Universities	Frye	
Strong Connections to Other Departments within the University	Frye Boyarski	
A More Serious Perception of Design in Academia	Frye	
Allows Things to be Done That Were Impossible to Do With Traditional Tools/Media	Kerlow Gaynor	Marcus
Students Feel They Are More Valuable as Designers with Computer Knowledge	Boyarski	
Fosters the Intrinsic Value of Learning and Growing	Frye Boyarski Monzel	
Encourages Career Advancement	Monzel	
Fosters New Business Opportunities	Monzel	Marcus Bauer Staples
Offers the Designer More Control Over the Project	Gaynor	Anderson Marcus
Allows Things to be Done Faster		Scher
Enables the Creation of Useful Interactive Products	Boyarski	Bauer

Perceived Disadvantages of the Transition

The shift to computer-based technologies in graphic design has also yielded drawbacks in education and in practice. Question ten asked participants to discuss what they saw as negative results of the move to newer media. This study showed more negative results noted by educators (citing 11) than by practitioners (citing eight). The responses to this particular question also did not show any overlap in what the two groups listed as negative implications.

Of the 11 negative consequences given by educators, eight referred directly to how the technology has impacted the student. Two of the five educators felt that students were hypnotized by new media, or as Kerlow (1995) stated “blinded by the shiny technology” (April 19, 1995).

Three out of five design educators highlighted that students: a) display an overemphasis on the technical or electrical aspects of their work, b) defer paper-based conceptualizing, and proceed directly to the computer for solutions, and c) often accept initial printed output from the laser printer as the finished piece, forgoing further exploration.

In generating ideas, three out of five educators think the technology encouraged students to a) accept easy answers, and b) overlook still viable traditional methods, such as drawing, collage, silk-screening, etc. One of the five educators interviewed sees the computer as having eliminated the differences between tools, and also sees the traditional methods being lost should educators exclude a historical component from the curriculum.

Finally, one out of five educators made noted of the division that computer technologies have brought among graphic design faculty members. Here,

the argument not only centered around whether or not computers should be a part of the curriculum, but also encompassed other related issues such as economic concerns.

Table 14

**NEGATIVE RESULTS OF COMPUTER TECHNOLOGY
AMONG GRAPHIC DESIGN EDUCATORS**

Negative Results	Educators
Student are Mesmerized by the Novelty of Computers	Kerlow Boyarski
Students Overemphasize the Technical Aspect of Work	Kerlow
Students Hesitate to Conceptualize on Paper and Tend to go Straight to the Computer for Solutions	Kerlow Boyarski Gaynor
Students Accept Early Laser Printouts as Final	Kerlow Boyarski Gaynor
Students Do Not Experiment with Laser output as They Would With a Hand-generated Drawing or Collage	Kerlow Boyarski Gaynor
Technology Encourages Students to Accept Easy Answers	Kerlow Boyarski Gaynor
Other Mediums/Tools Are Not Considered by the Student	Kerlow Boyarski Gaynor
Traditional Tools and Methods are Being Lost	Kerlow
Computer Technology Has Leveled the Differences Between Tools/Mediums	Gaynor
Much of Computer-generated Work Lacks the Human Touch	Boyarski
Computer Technology Has Created Divisiveness Between Faculty (users vs. nonusers)	Monzel

Again, not showing any overlap in the responses to question 10, design practitioners mentioned eight grievances. Each of which was stated by one out of five of the designers questioned.

Practitioners lamented the use of crude tools which lack the subtle requirements of the profession. These tools were essentially developed by nonspecialists early on, yet to a lesser degree they continue to be created this way today. Another concern involved the missing tactile quality of such tools. For some design practitioners, the evolution of such tools has created the frustrating task of keeping pace with the changes.

Work once done outside of the design studio, i.e. typesetting and color separations, have now become the added responsibility of the design practitioner. Additionally, the introduction of interactive media development to design firms has placed an increased demand on the practitioner. For the graphic design practitioner, collaborating with others on interactive projects may require additional effort. The challenge has become working effectively in a team environment with many people from varying professions or domains.

The quality of interactive projects has suffered as many firms have taken authoring programs off the shelf and provided interactive design services without really having studied either the technical or the aesthetic aspects of interactivity. These firms end up producing what one practitioner called "interactive stuff" (Bauer, April 30, 1995).

Finally, one out of the five designers interviewed noticed a drop in the overall quality of work produced by graphic design firms. This problem may stem from technology enabling such companies to take on more work, as the time savings in the production phase has increased. What is not widely realized is the idea that conceptualizing requires the same amount of time.

Table 15

**NEGATIVE RESULTS OF COMPUTER TECHNOLOGY
AMONG GRAPHIC DESIGN PRACTITIONERS**

Negative Results	Practitioners
Work Previously Done Outside Has Been Brought In-House Placing More Responsibility on the Designer	Anderson
Computer Technology is Not Tactile	Scher
Keeping Pace With the Changes in Technology	Marcus
Incorporating Other Areas of Expertise Has Made Work Aggressive, Accelerated and More Demanding	Staples
Created the Challenge of Working With a Variety of Professionals from a Greater Number of Disciplines	Marcus
Readily Adaptable Technology Has Resulted in Low Quality in Most Interactive Products	Bauer
The Overall Quality of Work Has Dropped at Some Design Firms due to Computers	Bauer
Electronic Tools are Still Crude and Lack Subtle Nuances	Marcus

Portents: Education, the Educator, and the Profession

Question 11 solicited forecasts and suggestions for the future in light of computer-based technologies in graphic design. Both educators and practitioners had many projections. I have divided their responses into the following three categories: a) graphic design education, b) graphic design educators, and c) the profession overall.

Graphic Design Education

Educators have suggested that the individual approach to problem solving in education has become secondary to team efforts. One out of five educators forecasts the increased use of collaboration to reach the optimum solution in classroom-based group projects.

The shift to an emphasis on collaboration is only one of the many changes in the discipline. The refinement of the teaching methods and techniques in graphic design education must be ongoing, as newer media are introduced. With the use of emerging technologies, three out of five practitioners agreed that design education must still emphasize the fundamental knowledge and skills fostered by graphic design which involve thinking, planning, developing strategies, and conceptualizing.

Graphic Design Educators

In the climate of technological and pedagogical interaction with change, one of the five educators recommended that teachers stay current with computer related literature. This literature deals with the social and ethical implications of computer technology. As they interact with change, educators suggested an attitude of mobility and flexibility.

Two out of five educators suggested that students should be encouraged to explore and experiment more. This suggestion applied not only to the students' investigation of computer technologies, but to their interaction with more traditional media as well.

Of the five practitioners questioned, one differentiated between the two types of knowledge and skills disseminated in design programs. The types are a) computer skills, and b) knowledge of conceptual and design issues. In educating

the graphic designer, this practitioner proposed that teachers focus on having the student come away with only a basic knowledge of computers, enough to yield an entry level job position. According to this practitioner, greater emphasis should be placed on conceptual and design issues (thinking, planning, strategy, conceptualizing). Knowledge of these issues encourage advancement beyond the entry level position.

One of the five practitioners forecasted that graphic design educators will realize that the problems presented by virtual or digital space (cyberspace) are fundamentally different from those faced by the traditional graphic designer. This distinction was made because of the uniqueness of both spaces: paper and signage as space, versus cyberspace.

Both educators (two out of five) and practitioners (five out of five) thought that the refinement of design teaching methodologies with new technologies in design education was very important. They called for better ways of incorporating computer technology with the basics of traditional graphic design, its tools, history, and theories. Some questions in this endeavor might include: How should this be done? How should priorities be set? On what should graphic design programs focus? And what does today's graphic design student really need to know?

The Profession

This category includes issues that might apply to both educators and practitioners. The profession itself is said to be evolving, and one out of five educators noted a continuous reevaluation and redefinition of the discipline. For two out of five educators, this process emphasized the need to keep pace with the technology and its affect on teaching.

One out of five educators forecasted that technology will become a major force in graphic design, and that the focus will be on virtual environments as opposed to print, signage and exhibit design. On the other hand, one of the five practitioners envisioned a future where sitting at the computer workstation making designs is a low level occupation, requiring little thought.

Table 16
FUTURE PROJECTIONS
CONCERNING GRAPHIC DESIGN EDUCATION

Projections	Educator	Practitioner
Expect More Merging Together of Disciplines	Frye Monzel	
There Will Be More Ongoing Redefinition and Reevaluation of Graphic Design	Frye	
Technological Tools Will Continue to Evolve and Keeping Pace will Still be an Issue	Boyarski Gaynor	
There Will Be A Greater Focus On Virtual Environments vs. Print, Signage, and Display Design	Monzel	
Graphic Designers Will Continue to Be Involved in Communication as Educators and Practitioners	Boyarski	
Computer-based Technologies Will Be A Major Force In Graphic Design	Monzel	
Sitting Behind the Computer Making Designs Will Become a Low Level Occupation		Scher

Table 17

**FUTURE PROJECTIONS CONCERNING
GRAPHIC DESIGN EDUCATORS**

Projections	Educator	Practitioner
Design Educators Will Be More Flexible, Mobile, and Accustomed to Ongoing Interaction With Change	Frye	
Educators Will Encourage Students to Explore and Experiment With Traditional and Newer Media	Kerlow Boyarski	
Educators Will Be More Current on Social and Ethical Issues Involving Technology	Boyarski	
Educators Will Focus On Basic, Entry Level Computer Skills		Anderson

Table 18

**FUTURE PROJECTIONS CONCERNING
THE GRAPHIC DESIGN PROFESSION**

Projections	Educator	Practitioner
Team Concepts, Management, and a Variety of Contributions Will Be Vital	Frye	
The Older Profession Will Be Refined With New Tools	Boyarski	
Better Ways May Be Found to Combine the Basics of Traditional Design Tools, History, Theories of Good Practice and Core Design Subject Matter with Newer Media in Design Curriculum	Kerlow Boyarski	Anderson Scher Marcus Staples Bauer
Skills Involving Thinking, Planning, Strategy and Conceptualizing Will Again Become a Primary Focus in Graphic Design Education		Scher

The Transfer of Prior Knowledge

Before computer-based tools, certain fundamental rules and many systematic series of principles were commonly used in the graphic design discipline. These principles and processes were not used to restrain the designer, but to “encourage the production of successful designs” (Bevlin, 1977, p. 40). Some of the graphic designers who were schooled in these basic tenets of graphic design have applied or adapted this knowledge to computer-mediated disciplines such as interactive multimedia, user interface design, etc.

In her book Design Through Discovery, Belvin (1977) lists the elements of design as space, line, shape, mass, color, texture, and pattern. She also cites the principles of design as unity, variety, balance, emphasis, rhythm, proportion, and scale. Baecker and Marcus (1990) in their text Human Factors and Typography for More Readable Programs similarly discuss some 22 processes and principles “evolved through an iterative process guided by the principles of information-oriented, systematic graphic design” (p. 43). Many of Baecker and Marcus’ (1990) graphic design principles “are similar to those cited in basic books on graphic design” (p. 43) by authors such as Dondis, 1973; Ruder, 1977; Muller Brockman, 1981; Carter et al., 1985; Miles, 1987 and White, 1988 (Baecker and Marcus, 1990). Some of the principles and processes they cite include legibility, relationships, page composition and layout, typographic vocabulary, multiple views, access facilitation, and clutter minimization.

Question 12 prompted both groups (educators and practitioners) to give those processes and principles from their traditional backgrounds which they have incorporated into disciplines based on interactivity. The data from this question showed that both groups discussed clarity, sensibility, a problem-solving methodology, order/organization, principles of book design, anticipated viewer response, color, and typography.

Of those processes and principles listed below in Table 19, three were noted by two of the five educators interviewed. They are legibility, composition, and an understanding of visual aesthetics. Three educators mentioned appropriateness, while two practitioners and two educators agreed on color, and basic design theory. The remaining responses were stated by either one educator or one practitioner. In the end, one educator stated “Everything [transfers]. Nothing does not transfer” (Gaynor, April 28, 1995).

Table 19

**PROCESSES AND PRINCIPLES TRADITIONALLY USED IN
GRAPHIC DESIGN THAT TRANSFER TO INTERACTIVE DESIGN**

Educators' Responses

Concepts of Design	Processes of Design
Composition	Team Research
Clarity	Group Interaction
Simplicity	Group Discussion
Symmetry	Comparing Reactions
Appropriateness	Critique of Project's Effectiveness
Readability	Cycle of Analysis
Legibility	Cycle of Synthesis
Functionality/Logic	Open-mindedness
Color Principles	Interacting About the Problem
Design Theory	Questioning
Understanding of the Visual Aesthetic	Team Process
Beauty	Design Process
Harmony	- Planning
Order	- Construction
Form	- Evaluation
Typography	Problem Solving Methodology
Image Design	
Photography	
Other types of Image Construction	
Concepts/Principles of Book Design	
- Page numbers	
- Indexes	
- Table of contents	
- Options for linear/nonlinear navigation	
- Identifying Chunks of Information	

Table 20

**PROCESSES AND PRINCIPLES TRADITIONALLY USED IN
GRAPHIC DESIGN THAT TRANSFER TO INTERACTIVE DESIGN**

Practitioners' Responses

Concepts of Two Dimensional Design	Processes
Clarity	Iterative Design Processes
Sensibility	(rapid prototyping processing)
Organization of Information	Processes for Approaching
Communication	a Problem
Principles of Book Design	Problem Solving Processes
Anticipation of Viewer Response	Visual Processes
Sequencing	
Pacing	
Timing	
Layout	
Use of Color	
Visual Language: Skills & Principles	
Principles of Information Design	
Grid Systems	
Use of Typography	

Interactivity Defined

In 1988, the first meeting of INtertainment, an annual conference which brought together people from all corners of the interactive entertainment business was held. It included industries such as video games, personal computers, broadcast and cable television, amusement parks, museums, and optical media (Laurel, 1991). Over a two day period, members of the conference debated the meaning of the word "interactivity." Yet, a singular, generally accepted definition was not generated (Laurel, 1991).

Question thirteen asked graphic design educators and practitioners to define the word or idea of interactivity. Two out of five educators approached

the definition of interactivity by breaking it into two categories. One educator defined interactivity as a) a finite product, i.e. interactive games, encyclopedias, etc., and b) an infinite product, i.e. on-line conversations [the internet], and data bases. This educator focused on interactivity as products that offer the option for conclusion or boundlessness.

Another educator split interactivity into two distinct types: a) interactivity in a more general sense, possibly involving the act of living, or a conversation between two people; and b) computer interactivity which involves, communication with a person (or people) through the computer terminal or screen. Here, the latter explanation illustrates that the term is not computer-specific.

Two out of five educators' answers spoke of interactivity as a process in which the user or viewer is empowered to respond and become a part of a decision making process. Two of the five practitioners came up with similar responses.

Three out of five educators and one out of five practitioners compared interactivity to a conversation, in which there is an exchange of information or "give and take" (Boyarski, April 25, 1995). However, most graphic design practitioners (three out of five) compared interactivity to a book and the way one applies its interaction tools, i.e. the table of contents, page numbers, and index. One out of five practitioners referred to the book as an "interactive display environment" (Marcus, April 20, 1995). None of the educators referred to the book as interactive.

One out of five educators defined interactivity as a process of communication, while none of the practitioners questioned spoke of communication. Three out of five graphic design educators and one out of five practitioners compared interactivity to holding a conversation or dialogue.

One out of five practitioners compared interactivity to objects or experiences such as a door, a translation device, and the act of driving from point a to point b. All of the participants (educators and practitioners) suggested that interactivity involved two or more entities; whether these entities be human or computer.

Table 21
EXPLANATIONS FOR INTERACTIVITY

Explanation	Education	Practice
Finite or Infinite Products	Frye	
Human Interactivity / Human Computer Interactivity	Kerlow	
Communication	Kerlow	
A Conversation / Dialogue	Frye Kerlow Boyarski	Staples
Involves Two or More Entities: Human and/or Computer	Frye Kerlow Boyarski Gaynor Monzel	Anderson Scher Marcus Staples Bauer
Allows User to Respond and Make Decisions	Frye Kerlow	Anderson Marcus
Involves Media-Oriented Components: Text, Video, and Sound		Staples
It is Like Using a Book, Door Knob, or Car		Anderson Scher Marcus Bauer

Fostering the Development of Interactive Multimedia

Question 14 also sought the graphic designer's opinion regarding technology. This question focused on trends found in graphic design education and practice that contribute to the development of interactive multimedia.

Toward the Development of Technology

Four out of five educators said new media has had a profound impact on graphic design education. The design educators interviewed noted that some professors have used computer technology in their teaching efforts as early as 1984 (Boyarski, 1995). From that time to the present, many design programs have kept pace and matured in their use of the medium for teaching.

When authoring programs like HyperCard hit the market (1987), these educators were poised to take advantage of the new tools which added the new dimension of interactive media design to graphic design programs. Because of the early adaptation, and the maturing of teachers along with this evolving media, many graphic design departments are now able to provide more informed instruction in computer-based multimedia and other interactive design disciplines. Some have even developed programs and/or departments that allow students to focus in interactive design exclusively (Boyarski, 1995; Kerlow, 1995).

With its diverse methods of information delivery, interactive design affected the way graphic design educators taught, gave them new questions to answer, and in many cases, changed their concept of teaching (Boyarski, 1995). Design students today may become more involved in the programming aspect of the process, in how software is created and what it does (Monzel, 1995).

Each of the five design educators questioned suggested or stated that graphic design education influenced the technology. As suggested above, technology has also influenced design education. So, how does design education influence or contribute to the development of technology? Education extends the capability of the software in the classroom, encouraging students to use it in innovative ways (Boyarski, 1995). It also provides the job market with better educated and trained interactive media designers. Consumers can now look forward to better interactive communication products than those available ten, or even five years ago (Kerlow, 1995).

Design education encourages collaboration among disciplines such as communications, learning theory, and computer science (Monzel, 1995); these efforts contribute to the development of more sophisticated multimedia. The technology-centered evolution of design education, coupled with fundamental core design curriculum increases the likelihood of the future use of graphic designers in work involving multimedia and on-line services (Marcus, 1995).

Graphic design practitioners also push multimedial technology development. These designers master and exploit the technology. They work hard to set a higher standard for the implementation and application of software, and in this process, they often discover uses for the programs that even the product's developers are not aware of (Bauer, 1995; Gaynor, 1995). Some software development firms have recognized graphic designers' contributions by hiring them at the inception of a project. The designers may address interface and communication issues (Anderson, 1995). Graphic designers also make direct contributions by founding user interface and multimedia design firms which focus on design for human-computer interaction (Marcus, 1995; Staples, 1995).

Two out of five graphic design practitioners (Scher, 1995; Marcus, 1995) say designers find new uses for technology by incorporating the technology into their work. Some of these newer uses include interactive presentations, exhibits, and annual report design (Marcus, 1995; Scher, 1995). One practitioner who is a user interface designer stated "We design the technology" (Staples, April 26, 1995) in response to question 14.

Controlling all Components of Multimedia

By combining various media disciplines, sophisticated multimedia may require the expertise of computer scientists, cognitive engineers, musicians, videographers, etc. However, the technology is such that one person may control all aspects of multimedia design and production. Question 15 asked if one individual taking on all aspects of such a project is a desirable approach.

In response to this question, two of the five educators and four of the five practitioners answered yes. However, these designers qualified the desire to do everything as a type of wishful thinking, rather than as a practical course of action. Of these six educators and practitioners answering yes, five were of the general opinion that a) taking on such a load would lessen the likelihood that each aspect would be done effectively, b) sophisticated multimedial projects require a team headed by a director to plan, track, orchestrate and address scheduling and budgeting concerns, and c) from the perspective of quality and conceptual development, a group effort is best.

Three out of five educators, and one out of five practitioners answered "no" to support an interdisciplinary approach. They spoke of the value of acquiring input from experts from each discipline. Boyarski (1995) described the desire

to control all aspects as "self indulgence," while Kerlow (1995) discussed issues of timing and efficiency with respect to the progress of each task in the process.

Designers Spanning a Number of Disciplines

The variety of media involved in interactive multimedia has presented new areas for graphic designers and others to consider. Question 16 asked: How does interactive design affect the need to function in, or span a number of disciplines?

As previously mentioned, interactive disciplines such as user interface design, and interactive multimedia require the expertise of individuals from many domains of knowledge and skill. Ideally, one out of five educators and one out of five practitioners believed that a team of professionals or specialists in the appropriate areas should be assembled from the inception of the project. This team would include a graphic design expert. With such a diverse combination of expertise on the team, graphic design educators (three out of five) and practitioners (two out of five) recommended that the graphic design professional have a basic knowledge of the other potential multimedial domains that might be represented in such a group.

Justification for General Knowledge of Other Multimedial Disciplines

Why is this general knowledge needed by the graphic designer? Participants considered this question, and their responses are listed as follows. The basic understanding of other related disciplines empowers the graphic designer to:

1. Explore other aspects of her/his intelligence, interact with other team members, and to inspire, elicit, translate, and get multiple input on a project (Frye, 1995).
2. More effectively communicate and work with others who have their own particular areas of expertise (Boyarski, 1995).
3. More effectively incorporate and exploit the valuable attributes of other domains in the development of her/his work (Anderson, 1995).
4. Manage or direct a team of specialists/experts (Anderson, 1995; Marcus, 1995).
5. Understand what the other members are doing, and offer them feedback as the project progresses (Staples, 1995).

However, two out of five educators, and one out of five practitioners warned against a jack-of-all-trades approach. Two out of five educators and two out of five practitioners supported the type of interdisciplinary team collaboration that seems to require a general knowledge of several domains. However, one out of five design educators and one out of five practitioners recommended focusing one's expertise in graphic design. Two educators, and two practitioners felt that a knowledge of other related domains was required, while one educator said that this knowledge was optional, and that the student should decide what other domains to explore. The idea of teaching graphic design students to manage a team of experts was supported by one out of five educators and one out of five practitioners.

One educator and one practitioner suggested that some of the other disciplines be included in the curriculum. Yet, how can this project be achieved in graphic design education? Frye (1995) recommended taking full advantage of the liberal arts education environment. She suggests that one should require or

encouraged graphic design students to take advantage of courses in other disciplines on campus, rather than trying to teach all of the related domains from the design department or program.

In answer to question sixteen, the participants mentioned some of the specialities and/or domains in which students and practicing graphic designers may need supplemental knowledge. They are listed as follows:

1. Authoring Programs
2. Other Multimedial Software/Hardware
3. Film/Video Imaging and Production
4. Distributed Communication
5. CD ROM Production
6. Cognitive Science
7. Computer Programming
8. Group Dynamics Training
9. Linear Storytelling
10. Management
11. Photography
12. Script Writing
13. Sound/Music

Implications for the Interdisciplinary Process

In graphic design education, traditional methods of research, design, and production were once the norm. Increasingly however, graphic design education has become involved with the teaching of interactive design. As more graphic design departments and programs offer this discipline, educators will continue to confront the issues of implementing the practices and procedures of interactive

media design in light of the need for traditional methods and procedures. Some of the practices include an emphasis on collaborative processes, cooperative teamwork, and distributed production. Question 17 asked educators and practitioners if these additional components should also be emphasized in the graphic design curriculum.

Unanimously, all participants thought that somehow the graphic design curriculum should continue to include more traditional graphic design methods of research, design and production. In terms of additional components, four out of five educators and four out of five practitioners favored a greater focus on team processes in design education.

Interdisciplinary collaboration, and cross-discipline compatibility were also highly favored by both groups. These approaches won the consensus of three out of five educators and four out of five practitioners.

Such methods are important because they have become part of the practice of professional interface, and multimedia design professionals. Marcus (1995) indicated that this way of working shows the student a) that she/he may not be responsible for each aspect of the project, b) the importance of developing the ability to communicate and work with others within and outside of graphic design, and c) that larger teams efforts (five to twenty people) are the norm. An emphasis on team process and collaboration illustrates to many students the fact that designers function in different ways. Boyarski (1995) noted that designers may also work in the following ways:

1. At a conference table
2. Making presentations at a white board
3. At the computer alone, or with someone else
4. On a team

Two opposing opinions on team versus individual efforts came from one out of five educators and one out of five practitioners. The educator felt that individual attention is what students need while in school, and that teams are too often unfair, forcing students to work in areas where they have no interest. The practitioner thought that the introduction of these additional practices took away from the teaching of core graphic design subject matter such as critical thinking and conceptualizing. They both felt that these more recent methods are not necessary in the graphic design education environment, and that students could pick up such knowledge on-the-job.

One out of five educators and four out of five practitioners felt that some attention should be paid to the issues of interactive design. One out of five practitioners would also like to include group management as a part of design education. Additionally, one out of five educators and one out of five practitioners want to see research, testing and evaluation become a bigger part of basic graphic design education.

Sensitivity to New Issues

Question 18 investigated whether or not a new sensitivity to cognitive abilities and audience preferences was required of graphic design educators and practitioners in approaching interactive media design. It also sought to uncover ways to address these new considerations.

Eight of the ten participants (four out of five educators and four out of five practitioners) agreed that a new sensitivity was required. They cited other areas such as human factors, research, and testing, that make this new sensitivity paramount.

In terms of cognitive issues, the participants spoke of the need for design students to gain exposure to the preferences of the particular audience, cultural habits, communication, and learning theory. These eight participants also thought this new sensitivity was necessary due to human factors issues such as accessing information, and timing of interactions, etc.

In the area of research, the participants suggested the necessity of the study of markets as a means of identifying the audience, and creating demographic profiles on end users. The study of research methodologies and their related data collection and evaluation techniques were also recommended.

With respect to testing, some participants called for usability studies. Also, focus groups provide informative feedback which may have significant implications for the design. To address these issues, educators and practitioners recommended four courses of action. They are:

1. Require students to take related courses in other departments that specialize in the particular area of knowledge needed
2. Develop new courses within the design department to address the new concepts that affect students' work and future profession
3. Enlist professionals to give workshops that introduce design students to these new ideas
4. Encourage students to stay abreast through seeking out and studying related literature (books, magazines, periodicals, etc.)

However, one out of five educators and one out of five practitioners insisted that no new sensitivity was required to address the issues of interactive media design. The educator conceded that there were new media considerations such as sound, etc., but insisted that "It's not a question of a new sensitivity. It's a question of sensitivity period" (Gaynor, April 28, 1995). The practitioner con-

tended that to communicate effectively, all that is needed is “a basic understanding of one’s audience” (Scher, April 17, 1995).

The Graphic Designer on the Interactive Media Design Team

The role of the graphic designer is evolving, particularly her/his role on the interdisciplinary design team. Question 19 focused on this role with respect to the design of interactive media products. Graphic design educators and practitioners were asked about the possible roles that a graphic designer might play on the multidisciplinary interactive media development team.

The two main categories that emerged were a) a combination of roles, and b) the role of director. Three out of five educators, and four out of five practitioners indicated that a graphic designer might assume a number of roles, while two out of five educators, and one out of five practitioners emphasized the role of director. Some educators were quick to point out that a) they prepared students to understand the whole process (Frye, 1995), b) all kinds of graphic designers exist, and each one has to determine his own role (Kerlow, 1995), and c) they promoted and encouraged graphic design students to become leaders in their profession (Boyarski, 1995).

Possible Roles for the Graphic Designer

In response to this question, fourteen roles were mentioned. The participants discussed the following:

1. Designer/Organizer
2. Designer/Strategist
3. Designer/Illustrator
4. Director

5. Production Specialist
6. Concept Developer
7. Casting Director
8. Project Manager
9. Layout Specialist
10. Layout Standards Developer
11. Specifications and Guidelines Document Writer
12. Producer
13. Visual Designer
14. Navigation/Wayfinding Specialist

Numerous factors determine exactly what role the graphic designer will take on the team. The graphic designer's role may depend on how the team was assembled. Roles may be delegated in preassigned positions, determined by group selection, or by self appointment (Boyarski, 1995).

The role the designer plays may also depend on the knowledge and skill level of the designer. Marcus (1995) suggested that optimally, a director is articulate, has broad knowledge and interests, and is a good manager of people. Staples (1995) noted that functioning in the role of director depends on the amount of knowledge the designer has, and sees a director as one who is highly skilled in design, project management, and software development. Much may depend on the individual designer's personality (Boyarski, 1995), and how far beyond traditional graphic design she/he wants to go (Marcus, 1995).

Having Our Say

Recommendations to Practitioners from Educators

Graphic design educators and practitioners seem to share a common concern: the education of future design professionals. Educators have the primary responsibility of preparing students for practice. Practice develops further from the educational foundation by providing lectures, cooperative internships, and in some cases, on-the-job training and/or professional development.

Question 20 was designed to allow both design educators and practitioners an opportunity to communicate with one another, and to offer comments and suggestions.

Fortify the Alliance

Two out of five educators discussed factors that would strengthen communication and further develop their relationship with practitioners. These educators would like to establish a forum or conference where educators and practitioners could meet on a regular basis to discuss issues which concern both groups (Boyarski, 1995). There is also a need to have more practitioners attend and speak at conferences, symposia, etc. (Frye, 1995).

Educators do not want to be viewed as technology factories, but as thinking labs. In strengthening the relationship between education and practice, educators invite the expertise of practitioners to help with the preparation of design savvy, technologically informed young professionals. Monzel (1995) mentions two of the numerous ways this can be accomplished. They are: a) provide models for technology-based education and training, and b) assist with equipment support, particularly at art and design schools and colleges, those educational facilities not connected to universities or a liberal arts environments.

Work Habits

Two out of five design educators touched on issues relative to the work habits often imposed on designers. Educators called for more respect and consideration for these young professionals. An example of a negative work habit is what Gaynor (1995) calls the "computer nerd syndrome" (Gaynor, April 28, 1995). This syndrome is represented by the strapping of an upcoming designer in the role of the computer operator. Such a designer has few opportunities to design and/or undergo any other type of growth and development. The "computer nerd's" only function in the firm is to execute on the computer, the ideas that are handed down from the designer. Another negative work habit involves health issues which may be created by repetitive activities, and by extended hours of sitting at the terminal. Educators prompted the practitioner to evaluate these issues and to question whether or not such conditions should exist (Kerlow, 1995).

Hiring Practices

Some educators (one out of five) have recognized a trend by practitioners to hire designers with a focus on the amount of computer skills she/he possesses. Boyarski (1995) reminded the graphic design practitioner that designers are still problem solvers and visual communicators. He encouraged practitioners to consider other criteria such as thinking skills.

Professional Development

Since many design firms now incorporate services and product development based on interactivity, technology has also brought new design considerations to practice. These may include the design of home pages for on-line ser-

vices, multimedia titles, and/or software interfaces. One out of five of the educators interviewed warns practitioners not to take the off-the-shelf approach to interactive design. Rather, practitioners should reeducate, or seek out and study the cognitive, audience, communication, and research issues surrounding interactive design (Monzel, 1995). In this process, one out of five educators encourage practitioners to make valuable connections with other professional disciplines, thereby creating a multidisciplinary approach to design for interactivity (Frye, 1995).

Recommendations to Educators from Practitioners

Most of the suggestions made by practitioners to educators centered on what to include in the graphic design curriculum, and what they felt students should be exposed to in the academic process. Essentially, educators should instill the knowledge and skills practitioners noticed a need for, with respect to young graphic design professionals in the workplace (see page 126, and Tables 19 and 20).

Deflation of Technology in the Classroom

Two out of five practitioners thought that academia now lacks the essential fundamentals of a solid graphic design education. Marcus (1995) warned educators not to be so spellbound by technology, that they allow it to hinder the teaching of traditional, and still valued rudiments of a graphic design education. Many of these fundamentals are listed in Tables 19 and 20.

Instead of trying to keep pace with updates in technology, Marcus (1995) recommended acquiring some basic computer equipment. He then suggested

that educators should focus on the essential skills of software usage, and should instill enough information to enable the graduating student to get an entry level job. Marcus (1995) thought that the students' attention in the classroom should be primary focused on ideas, quality, and the time-honored issues of design and communication. This core design subject matter will take the designer beyond the production position, and provide her/him with a basis from which to "assume leadership in the design process, and to provide insight into key strategic issues that are fundamental to successful product and service development" (Marcus, April 20, 1995). He also indicated that lectures and field visits still provide good supplemental learning.

Scher (1995) supported this approach, but goes a step further. She felt so strongly about the issue of overemphasizing computer technology, that she counseled educators to focus on teaching students to think, reason, draw conclusions, make analogies, and become visually literate. Scher (1995) suggested that it is on-the-job, or on their own that young designers can learn the particulars of the computer and its components.

Additions to the Curriculum - New Content

Based on the infusion of interactive design into graphic design programs, three out of five practitioners provided new considerations for design education. The introduction of sound, motion, cognition, management, and other multimedial disciplines and issues were suggested (Anderson, 1995; Staples, 1995). Staples (1995) indicated that management courses should be required of students in graphic design programs.

Approaches to New Content

Two out of five design practitioners offered ways to approach the teaching of interactive design. These recommendations came from Staples (1995) and Bauer (1995). They included the following:

1. Encourage students not to address the visuals too soon in the design process, but to address the overall vision of the product (Bauer, 1995).
2. On a challenging project, encourage students to examine all the details and restructure (rechunk) the information in the interactive sense, before going to the computer (Bauer, 1995).
3. Encourage students to design for the user/viewer instead of following current styles, or designing for other designers (Staples, 1995).
4. Allow collaboration on interactive design projects (Bauer, 1995).

The Driving Force Behind Computer Technology

With the computer as a fixture in both education and practice, question 21 prompted graphic design educators and practitioners to give their views on what is driving the technology. Both groups seemed to think that developers and consumers were equally influential in terms of pushing computer related products.

Hardware and software developers and manufacturers were mentioned by six out of ten participants (two out of five educators, and four out of five practitioners). Likewise, consumers were also mentioned by six out of ten participants (three out of five educators, and three out of five practitioners).

Two out of five educators, and two out of five practitioners saw the influence of computer technology as a combination of forces. These forces were a) hardware and software developers and manufacturers, and b) consumers.

Three participants recognized the influences as economic. They cited money or profit on the part of the developer and consumers (two out of five educators, and one out of five practitioners).

As the driving forces behind computer-based technologies, political forces, and the defense and entertainment industries were two of the least frequently mentioned responses. Each was mentioned by only one out of five practitioners. Also, with the growing popularity of the internet, one out of five educators mentioned information exchange as a current driving force.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The Purpose of the Study

The purpose of my study was to focus on the concerns of graphic design educators and practitioners with respect to computer-based technologies including issues of interactive media design. This study also concerned itself with the comparison of the two groups of graphic designers: educators and practitioners in order to uncover and document the essential points of transition to newer media.

An open-ended question outline was developed, and was comprised of twenty-one questions. The outline was instrumental in providing the framework for the interviews with five design educators and five design practitioners.

My study sought responses the following basic research questions :

1. What are the critical issues faced by traditionally educated and trained graphic design educators and practitioners in transition from standard tools and methods to computer-based media?
2. What type of preparation did these traditionally educated graphic designers undergo in making the transition to newer media?
3. What design processes and principles learned from their traditional education and training do these graphic design practitioners and educators now use in their work involving interactive media design?

Procedures

Selected primarily through peer recommendation, ten graphic designers served as participants in my inquiry. A small but diverse group, they totaled ten; five representatives from design education, and five from practice. The participants represented four college level graphic design programs, and four firms involved with graphic and interactive media design.

Because my research involved human subjects, I filed a "Consent for Participation in Social and Behavioral Research" form with the Office of Research Risks. On the campus of The Ohio State University, Research Risks provided this form and other related literature which explained filing procedures. The study proved to be exempt from full committee review, and was approved. The approval date is April 4, 1995, and the protocol number is 95130114.

Though the research was headquartered in Columbus, Ohio; the schools and companies together spanned five states: Massachusetts, New York, Pennsylvania, California, and Ohio. Within these states, I visited designers in five cities: Boston, Manhattan, Brooklyn, Pittsburgh, and Cincinnati. Of the ten interviews, eight were conducted face-to-face, and two (in California) were conducted by telephone.

Three weeks prior to the interview, all participants were provided with a set questions identical to those asked in the actual interview. This provided participants with the opportunity to familiarize and if necessary, prepare themselves for the questions they would be asked to address. The question outline was roughly divided into four sections a) introduction to computers, b) general technology and graphic design, c) interactive multimedia-specific design, and d) recommendations/speculation. The interviews were conducted between April 14th and April 30th, 1995.

Each interview session lasted approximately one hour, and was recorded on audio cassette tape. Using a word processing program, I transcribed the interviews then mailed a hard copy to each of the participants.

This proof copy gave the participants the chance to review the information and make minor changes. Returning the proof was made optional. The proof's primary function was to have participants check the accuracy of the content, and to check for spelling of proper nouns, etc.; not to perfect grammar, regionalisms, etc. By not returning the proof, it was understood that content was approved by the participants. Of the ten proofs sent out, only four were returned and the changes they contained were minimal.

In analyzing the collected data, all responses were labeled, cut out, separated, and placed into folders according to the question number. For example: all responses to number one were placed in a folder marked "#1", and each enclosed response was labeled with the participant's name and group. All 21 questions were handled this way.

With the folders prepared, the responses were then analyzed by searching for key ideas, patterns, themes, and categories, then comparing and contrasting the responses of educators and practitioners. Word tables were also generated from this data. The purpose of the tables were to a) supplement the text in identifying and associating the participant with a particular response, b) provide a more visually structured and graphic representation of the information, thereby making the overall document more user friendly; and c) foster simplification and ease of navigation throughout the document.

Summary of Findings

The results of my investigation uncovered and documented several important concerns of traditionally educated graphic design educators and practitioners in their transition to computer-based media. The first of the basic questions of my research inquired of the critical issues for designers in transition to interactive media. Below I have noted eight that appeared most crucial. The first three were of mutual interest to both the educators and practitioners. They were:

- Ongoing professional development involving newer media
- Keeping pace with new software and hardware releases
- The funding of new technologies

These were themes that surfaced several times as participants relayed their experiences with technology. These issues are not exclusive to the design profession, but may be shared by users from all disciplines. Until computer-based media reaches its evolutionary peak and levels out, educators, practitioners, and others will continue to struggle with these realities. Another alternative is to draw the line with respect to new releases, and continue with aged, yet basic equipment.

Critical issues specific to education related to teaching and curricula issues, and the conflicting interests of faculty. They included:

- Maintaining the core of traditional graphic design pedagogy as newer media is implemented
- The creation and refinement of new paradigms for the use of emerging technologies in graphic design education
- Finding a place for the teaching of new computer-based disciplines such as interactive multimedia within graphic design programs

- Interdisciplinary collaboration as an approach to the teaching interactive media design

- Resistance to technology: both past and present

Critical issues with practitioners dealt with the use of technologies in practice. These issues dealt predominantly with the maintenance of quality among practicing designers, and in the quality level of the work produced by design firms. They are listed as follows.

- The creation and refinement of new paradigms for the use of emerging technologies in graphic design practice
- Adding new interactive design services as newer media makes interactive multimedia design more feasible in the graphic design firm
- Maintaining quality as technology allows for increased volume of print and signage work; as well as applying those same standards of high quality (established in graphic design over the years) to interactive media design
- Young design professionals' lack critical thinking skills involved in planning, creating strategies, making analogies, drawing conclusions, etc.
- Young design professionals' lack of the basics of traditional graphic design (principles and theories related to typography, color, layout/grid systems, symbol set development, etc.)

The second of the basic questions of my research involved the methods used by designers primarily instructed with traditional methods and processes, and the steps they took in the process of transition to computer-based tools. These resources accessed by the participants are contained in Table 5.

Interested designers did what they could based on the availability of equipment, structured and unstructured learning environments, and related literature. As Table 5 indicates, designers feel strongly that there is no replace-

ment for hands on experience with computed-based technologies. Many traditionally schooled graphic designers can and have made the transition without the aid of the formal classroom. However, when relative courses did become available, they took advantage of them as their schedules allowed.

This examination documents some of the keys to making a successful transition from traditional to computer-based tools and applications. These appear to be interest, strategy, attitude toward learning, access, and time.

Though educated with traditional methods, the participants became interested in technologies for various reasons. For these designers, interest stemmed from personal curiosity, the changing demands of the job, and/or the desire to keep pace with what was going on in the discipline.

Learning about new media may call for a strategy or plan of action. What routines or steps will be taken to facilitate the transition? Whether the approach to learning new content is formal or informal, a strategy will contain the routines, or set of actions which might be taken to foster the transitional process. These routines may be set forth in a series of courses established within the academy, or informally outlined by the individual learner. Some of the repetitive actions noted by the participants of this study were reading related literature, discussions with others in transition via user groups, hands-on time with the system, and related courses when available.

The designer's attitude toward learning about new media also seemed to play a key role. This attitude may determine the level of proficiency attained by the designer approaching new media. Prior knowledge and the determination to tackle new content also seems vital for a successful transition; as working with computers may initially prove frustrating. The whole idea of "emerging" media must be understood to mean that new information and ways of doing things are

always in on the horizon. It is ongoing in that new products may continue to find their way into the classroom and office for an unspecified period of time.

Access can present a problem for many who want to find out more about technology. Access in this context refers to the ability to readily use or acquire computer-based technologies for exploration or work. Here, as the participants have suggested, one has to be resourceful. Participants in this study gained access through jobs, schools, computer learning centers, and the purchase of their own equipment (new and used).

Along with the establishment of interest, strategies, attitude and access, a comprehensive transition will require a significant amount of time spent working with pertinent hardware and software to become proficient. The issue of time is of special concern to full-time working educators and practitioners. The amount of time available for such exploration may also determine the level of proficiency achieved. My study revealed that some of this time may be secured on-the-job through company-sponsored training, or just by learning by doing as jobs are assigned. Evening courses, home computing, workshops, etc., all have to be considered as the working professional makes the transition.

The third of the basic questions of my research dealt with the processes and principles traditionally used by graphic designers, and which of those could be used in the interactive media design disciplines. These components were cited by participating design educators and practitioners, and have been placed in Tables 19 and 20. These tables also tell of the knowledge and skills graphic designers may bring to the interdisciplinary interactive media design team. Additionally, such expertise makes a strong case for: a) bringing the graphic

designer in at the inception of a project, b) drawing upon these resources throughout the various phases of the process, and c) the variety of roles which the graphic designer might play on the team.

Conclusions

For graphic design educators and practitioners, computer-based media has fostered new ways of working and thinking, and has had a significant effect on the work of both groups. Prior to this study, I assumed that the participants would have only become involved in computer technology in the early to mid-eighties. This was a time when the computer began to become widely used in graphic design. I also assumed that the involvement would be limited to that of a user, rather than that of a developer of the medium. However, this study suggests that graphic designers' involvement goes back as far as the mid-sixties, and actually includes work in the area of the development of computer-based technologies within prominent research and development labs.

In making the transition, classically-trained graphic designers used their available resources. Some of these resources included accessible machinery, and software, on-the-job-training, users groups, literature, courses, time, etc. In the early years (late seventies to mid eighties) the software they used was very crude, and it was often the beta versions of what are now more highly-developed programs. They seemed to have reluctantly taken the challenges of equipment costs, new product releases, learning curve, etc., in stride.

They have come up with innovative techniques and methods to address the issues of technology as they went along; changing with the technology. Most of them described their transition as a natural one, inspired more by their own interest and curiosity, than competition. Presently, they utilize a host of ad-

vanced hardware and software including programs for authoring, animation, editing, image manipulation, page layout, illustration, etc.

Seemingly in the design arts, computers and their related media would have been readily welcomed into programs and departments. Yet, this research indicated that like other technologies such as the camera, computer-based media was not always met with a hardy reception in education or practice. Instead, a place was secured for computers by dedicated new media advocates in design education and in practice. Now that emerging technologies are in place in many graphic design programs and firms, such advocates are confronted with new issues that are linked to the use of these technologies.

My study illustrates that graphic design educators (through formal classes) and practitioners (through on-the-job-training) are bound by a shared interest in the education of future design professionals. Emerging technologies are redefining the avenues a graphic designer can take in her/his career, and both groups have strong opinions on what should be taught, and how it should be disseminated to students in preparation for future careers. In many cases these views overlapped. This somewhat evolving redefinition has underscored for both groups, the increased necessity for ongoing professional development, or continuing education efforts.

This examination found that the implementation of computer-based media has brought both good and bad results to education and practice. Positive results appeared obvious, and included time savings, increased productivity, and more control over projects. However, the most prominent negatives impacting both groups stemmed from a preoccupation with computer technologies on the part of design students. This research suggests that new media as a subject of study has challenged traditional subject matter; leaving it de-emphasized within

graphic design programs. The teaching of traditional graphic design has not been replaced by computer-based courses, but rather shares the time and attention given to the fundamentals of the practice by educators and students.

My research also shows that students tend to focus more on the technology, and display a tendency to shun many long held principles, materials, processes, and methodologies. These tendencies are played out in the form of a decrease in critical thinking skills, decreased use of traditional media, and decreased exploration during the conceptualizing of school projects. Such tendencies are also played out negatively in practice. Graphic design firms (and interactive media firms) still need designers who understand rudimentary, unchanging, graphic design principles, and the thinking skills needed to develop and apply fresh concepts to products, goods and services.

My investigation found a major challenge in graphic design education to preserve design fundamentals, theory, and history, as new media is introduced. The base from which the participants built their knowledge of interactive media, and their careers, was from the understanding of traditional theory and methods. Both educators and practitioners insisted that many attributes of traditional graphic design must be maintained. Simultaneously, design educators are expected to address new media applications with principles and processes specific to emerging disciplines such as interactive design (multimedia, user interface design, etc.), without decreasing the focus on graphic design (print and signage).

Interactive media design has become an important issue in graphic design education, and practice. Both groups contribute to the development of interactive media in a variety of ways which range from developing new media

courses--teaching its principles and processes--to commercially designing and producing multimedia titles, user interfaces, etc.

This study of multimedia design and other interactive disciplines has also placed emphasis on the need for educators and practitioners to work interdisciplinary, and on teams. It is also expected that graphic designers will have a working, or at least a general knowledge of other disciplines represented on the interdisciplinary design team. This expectation exists in both groups, but presents an increased load on graphic design education which is expected to cover all the bases; traditional and interactive.

Design educators where possible, address these issues by using the educational resources within their schools. They may call upon the expertise housed in other departments on campus, such as cognitive science, computer science, education, theatre, etc. In some cases, design students may be required to take courses from departments such as these. In practice, there may be professional development opportunities available on-the-job, or through continuing education efforts.

On the interdisciplinary interactive design team, the role of the graphic designer varies and may range from producer or director, to layout specialist. My inquiry identified 14 possible roles for graphic designers on the multidisciplinary media design team. These roles are documented on page 130.

My research found that graphic design educators have vital recommendations for practitioners, and vice versa. This work gave each group a forum for expressing these concerns. This could be a starting point for fulfilling two of the important recommendations to come out of this investigation. They are: 1) to strengthen communication and further develop existing relationships between

each group (education and practice), and 2) develop a symposium or conference where by these design professionals can meet on a regular basis to discuss issues pertinent to both education and practice.

Limitations

A number of factors may come into to play when a researcher is designing a study. These may include budget and time restraints. My study could have been enlarged to include an increased number of participants. Perhaps 100 educators and 100 practitioners, instead of five of each. In doing so, there might have been an opportunity for a greater variety of responses.

However, I chose a small quantity of ten of the country's leading design professionals who were involved with notable graphic design education programs and design firms. When planning the study, I initially specified face-to-face interviews with all participants as one means of collecting data. In the actual study, eight were interviewed face-to face. The remaining two participants were located in California. Since the research was headquartered in Ohio, the distance and limited funding prevented travel to California. The interviews with the two participants located on the west coast were conducted by telephone.

I also wanted to interview five educators and practitioners at five different schools and separate companies. Yet, two educators were from the same school (the University of Cincinnati), and two practitioners were from the same design firm (Pentagram Design, Inc.). This was done again for economic reasons. However, at UC and at Pentagram, I found participants with distinctly contrasting responses to the questions asked.

I considered longer interviews and multiple interviews, perhaps conducted over two or three visits. Limiting the interviews to one hour proved efficient and effective for both groups. For educators, school was in session and they were involved with teaching, student advising, industry conferences, etc. Practitioners were equally busy with project deadlines, meetings, travel, etc.

Spreading the interviews over several meetings was determined to be inconvenient, or impossible for some participants. Again, funding and participants' time restraints held the interviews to single, one hour sessions.

My final assessment is that all participants were genuinely interested in the research. And time and funding issues did not impede the progress, nor limit the quality of the data collected.

Implications

The subject of my study, and the implications drawn from its findings may prove to be of interest and value to several important groups of people associated with design and art education, professional design practice, and interactive technologies. Such groups include: 1) art and design educators, 2) practicing graphic designers, 3) design students, 4) various design organizations, and perhaps 5), software and hardware manufacturers.

According to my investigation, the process of using computer media has been fully underway in graphic design for eight to 10 years in education, and approximately 10 to 13 years in practice. During this period, many positive attributes were realized, but negative results also emerged. This research shows that the critical issues of transition are numerous and varied. They involve not only the educator and practitioner, but the student, design administrators in academia and on-the-job, and hardware and software developers.

I agree with Boyarski (1995) and Frye (1995) in that educators should work collectively with practitioners to establish a dialogue aimed at solving the problems presented by the shift to computer-based media, in standard (print, signage, etc.) and in nontraditional design disciplines (interactive multimedia, user interface design, etc.). No one group will be able to adequately address all the issues affecting both groups.

My research finds evidence suggesting that due to the transition to computer technologies in the design curriculum, graphic design is no longer taught in its entirety in design programs. It appears that the time traditionally spent on design issues is now being shared with the learning of: a) computer-based technologies which assist in print and signage work, and b) interactive media design disciplines, and their related computer-based and non-computer dependent components. It is appropriate for graphic design departments to stay current with what is being done technologically to foster the evolution of the discipline. However, many graphic design programs find themselves operating a parallel curriculum: one toward graphic design, and the other toward computer-based disciplines and training.

Design departments and schools should begin developing new programs, for the express purpose of addressing the suite of issues specific to design for human-computer interaction, and the teaching of core sets of software programs specific to the design and art disciplines. Models for such programs can be found in the Department of Computer Graphics and Interactive Multimedia at Pratt Institute; the Human-Computer Interface Design Program (Department of Design), at Carnegie Mellon University; and an emerging Electronic Media Design Program at the University of Cincinnati.

These newer interactive media design programs may also reduce some of the burden of teaching the various software programs and components in graphic design programs. They might also allow graphic design educators to focus more fully on graphic design principles, practices, history, etc., and allow graphic design programs to again turn their focus toward preparing students to become professionals in graphic design.

Graphic design education should take a collaborative look back over the past decade of using computer technology, and reexamine the technology infused programs in preparation for the next ten years. The aim should be the refinement of processes and principles gained through previous new media usage.

Implications for graphic design practice also emerged from my research. In design practice, the suggestions are to encourage a) increased contact with design educators, and b) increased professional development opportunities for practicing designers with respect to interactive media design.

Graphic design practitioners are also very much concerned about the negative results of using computer technology within the profession. Practice should work collectively with education to address the problems which have surfaced through the implementation of computer technologies. The recommendations recorded in this study should be on the agendas of all graphic design professionals with the intended goal of discussion and eventual resolution. Again, it is clear that a forum should be established, realizing that practice can not ignore the concerns of education, and vice versa.

Many of the firms offering interactive services, continue to take in print, signage, and other more traditional design projects. In many cases, the design of multimedia titles, and other interactive interface work has been added as a more

recent component of the firm's services. Not all graphic design firms have incorporated interactive design into their list of services. The firms involved in my research seem to have incorporated interactive design services with a systematic understanding of the issues that are characteristic of the discipline. However, my research suggests that many design firms lack the knowledge, understanding, and experience required to provide high-quality interactive design services. Without fully becoming involved in the research and study of the discipline, such firms assist in lowering the quality of available interactive products. Graphic design firms should seek out the appropriate expertise required to produce quality interactive media, and encourage the professional development of its staff in the interactive media disciplines.

Recommendations for Future Research

To build on the investigation begun in this study, another research effort should be launched to obtain results that will be generalizable across the U.S. Unlike the formative, qualitative approach employed by this study, a more summative, quantitative approach should be used in order to yield findings that lend themselves to generalizability.

As an instrument for this quantitative investigation, a stratified survey questionnaire should be developed, and should include 12 to 20 questions. Responses to this survey should be conducted by mail--with a goal of securing a sample size of 600 respondents--300 educators and 300 practitioners.

Basically, the questions for the survey should be closed-ended, or be phrased in such a way that they can be answered in a clear and concise manner, perhaps involving 5 to 7 words. As an extension of my study, I have developed 12 potential questions which a larger study might include. They are:

1. Which of the following best describes your primary occupation?

- Graphic Design Educator
 Graphic Design Practitioner
 Other (please list)_____

2. In your current work environment, is there a computer lab or other means of accessing computers for design and production purposes?

- Yes No

3. What percentage of the design process is still performed using traditional tools? Please circle one:

In Education: 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

In Practice: 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. Now that computers are used routinely in graphic design, list 3 things that you miss most about using traditional tools? In order of importance:

1. _____
 2. _____
 3. _____

5. Have you noticed a tendency to go straight to the computer, instead of conceptualizing on paper first?

Among Students:
 Yes No

Among Practicing Designers:
 Yes No

6. Now that the computer is a part of the process, do students/practitioners spend more time, or less time in the concept development phase of a project.

Among Students:
 More time
 Less time
 The same amt. of time

Among Practicing Designers:
 More time
 Less time
 The same amt. of time

7. Some have said that the computer levels the differences between tools. In graphic design education 10 years from now, will there still be a need to introduce traditional tools at all? Briefly explain:

Yes No

8. Does your graphic design program or firm currently offer any interactive media design courses or services which use authoring programs such as Macromedia Director, HyperCard, etc.? If yes, list the authoring tools you use.

Yes No

We are currently using (authoring programs only):

9. If you answered no to question 8, would you like to see such courses/services offered in your graphic design program/firm?

Yes No

10. What is the best approach to teaching/practicing design for human-computer interaction design (multimedia, user interface design, home-page design etc.?)

- In a situation where one can work independently
 In a situation where one can work in an interdisciplinary collaborative team environment?

11. In light of the graphic designer's interest in interactive media disciplines such as multimedia, interface design, etc., what new subject matter would you suggest as additions to your current graphic design curriculum? Please list in order of importance:

1. _____
2. _____
3. _____

12. Within a university setting, which department(s) do you feel is (are) best for developing a complete program in human-computer interface design? (multimedia, software design, home-page design, etc.)

- Design: graphic, product, interior
 Computer Science
 Engineering
 Other (please list one) _____
 Two or more departments working together

Other Related Research Topics

This study has also opened up many possible avenues for research which can focus on graphic design and technology. Such research might contribute to an improved quality in design instruction and practice using newer media. The following is a list of potential topics for future researchers:

1. It is commonly agreed that computer technology is changing the definition of graphic design and the role of the graphic designer. A study should be launched to pinpoint a present-day definition, and to compile the job titles and descriptions of these new positions.

2. Graphic design educators have gained about ten years of experience with infusing technology in the graphic design curriculum. An examination of the lesson plans created to support the units covered in courses utilizing computer technology should be conducted. A search should be made to find the most effective teaching methods for computer-based instruction in core graphic design principles and processes. Here, the inquiry should consider traditional and computer-based methods. For example: What are the best methods for teaching a computer-based, introductory course in typography? What kinds of traditional and computer-based exercises are best for such a course? What computer programs are best used in such a course, and why? Should the two kinds of tools be combined or should such a course continue to be taught traditionally? Is an introductory course the best place to bring in the computer? And how do these variables change in intermediate and advanced typography courses? Subsequent studies could be done for other courses which discuss core graphic design subject matter.

3. This study found that graphic designers were a part of the development of computer graphics technologies in the 1960s and 1970's. Designers have

used various technologies in their work as they became available. However, a comprehensive historical study should be made of the graphic designer's involvement with, and use of computer technologies from the mid 1960's to the present.

4. Some participants spoke of how computers allow things to be accomplished that were difficult or impossible to do with traditional media. Another historical effort should involve the discussion and display of how computer-based technologies have impacted the look or style of the work being produced for traditional print and signage applications; perhaps from 1985 to 1995. Some basic research questions might include: What particular components enabled these changes in the work? What are the things that were impossible to do before computers? And how are they performed on the computer? Both pre-computer and computer-mediated styles and approaches should be documented, compared, and analyzed.

APPENDIX A
INTERVIEW TRANSCRIPTIONS

Mary Ann Frye
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Head, Graphic Design Concentration
Northeastern University
Boston, Massachusetts
April 14, 1995

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. I have a funny answer in response to this which happened in about 1976. The Computer was a VAX. I was in graduate school studying graphic design and had heard that Brown University had a course dealing with computers and graphics. And I had been reading about it, and I thought something was coming. I thought I'd go find out what this was. And I ended up learning a scientific programming language. I think it was called PL1. So I learned this language. After tens of hours, it enabled me to play hangman with Xs on a dark screen--that was all. So, I have this sort of history of jumping in and out, trying to find a time-to-reward ratio that was enough to stay in.

Later at Harvard Extension, I took another course in a scientific programming language. I was trying to see if there was anything the computer was doing with graphics yet, that was practical to do. And it still was not.

Q. In 1976, what school was that?

A. I was cross-registered at Brown University, from Rhode Island School of Design. And the way we were doing typography then was through our metal shop. We were hand setting lead type. It was just pre-Mac. It was 1979, and then I graduated. So, I had been hunting for something, but it did not yet exist.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment)?

A. We're using the Mac Quadra 700s, PCs, and a range of software. Actually, in the last page of the packet that I gave you about the program is a list of everything that we are using. It's not updated for this year. But we mainly use Quark, PhotoShop, Macromedia Director, and Illustrator and a number of other things that we have copies of that students can experiment with.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator)?

A. Great question. The first thing I did after the programming languages seemed too time-intensive, was to sit in on a computer graphics class at a school where I was teaching at that time. And at that time graphic design was over here and computer graphics was way over there (in the mid 80s). In this class, I found that I was stuck in this precarious set of Kafka-esque negotiations with the software,

trying to make something and move it to one program from another, and it was all klutzy. Basically, it was a paint-program, maybe an early MacPaint. Probably the earliest one. And again I thought, it's not there yet. But it was so fascinating. I mean, I could see a glimmer of it--that it was going to be really useful, but it wasn't quite useful yet. I just kept checking in to see if it was useful enough yet. Then checking back out for a while if it wasn't.

The next thing I did was when I was a museum exhibit designer, which I think explains a lot about my interest in multimedia and other ways to apply graphic design. In fact, I know several museum exhibit designers who have gone into multimedia. That's another story. Anyway, at the company where I was working, I urged them to look into the computer (desktop computer) typesetting that was just developing. I encouraged them to do that, but it was too early. The coding still too cumbersome. I spent one summer teaching myself this one program called Targa Tips that was in the IBM [PC] environment. And what was exciting about that was this was the first time I saw a program that could be used to put words and images together in one program, and again, very slowly, very badly. But you could see it, and you could imagine what PhotoShop was going to be, [or] what the next thing after that [might be]--even what Macromedia Director might be. But it wasn't there yet.

The first class I taught with it was a class in visual semiotics of word, image, and meaning combinations (mid 80s). At this point, no one else in the graphic design area in my school would talk to me about it. They were just not interested. It had nothing to do with them.

My fellow lab rats were in music, interrelated media, architecture, and math. We were hanging out, talking to each other, and doing projects in common. But no, not in graphic design yet. In fact, I collaborated with the lab

director there to make and design some software for teaching design principles, and I still use a version of it in my classes teaching color, and pattern.

Using animation to teach very basic design principles in an interactive way was the next state for me. I wasn't doing the programming at that point, but I was seeing that I could come up with a concept, and I could work on a team with others with different skills.

Q. That sounds like a good product for design education.

A. Oh yeah, we should, we may. We're talking to a publisher finally at this point (1995), after working together for nearly ten years. Anyway, we are both so busy that's why we haven't.

Q. When you say we...who was the other person?

A. His name is Hu Hone, and I think you'll come across him in other contexts because he's doing an enormous amount of programming software for math education.

Q. Is he working in an educational environment?

A. He's actually the Electronics Facilities Director at Mass College of Art. But this is something he does separate from the college. It's not really their direction. It's what he does nights and weekends. But he's involved in an enormous number of innovative grant projects which involve new ways to teach math. It's wonderful. I'm so glad to have seen it develop over time. He and I have this ongoing

argument. He has the misconception that designers are the people who decorate it at the end. He should know better by now. But what I keep telling him is that “what we are doing is design, graphic design”.

The next thing I did after designing the software, was to take a class in desktop publishing, and it still seemed to be sluggish and jargon-heavy. But, it was the first time that I could use typography interactively. Again, this was still the mid 80s. I was seeing what it might be. This was a class established by the school where I was teaching. It was taught by someone who was very much a “techy.” It was very difficult for the designers and that type of person to talk together.

After that whole experience, I had the opportunity to move over to Northeastern, and immediately was involved in writing proposals and campaigning for acceptance of this kind of direction in the department. I worked on many fronts all over the university to find curriculum, new labs, technical support, and to make contacts for the program. So it was something that was brewing with me for a long time. Then, there was the opportunity to be involved in a place where the people were much more receptive [to computer technology].

It's interesting because Northeastern has a long reputation as a co-op school, like the University of Cincinnati where the students go to school for a few terms, then they go out on jobs. Some of the programs that are well known technologically are the sciences, business, law, and engineering. These have traditionally been an important part of Northeastern. I think people [here] are able to make the analogy to engineering and technology easily. So, in our situation where we are talking about incorporating a lot technology, it proved easier to do in a university than it was in a design school.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. I would say in the direction of slowed, the first school that I tried to get involved in this at, showed a total lack of interest on the part of the graphic design faculty. It was understandable, but to say, "we need a lab" had no effect. They would say ' "a lab for what? What are you going to do with it?" So, I just quit talking to the other [graphic design faculty] people.

In the university, there is another sort of sensitive issue which is the association of machinery with a vocational/technical approach. I think that people who were very involved in liberal arts initially, saw the computer as making the student run machinery, rather than doing research, or having intensive contact with each others. They didn't see it as something that supported their research, or their productivity. They saw it as machinery that you run, typing or something. It was just not conceptually there, which is no longer true.

In terms of accelerating, I think it's taken the total commitment of a few faculty to this vision. We have just not let up the pressure. If we needed to talk, to use diplomacy to change the situation, we did that. If we needed to write proposals, we did that. If we needed to attend committee meetings, we did that. I think once you see this as the future, and a positive thing, you don't have a choice. You have to keep pursuing it.

Q. I noticed you said a "few" faculty. What did you find to be the point of resistance among the other faculty members?

A. Well, at the previous school where I was, I think it was because of when it was. It was so unfamiliar. No one was afraid of it taking away their job because they weren't interested. They didn't know what it was. So, it just wasn't an issue. It was as if I was saying: "why don't we have swimming in the program?"

In the university it's been fascinating to watch this happen. My background was in liberal arts. As an undergraduate, I was not in art and design. I went into that in graduate school. And I am very committed to a liberal arts background. I think that it's the most valuable thing that a university can do for a design program. So, I just assume that. However, in the past if you came in talking to academics before it was clear what computers could do for education, it was difficult to understand. They'd think if someone was talking about technology, they were talking about technology replacing a liberal arts education, or the students becoming technicians, rather than becoming thinkers. The faculty here had to get to know me for a while to realize that my priorities weren't only technology. But that it was the vehicle for something exciting. So the resistance was, "are we doing this instead of education?" It hadn't become transparent yet, to the point where you are saying, "the way we can do education is that we can get better access to information, easier ways to get information from the libraries, and a way to contact colleagues all over the world." It's a situation where it isn't the machine, it's communication. And I think once people were sure that it was communication, and it increased productivity; then that made it more approachable.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. It did not slow the decision to change.

Again, the will and the conviction to do it never wavered. I think what I learned over time, was that there was a very steep learning curve, there was a new relationship to equipment, and that we were no longer buying equipment, we were buying time. I mean, we spent thousands of dollars and got these boxes, and two years later, it's not the right box any more. So, it's hard to know. I would say that the decision was made. Nothing was going to move the decision.

One thing that did actually make the decision clear, was our students. We had written proposals and had all the planning in place for the Macintosh lab. Our students realized so well what was happening, that they went to the president of the university. They told him that it was going to negatively impact their education, their coop experiences, and their careers, if they didn't have this lab. The president here who is very sympathetic to student concerns, said OK. For him, I think it wasn't so much a money issue. It was just understanding the relationship of technology to this field.

I would say still, on the relationship between money and implementing technology, there were two opportunities that we found. I think that this would be of particular interest to other people in education. First, the concept of the food chain. We're pretty high end users of technology, and there are other places in the university where people understand Macintoshes, yet they don't need what we need. So if we upgrade, the machines we have are then useful to someone else.

Realizing that, relationships with the rest of the university worked out favorably. When we would get new equipment, someone else could use the older equipment that we had, that's one thing. The other thing was the idea of constantly refreshing the technology. This is the idea that you're not buying machines, you're buying a certain amount of time on this kind of machine. In all aspects of our planning (day to day and long term), we just have to accept that and continue to keep looking for strategies, looking for opportunities, writing proposals, and looking for university initiatives about technology and being in on them.

I think the most interesting result of those kinds of relationships, are the alliances we made across disciplines because of technology. Since then, the contacts we developed have become links that we can build on for other intellectual pursuits that are interdisciplinary. So, we started out talking to one another because we were all interested in technology, and we're now doing projects together.

Q 6. Was the shift a natural one, or was it forced by competition?

Please explain.

A. Natural? I would say seeking the edge is behind most of the moves I have made in relation to this program--hires that we have made, purchases that we have made, everything. I feel like I have been certain for a long time that technology would be a serious part of life. And that the phenomenon of change itself had to be integrated as wisely and as wholly into the program as possible. So, I think utterly natural.

On the question of competition, I don't really see us competing with other graphic design schools. I don't see that as the most significant thing--or even competing with non-designers using technology. I think for me, the issue is participating and injecting the energies of designers into the processes that technology is fueling--the whole situation. It's not "do we have more equipment than the other schools?" It's "are designers going to have a voice in this?" Or, "is it just going to go by us because we're ignoring it?"

We've held now two of what will be yearly conferences for high school teachers, counselors, and students, about what's happening to the field of design related to technology. And again looking at ideas--once the teachers got together, they were exchanging an enormous amount of ideas about how to set up labs, and funding, and all these things. But, it was really about the education issues.

The other thing that we have done is to co-present with AIGA/Boston sponsorship, a symposium for college and university teachers of graphic design in the New England area who are either using technology, or are concerned about technology. So, it feels more like we are working together to solve this.

Q. In the high school student program, are there workshops?

A. Well we've had requests to have workshops for students. The way we approach that, and this is often the way I tend to organize things is to say, who in the field is doing the work that's most pushing the edge, pushing the boundary in that area? Then we get them to come and present. The first presenter we had was Dietmar Winkler, and he discussed new issues for the field. We also had Wendy Richmond who writes for CA (Communication Arts) on design and tech-

nology issues. We had Joel Markus who is involved with the D.I. Group that does broadcast design here. Also, Scott Nash of Big Blue Dot, which is part of Corey & Company: Designers, have presented here. They do a lot of broadcast design, and at that point, this was something new for graphic designers.

Q. Again, with respect to the design program for high school students, are you looking for a different kind of design student? What is going to be the criteria now when looking for designers for your program? What were the criteria and how have they changed now thanks to technology?

A. We had two reasons for doing those conferences. One was, we really did feel like there wasn't much knowledge of the effects of technology on the design field at the high school level. The other reason was our feeling that the students we were getting, were students who identified themselves as artists, or someone had said to them, "go do art," and they'd been put into the art track. Either because of their own interests or because of the way they had been advised. They were seeing art separate from verbalization, visual thinking, and mathematics.

They were coming to design at a point when design was crossing boundaries. To be able to speak to people in other disciplines, and to articulate your ideas verbally as well as visually is now vital. Also, one needs to be able to see the connection between graphic designers making diagrams, and mathematicians programming animations that explain mathematical concepts.

I think we felt this was a service that we could provide for people in high school. In fact, some of them got so angry when they were at our conference saying, "Why haven't we been told this before? Why is no one reaching out to us?"

So it seemed like a timely thing to do. They seemed to feel out of touch with new information about where the field was going, and the way the field was broadening because of technology.

One reason to reach out to the high schools was to say: "OK, what about the kids who are interested in drawing, but are also interested in writing, math, and have more of a range of interests?" You could say, "renaissance people" would probably be happier in design, at least in design the way that we're defining it.

Q 7. Economically, how has the technology affected you as a design educator?

- In Education: economic affect on design department: funding & funding methods, etc.

A. Specifics of how we implemented the lab here--the university has yearly computer initiatives. So there's been some funding across the board, but if you don't apply for it, if you're not interested in it, it doesn't come. So being proactive in that way--I mean, this university has been very supportive of technological initiatives. They recently approved the networking of the entire campus. There is very good access. So there is support for it, and whenever there has been funding for it we've been there telling them what our needs are.

Q 8. Did the learning curve or time commitment seem too great to justify the shift? - Education: training of faculty members

A. Well, now there are two full-time faculty members. There is one full-time technical director. There's a full-time coop adviser who is a faculty member but she doesn't teach in our program. This is a new idea to me. I've only talked to one person about it. And I think we were in an ideal situation, even though it was a very difficult period. What we do now, and what we do out of necessity--and what I now think is perfectly suited to the time--is to have a lot of part-time faculty. In a large program, having only two full-time faculty means a lot of courses are taught by specialists in the field whom we can call in for a course as they are needed.

The list is very impressive. The disadvantage is that there is an enormous amount of preparation, and explaining to people what we are doing. But, one advantage has been that we haven't done that much software training (for faculty).

It hasn't been an issue for us because if we want someone to teach a multimedia course, we invite someone who is actively doing multimedia. It's more a problem of making sure that our lab is equipped in a way that they can use it. Long term, I'd like to have more full-time faculty than we do. But short term, the fact is that the technology is changing so fast and our program is in a constant shift. Those things work together.

We decided immediately, it's not about learning software. We are not going to be a program that just turns out technically-trained people. What it's going to be about--I mean as far as we deal with software--is trying to get the students to be comfortable with the processes, strategies, and routines of new

learning related to software. So, it really becomes a new part of the work process. It requires a new attitude, and attitude is what we try to teach. Sort of "software passes, we persist" [attitude].

Q. So, students are learning a formula for approaching new software.

A. Absolutely. I don't mean to say that they don't know software when they come out, they do. But, what we decided immediately was that we were going to do everything that we could to have them not get caught up in: "do I know the software, do I know the software?" One example that may be of specific interest--we have a lab monitor (TA, teaching assistant) in each of the lab-based courses. So the faculty member mainly concentrates on the course content, and the TA is there to deal with technical questions. We've distinguished very clearly in the class between learning the course content, and learning the software. But learning the software isn't first. We place the responsibility on the students to learn. If they know that two weeks from now, they should be conversant in Illustrator, they have to do that. We have in support of that, "just-in-time workshops" outside of class where we just schedule the workshop when we know that the class is going to need to learn that, and those are generally taught by the student TAs.

We worked very hard to put together design assignments that help students to form the habit of quickly staking out the capabilities of new software. One of the projects taught, requires students to reproduce an assignment on one software program that's already been input into a different piece of software. So, they have to figure out the conceptual relationships between two pieces of software. I'm saying this glibly, but we've massed all of this cleverness painfully,

over time. We went through the phase when all the faculty were complaining that they were spending an enormous percentage of class time teaching software. We just said no. Anyone could learn software. What's the point of a design program, if all they did was teach new software?

Q 9. What are the perceived benefits of the shift?

I would say the broadened definition of the field of design. Rising levels of faculty, student, staff, and technology synergy--all of those things working together. I would say, really hot links to other areas of the university. Again, that bridge by way of technology. Some of the projects that are happening here include students working in the university multimedia lab. There, they are working with professors who are making multimedia software, bringing the knowledge of visual language to a project that the professor is bringing a scientific language to. A group of our students is now working on another innovative math project where they are again helping researchers to visualize something that's going to be a teaching tool.

I would say [another benefit is], a higher profile for graphic design at the university that I couldn't imagine happening in any other way. I mean, in some areas we're taken more seriously as a discipline because we're so well versed in technology. And then I would say, a real and constant challenge in resonance with the changes that have taken place culture-wide and internationally.

Q. 10 What are the perceived negative results of the shift; short and long term?

A. I think any negative results we experience are also culture-wide and international. And we have no control over them. I think we have to go with the technology and again, I don't see it as technology. I see it as new ways to do things. So, if there are problems, we've all got those problems. It isn't specific to the field of graphic design.

Q. 11 What does this information portend (signify in advance) for education and the educator in the future?

A. In a larger context, the same thing that I was saying about learning the software, and about being mobile. I think that attitude of mobility, and an ongoing interaction with change is required. I think that is an enormous issue, and not just in design; but in education outside and inside of the school. One should be able to say: "I see the changes and what I'm going to study is how to go with them, not to see if I can sit tight and not be moved."

I think it has to be taken into account, the collapsing together of disciplines which is scary. It's just scary by nature, but it's happening to all of us. I think also of the coming together of cultures, because of population shifts, mass communication, and the internet.

We need to keep human goals in view which is not usually an issue that you think about in a design program. I'll say more about that. But it's funny, I see this happening in classes--well, because I try to get it to happen in classes. But, an interpersonal care and attention, not so that everyone will be nice, but

because in a technological climate people have to work together. They have to be able to hear what each other is saying. One-on-one kinds of interaction or group interactions have paradoxically become enormously important, more important because of technology.

The ability to direct a team, maximize team effort, and contribute to a team [will become increasingly important in the future], as well as an attitude of research, and of understanding where the other team members are coming from. Also, a sense of the big picture and where the particular piece that you are working on fits.

An ongoing redefinition of the value that design contributes to the process. And I think, an ongoing redefinition of design, or say reevaluation of what design is. If everyone has the same technology, if you are working together on a team, with people who have a lot of different expertise, what exactly is it that design brings to the process? It's not a question that we had to ask when we were working with printers. We were the ones who got them the text and images, and did the layout. It's another set of issues now.

Q. 12 Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. Things operate consistently within a given space. I think even the analogy of conversation, very much the analogy of conversation, and a different structural organization. The principles that you use when you are diagramming or when you're mapping. Team process and research. Group interaction and discussion,

and the habit of comparing reactions, when a group gets together to critique the effectiveness of a project--a cycle of analysis and synthesis that you go through given an assignment that takes several weeks. Issues of legibility and readability. Appropriateness of decisions about form to the content.

All of those things. I think this new technology allows us to go back and look at what we are already doing in another way. The obvious thing that designers do is the product, but the valuable thing that we do is figuring out what the problem is: analyzing and interacting about it. Getting together as a team, comparing notes. All of those things are what we are about, what we do, and all of that applies.

Q. 13 How do you define the concept of interactivity?

A. Well I have a simple answer. I think of two major kinds. One being a finite product that you explore with some defined mode of access, like some canned reference--an encyclopedia that you may never do it--but logically you could look at everything that was in there. CD ROM disks, or games that you could explore. I've not gotten through Myst, but you could get through it. So again, there is a finite product and a way to explore it.

Another thing is something that has a live access available with its own paths, routes, and actions that you perform to get to some information that's constantly refreshed--that's constantly updated--data bases, on-line conversations. So, a situation where there's essentially a product or environment that's set up by someone else--you can get whatever is in there. And another situation is where you just go out into this wilderness of data, and things are constantly

changing. It's not the same as when you went there last time. The way to get there may be the same, but the information that's available will have changed.

Q. 14 What overall trends might be found in design education contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?) For example: a representative for Macromedia told me that what his company was most interested in with respect to research was the new applications for multimedia technology. How can we as creatives, push what they do or what comes out of the technology.

A. I don't really think I have an answer for that, except to say that if educators approach it as a situation where we're in a partnership with the software developers or the publishing companies. If we're viewed as being somewhat of a lab where that type of thing can happen, then that sort of thing will happen. I think if we are viewed as the people who can decorate it once they are ready to do it, then it won't happen. Then we'll be left behind and they will not have that potentially rich contribution to it. I think that both sides have to be optimists about that and say, "these are not separate things, these are the same things."

Q. 15 Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. I'm really not aware at this point of any (sophisticated) multimedia that was completed by an individual. I think the role of the individual, and the development of the whole product has to be kept on track and the model for the person that does that could be an art director, a producer, a film director, a managing editor, or a publishing author. My experience with this area makes me think that rigidity is not desirable here. There definitely needs to be someone to keep the thing (project) on track. I think there needs to be as much interdisciplinary discussion, and respect across disciplines. This is the important thing, as the schedule permits. The product is defined, and that model of having someone keep it on track, still has to be there. If there is someone saying, "I know what this is going to be" from the beginning, it's not going to be as rich an environment as if you say, "well now, I'm working with all these experts, can something happen in the process that makes the idea better because it's being changed by the way people are working together?"

Q 16. What is the affect of this technological revolution (interactive multimedia) on the need to develop expertise that spans a number of disciplines?

A. Again from my experience, I would say that it frees a person from a confined professional role to the extent that other aspects of their intelligence comes into play: their ability to interact, inspire, elicit, translate, and get multiple inputs or contributions to the product through the process. I think you come to it with a defined discipline, a certain education, and with a certain background. You come with your own discipline, and you come with the ability to listen to other people. Then you quickly learn, as you progress, what areas you can contribute in, and what areas that you really need to know something else about. I think again, the attitudes of flexibility of search are most important in that early stage. At Northeastern, we are an undergraduate program. It is unrealistic to think that our students can come out being experts in many areas. The choice that we have made is to concentrate on making them experts in graphic design.

We're also a university that has a strong commitment to the liberal arts. So, there is interdisciplinary experience inherent in our education. Students take courses in different areas; they work with people in different areas. So, they come out with a discipline, but they also come out with an interdisciplinary experience. What we're more and more trying to do is focus on is the ability to function in a group that's working on a project.

We're looking at the definition of designer as being someone who enables a certain kind of process to take place. Do you need another specific discipline? This is another topic, but another thing that technology has done to the design

field is to make many, many more paths possible. So if you have an interest in design and geology, there's probably something you can do.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes, I know I have covered some of this already. But, I will say that we're focusing on listening, and being alert to the non design-specific gifts of the other team members. You know, somebody's good at getting people to work well together, someone is good at presenting, someone is good at writing. Be aware of that. A sense of just-in-time, and being able to see something and hop on to a better idea, not clinging on to the idea that you had. Questioning the aptness of the solutions that you have inherited, metaphors, relaxing, going away from the computer for solutions, and inspiration. Alertness to cross-platform compatibility in the largest sense of disciplines, not of software/hardware. And being able to look at current technology, taken with a grain of salt.

I think very importantly, keep an eye on the revolutionary tendencies of the on-line world, and the big team work that is happening internationally through technological connections.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

I think that designers have been educated to think that we have great intuitive sensibility, and I think to a large extent, that's true. But, the interactive environment is changing the demands. One thing that we are not really prepared well for is the sense of the timing of interactions and the ergonomics of accessing information. There are other fields that have done this very well. I think the best thing to do right now is to use the leaders in those areas to work with us, to do workshops with us, and to introduce students to those concepts. I would be much more likely to send my students to take a course like that, than to think that we could manage that within the resources that we have. I think it's a very serious question.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. Yes, there are many paths. I think there now exist in the profession: designer/illustrators, designer/strategists, designer/organizers. There are all these different niches. I think what we are trying to do in this program is to prepare designers who understand the whole process, and are able hands at production. I think it will be true for a while that being very good at computer production is a good way to get into a job. But what we're aiming to do is not just have software access, but to have people who have an overview of the process.

Though they may be hired as technical whizzes, they will be able to grow throughout their professional lives. I would hate to see design atrophy into this area of the ones that do the final production for people who are actually doing the thinking.

Q 20. As a design educator, what recommendations do you have for the practitioner on the use of newer media: its development, direction, application, etc. (educators)?

A. Well, we did talk to the high school people a lot about this. We suggested the use of analogs where it's better to not always think that you have to be working on the computer. Use analogs either where it's better, or where the technology is out of reach. If you can't afford something that allows you to animate, you can create storyboards, or act out. You can deal with the logic of any kind of interactive project. I think we should make alliances with other disciplines through technology.

I think it is very important to demonstrate the value of design knowledge, and the broad view of graphic design knowledge to your collaborators, because people often don't know that. I think we could promote mobility of mind--the idea of multiple paths--redefine the profession, go to conferences, and speak at conferences. This is so difficult. I just had a big discussion today with Dietmar Winkler about this. We couldn't solve it but tried to figure out what the art impulse is, and where it goes in the technological world. Because if we're saying that designers are now people who have other skills, interests, and intelligence besides the visual, what is that visual interest and what does it contribute to this technological world?

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/ artists, and other users)...perhaps both? Please select and explain.

A. Well, I usually tend to think it's the profit motive that's driving the technology. I thought, yes that's it, "they're looking for markets, they want to sell the stuff." Then I thought, that there's all this stuff happening on-line. And I think what's happening on-line is not looking for markets as much so far, as it is looking for community, looking for information exchange. You know, even the sense that are those consumers any more, or are they changing into something else? For the people that are using the internet, it's another set of interests.

So, I'm watching to see those come together. What will happen when those come together? There's enormous pressure for a lot of what happens in the profit motive world to move on the internet for instance. There are some very powerful things happening there, but how they will move that into the larger culture? I want to answer the question that you didn't ask me. I have something to say to the profession.

What recommendations do you have for the use of newer media...?

A. It's not quite that [one]. I want to say something else that's related to that. And that is...and you rightly, cite some instances where this is happening. I'm saying as much as is possible to use the schools as thinking labs. You know, not just sort of technology farms where we make the hands to take the software tasks.

A very important issue is to help us with models for technical training and equipment support. This is much more important for stand alone art and design colleges than it is for universities. The situation now is that each unit is in danger of starving by itself, because you need the technology to do the work. But art and design colleges and often universities, usually don't have the resources. Where are we supposed to get the resources that allow us to graduate people who are very technologically savvy?

I think there needs to be new models. The same way that there needs to be new models for libraries, and new models are developing so that there is access even if we can't pour in millions a year to update the lab. But that there is cooperation. The field needs new people coming out that are technologically sound, as well as design savvy. But, I think many, many schools feel in jeopardy, because how are they to support this ongoing technological process?

Q. So, practitioners should have more of a vested interest in the educating of the people who will one day become their staff?

A. Right. And the overwhelming umbrella issue is that everybody in the culture is struggling to make sense of technology--have enough time to deal with it, have enough money to pay for it--and all of this. And I think that we're sort of at the point where we could be looking more at each other's situation. We could be looking more at resource pools. So that people in the profession are working more closely with schools. So that they just don't expect us to send the people out ready, but there's more of a partnership there.

I know design firms and corporations that have design departments do a lot of on-the-job training. This kind of connection with education, I suppose would reduce that to a certain extent also. I think in an article I read, there was mention of designers coming in, and how they were very well versed in working and using software, but then they had no hand skills. And they had beautiful portfolios, but no hand skills. Well, if practitioners or the industry were more involved in education, then we could figure out exactly what still needs to be emphasized, together. As opposed to educators sitting in one corner saying: I think we are going to need this, and not knowing exactly. I think there needs to be more of a collaborative effort by both parties.

A. To answer this sort of implied accusation about the hand skills which I do hear often. I think it's partly that the people in the field were taught that way. And they're doing fine, so what's wrong with knowing hand skills? But in education, two things: 1) it takes so much time to work with the technology and 2) you can't run two parallel curricula simultaneously.

The other thing is that the students, once they have access to computers. There's a fascination that often makes them turn their backs on other ways of making things. We're making a conscious effort in this program to move back and forth to have drawing, modeling, research, and reading things coming from other areas, and all feeding into the education process. But I think it's very easy to feel that some things are left behind, just because of the pure time considerations, because there is so much that you can do with the computer. It's hard to get the student to realize that the rest of the world is still out there, and that the rest of the world is just as real as it ever was.

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Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. My initial introduction to computer technology was in the form of a Digital Equipment Corporation VAX 11780. They don't make those any more I don't think, and the UNIX environment with some proprietary 3-D Software developed at Columbia University. That was how I started, and soon after that, I started working with an Apple II. So, I started working as a designer doing graphics for video games in the early 80s for Apple IIs, Commodore 64s, and at the same time I was working with this higher end machine which is kind of similar to an SGI (Silicon Graphic Iris). It did the kinds of things that an SGI does today.

Basically, I guess it was through the workplace. I mean I took only a couple of computer classes at school. And I think I was very curious. They sparked my interest. But I didn't really learn much at school, because it was all [just] starting. When I took the class it was probably '82. I took one class at school. However, if I compare it with what we've done here, and the way we teach it, it would be an entirely different story. The course was taught as Computer Science 101 - Introduction to Graphics." You really had to make the con-

nections yourself. I mean, you didn't understand why you had to learn all those things. And you didn't understand why you had to do those assignments. But, it was neat, because you were able to create animations and images, and that was good.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

A. Well here at Pratt, we have in our department a multi-platform lab. That's basically the way I think education should happen. I don't think you should have a single platform lab, especially for graduate students. Even for undergraduate studies, it's giving students the wrong expression. The workplace is not a single platform, or a single format, or a single program. And very often, throughout your career you will have to switch programs, or lets say, learn new versions of programs which might be significantly different. You will have to learn new programs, work with different machines, transfer file formats from one operating system to another, etc. Even if you are not a designer that's involved with the production aspect of things, then someone will do these things for you.

I think it's important for you to understand what's happening. Because all those limitations are factors in your design work. So, we have Macs of all kinds. We have Mac CIs, 286s that we've upgraded all the way up [to the] maximum. We have Quadras, Power PCs of all types, and, we have SGIs. That's really pretty much it. Oh, and we have one Amiga that we purchased for some students to do a special project. As far as my own work, I do most of my work either on Macs or SGIs. I rarely use PCs, but that's just an accident.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. Well, I think that I am a hands on person. I think that conceptual thinking is extremely important. On the other hand, you shouldn't concentration on it alone. I mean, not for our profession. It would be different maybe for a philosopher, or to limit it to some real world ideas.

For designers, it's very important to conceptualize, then it has to get done. And either you do it, or somebody else does it. So, I basically tried a lot of systems, tried a lot of programs, that was very important. And, I think there's no replacement for that. And, I think there's no replacement for that.

The only other important aspect of my investigation and exploration was to read magazines. I think especially in the mid 80s when things changed drastically overnight, for the first time. Now we're experiencing the same thing again. I think there's a very, very significant change in computing right now. Read magazines. That's really an excellent source of information. I think people underestimate how valuable reading magazines is. Normally, that's really the best way to get good information.

Talk to users. Early on, I went to user's group meetings. I attended them a lot. Now, I don't have time. It also interests me a little less than it use to. But, I think for somebody who's starting, that's an excellent way to get information.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. That's a very good question. Well, let me tell you why I think this question is very interesting. In the late 80s, I use to do tons of consulting for graphic design firms in Manhattan who were considering computers. It was interesting for me to think about what my motivation was. They were hiring me, and I was very happy. I had things to do. But, they had different reasons to get into computers. Some of them--the least of them--because they believed this was a better way to do things. Better in a very wide sense of the word. I mean, it was maybe faster, or more inexpensive, or more flexible, whatever.

However, I feel most people got into it, early on because of trying to stay competitive. They said: "my competitor is doing it. I have to do it. I hate it. I don't want to do it...I'm not ready for it. But, I have to do it. So, help me do it. Tell me what to do." There was a lot of that in the mid 80s here (New York City).

For me it was very enjoyable, because these were the same people who two years earlier were saying, "we'll never use computers. We hate them. You're all crazy." You know? I think that's what happened early on.

Then, later designers realized that it was not a big deal, and that there were lot's of benefits: creative benefits, and production benefits. In the case of Pratt, we were very active in bringing the computer into education before there was a huge demand, from the student's part for being educated with computers. In our [Computer Graphics] department at Pratt, that was one of our main missions. But, in other departments, and many other schools, they were a little more

passive. They started getting into it because the students started saying: "look we're not going to get jobs if we don't know how to do this. And, why aren't you telling us what it is?"

I think, especially now, if you go to any school--for example, when I talk to prospective students when we have parents day, the parents, and all the kids come here. These are seventeen or eighteen year olds who really don't know anything about design or the profession. The first thing they ask is: "what kind of computer education can we get here?" That's very, very important for them because they realize that whether you like it or not, the world relies on digital technology. It's like a basic thing now, as far as professional development goes. It's a basic issue.

The combination of basic design education and computer technology is not a harmonious blend yet. But, of all the design programs that I know about--that I follow, and see people coming out of, or know people teaching not only in New York, but in other places--I can't think of any place where they have pushed the design aside to make room for the computer. I mean designers are very proud of design concepts, and for a good reason. So, I don't think if that's happening anywhere. At least, not in any of the good schools.

Of course, there are a lot of trade schools, that have popped up and said to people: "become a designer in two weeks, learn how to use Quark Express." But that's not what I'm talking about. There's a lot of that trade-oriented training, or becoming an operator. But that's not what we're talking about. We're talking design schools that have been around a long time, or a short time. But as long as they are design schools, there trying to [appropriately] integrate the computer into their programs. Some are doing a better job than others, some are doing it in a more

harmonious way than others. But, it's definitely happening. I don't know of any design program that's not dealing with it in one way or another.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. I don't know if I would call this automation. I don't know if this was really an automation situation. When first considering integrating a computer system in to a curriculum, did the cost of hardware/software slow the decision to change? Not in our case. We got a fairly large grant to start the program. So, we had the budget, we didn't have to think about it. I mean we had to work a lot to get that grant, but once we had it, we had it.

On the other hand, you have to work within a budget and you only have so much to spend. So, of course I have to make decisions, but it didn't slow me down. It defined many of the things that I got to do, or didn't get to do as the designer of the educational program. But I don't think we had to do anything extreme, we just got the money right away.

Q 6. Was the shift a natural one, or was it forced by competition? Please explain.

A. Here, it was very natural. It was very active. That's basically why I came to Pratt. For me, that was the reason for being here, for being in education. It was a natural shift. I wanted to do it.

What is happening now in other departments at Pratt, has been happening, I guess for a couple of years. In many cases, it is forced by competition.

Many departments here are very traditional, just as they are in any school. They resisted changing especially when there are a lot of tenured professors that have been teaching the same thing, the same way, for 20 years. They don't have a good reason to change it. So, it really took them a while to face the fact that people out there were doing it another way. Students were starting to express dissatisfaction, so they got into it.

Q 7. Economically, how has the technology affected you as a designer (educator) - In Education: economic affect on design department: funding & funding methods, etc.

A. I think there are a lot of issues in this question. First, these are not ranked in any kind of order, but I guess there is one thing that is a big issue for us here in this department. This has to do with the fact that faculty have to stay on top of the technology in our department. And that's a big issue. Because usually, once you reach a certain level of skill, proficiency, and knowledge, it is assumed that you can pretty much remain with minor improvements at that level for all of your career.

When you're dealing with computer technology as we have it now, it is really constantly changing. You can't just sit back and say well, "I learned Quark Express in 1986, I don't have to worry about it any more." No, you have to re-learn it, because if you don't, you don't know what you are talking about. And it didn't use to be like that in design education, or even in the design profession. As I said, even those who deal with very conceptual issues and are not involved

with production, really have to know about these things. Even if only vaguely, they have to keep reeducating themselves. So, professional development is a very big issue in technology.

Another issue which I think is crucial has to do not so much with individual educators, or even the individual chair people, but with educational institutions understanding how to manage technology. That's technology for the arts or for design education, technology that rapidly becomes obsolete. I think this is a fact that design schools never faced before, at least not at this degree of intensity. I mean, maybe at some school 20 years ago, they bought typesetting equipment and they knew that it would only last ten years. It was a big investment, they just purchased one. Students found out and that was the end of it. They called the company when it broke down, and they got supplies in the form of chemicals and paper. It was technology on a very contained scale, very stable.

So, I find that as an educator and as an administrator, that has really been the biggest hurdle, not only here but everywhere. Making the top administration of our educational institutions understand that this is not about buying one big piece of equipment that you put in a room and forget about it for ten years. That's not the way it works.

Is that something that when you apply for grants, that you work into your proposal--the fact that in maybe three to five years, you're going to be upgrading to the next level?

A. Yes, good thinking. But, in terms of things that have effected education, I think that's been one of the biggest issues. And, it works both ways, it's not only making people who approve budgets or grants understand that these things

have a limited life. It's also about being responsible, making a selection that will last the longest amount of time. I really believe it. I don't believe in changing computers every other year which is a view that many people have. People still say: computers are expensive, that's just the way it is. We have to throw it away every other year. I think that's wrong.

So you're looking at technologies that are upgradable for the most part.

A. Yes, and I think that we don't want to teach students, future designers, or any one else for that matter, to go out and purchase an appliance, then through it away the next year, because it doesn't work. What's the point? We don't throw out our hands every other year, we have our hands our whole life.

The whole educational process includes making students understand why we purchased those things, and what went into that decision. They have to face the fact that maybe they won't be working with the latest equipment or software every semester, and that's OK. They can still do great design.

Q 8. Did the learning curve or time commitment seem too great to justify the shift? - Education: training of faculty members

A. Well, basically what happened here at Pratt in the Computer Graphics Department, is that all of the faculty members in this department were new to Pratt. They were all trained. So, I didn't have that problem. I know in other departments here at Pratt there's been all kinds of experiences with training, some successful, some not successful.

I'm sure that for many, training was an issue. The issue was probably the learning curve more than the time commitment. Having done a lot of training, I find there's a huge difference between good training and bad training.

You can really turn beginners into fairly good users in a week, if you do it the right way. Or, you can totally frustrate somebody for the rest of their lives in one week with bad training. So, I think that's a big issue that some schools are paying a lot of attention to, because they are really taking the time to plan training that they feel will work.

Q 9. What are the perceived benefits of the shift?

A. Well, we are made to do things that were not done before. I mean, there are definitely things that you can do with computers that you don't do with other tools and with other media. For example, [compare] students' work 10 or 15 years ago. The work they brought into a design studio class, to the type of comps that they bring in today: Iris printouts, or just any kind of medial resolution color printout. That was just not possible [back then].

You didn't have this level of control over your product. I think that is a benefit. You couldn't do things like [interactive] multimedia, period. There just wasn't any way. I mean, when I went to school, there was a class where they showed us how to do slide shows with slide projectors which were timed. And that was great but...

That was multimedia I suppose.

A. Multimedia, that was multimedia, exactly. I mean, it's totally different, and I remember we had to do the sound track. It was this cumbersome audio tape machine, and it was just painful.

Q 10. What are the perceived negative results of the shift; short and long term?

A. The short term is very obvious. From my point of view, the negative results of using computers in design education is that students--especially the younger students--are kind of blinded by the shiny technology. They pay too much attention to, and put too much emphasis on the technological aspect of their profession, and put less emphasis on the conceptual aspects. I think that's natural. Computer technology can be quite complex and requires a lot of time to learn and really master, especially at the beginning. But their minds are on learning or wanting to learn very technical aspects. Sometimes, they won't even listen when you are talking about other things. I mean, they will listen, but it goes in this way and goes out the other way.

Is there a tendency among students to go straight to the computer as opposed to conceptualizing on paper?

A. There is, and that's why in many of our courses here--now that we've been doing this for a number of years--we have designed the courses so that students are forced to sketch on paper, and present everything on paper, present a verbal

rational of their project. And until that happens, we don't even talk about computers. Maybe that's a little extreme.

Last term, I taught a course called "Visual Dialogue" which has to do with exploring what a visual dialogue for interactivity really is, and for having such a dialogue with other people--without your being there number one, and without using verbal language and speech--with only images and type.

In the first session, when I told them: "no, we're not going to be using computers. This is a paper and pencil course." They were totally enraged. They said, "but this is the Computer Graphics Department!" And I said: "Sorry, if you don't like it, leave." But, they were very happy at the end, because the following semester which is right now when they're taking the interactive workshop, they already know so many of the basic concepts, that they can really now focus on the hands-on detailed aspects of which buttons, which sequence of menus, etc. But, they already know what the whole thing is about, or at least, they have a good overview. So, those are the negative results of the shift short term. They put a little too much value in just technology.

They want to buy a computer right away. I always tell them, "don't buy a computer until you are graduating, or until you are a senior, until you are working on your thesis, because we have the computers here. Why are you going to spend your money now, when you can spend it right before graduation and have a better system? Let the systems here get old, and leave with a new system."

Long term, this may sound too cliché, but I think it's true. Most people tend to do the things that are easy. Unfortunately, that applies to design students as well. So, due to the fact that unless we force them to look at the rich tradition of

design before computers, they're not going to look at it. For me, that's totally impossible to understand. Because I grew up with the notion that books were extremely important.

A lot of people are not looking at books any more, unless you force them to. People won't realize the value of wood cutting, or some really manual thing like printing your own poster with silk-screening. That sounds like the stone age now that you have Quark, and ink jet printers, you know. Why bother? I think that it's not the end of the world but, it's a shame because a lot of important things are getting lost. Unless you retain the important part of the tradition, students will not know where things came from. That's very bad.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A. There is a lot of work to be done with integrating it with the other things that preceded it. We just finished a period of big changes. Now we have to refine it, bring it up to the level of sophistication that we had before. For example, when you took a typography course fifteen years ago, before computers, you were taught by a person who had been teaching typography for twenty years. You really got a refined vision of things. On the other hand, when you learn typography from somebody who has only been doing type for three years, and type design with a [computer] program that's only been out for two years, you get a lot of information, but some of it is not as elegant, or as digested as the other. So, I think that's what we have to do now. We have to continue to refine an older profession with the new tools.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. A lot of it. Basic two-dimensional design concepts, like everything that has to do with composition. That's abstract, pretty medium-independent. The concept of symmetry. It really doesn't matter if your printing it, drawing it on a wall or putting it on a screen. Symmetry is symmetry, and it has a communication effect, and an emotional effect. So, those kinds of principles: color principles, basic theory, basic typographical design, image design, photography and/or other ways of constructing images. That's pretty universal. Yes, so there were a lot of things that I was able to translate from my previous training.

Q 13. How do you define the concept of interactivity?

A. Interactivity is communicating, really communicating. Interactivity is exchanging information. It's a two way communication process. It's an active, two way communication process. And interestingly enough, interactivity is not a computer-exclusive concept. Our lives are interactive. We're interacting, we're having a conversation. I tell my students, the best example of an interaction is a conversation where you are exchanging ideas, using verbal language, using visual feedback, and using gestures, etc. That's what our lives are all about.

So, when we talk about computer interaction, we're really talking about taking a complex, rich way of communicating with people through a terminal or screen. That's a big challenge.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. I think there's learning taking place. I think that people coming out of school now, know and have learned different things than people who came out of school ten, or even five years ago, as far as interactive multimedia goes. That has to do with many things. That has to do with the fact that those teaching now have a better idea about what they are talking about. Technology itself has matured, and students can be more focused. I think that eventually, all that has a positive effect.

If you have professionals (educators) who know what they are doing, then students and professionals have a stronger foundation and are freer to be more creative. Many technological hurdles have been cleared. That means we may look forward to having better products and better communication.

So, I guess what I'm hearing is that in terms of the development of interactive multimedia, what education contributes is the refining of the process of teaching methods.

A. Well, let me give you an example.

OK.

A. When you walk into a bookstore. Is there like a big book store in Columbus, where they have tons of books like Barnes & Noble?

Yes, we have Barnes & Noble in Columbus.

A. OK. Here, there are a couple of huge Barnes & Noble stores. Where you walk in and you can spend days just looking at the books, looking at the covers, looking at the picture books, learning. Now, we don't have those bookstores by accident. We have those bookstores because we have thousands and thousands of very well prepared designers who can make beautiful books. That's how we have a publishing industry. I mean, there obviously are the writers who write the books and printers who print the books, and that's very important. But designers have a big part in the existence of that rich book world. We don't have a rich interactive world in our lives, today. We don't. I mean, there's ten good products out there. You can say that CD ROM is very interesting. The interface for that cash machine is very interesting, but you can count them on one hand, I guess.

The main contribution of programs that are teaching interactive design to students is that we're building momentum. Say you were five years from now. At that point in time, there's going to be more people who know what interactive design is about. Then, there's going to be more resources for actually building a rich interactive world which I don't think we [now] have. I mean, there's a lot of

ideas, there's a lot of expectations. But if you look at employers, you'll see that they can't get people who really know how to make it work. It's a new thing.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. Yes, I agree with you. Interactive multimedia involves a lot of different types of specialized work for its production. I think by now, we know that almost never can a single individual take care of all that. It doesn't make sense from the production point of view, because many of these processes have to happen at the same time. The code has to be written, while the images are being scanned, while the type is designed. One single person can't do it all efficiently. So, it's a practical issue there. Also, there is a conceptual issue. Why should we do it that way? There's no reason to have one single person do it all. That's the fixation that some graphic designers have which is based on working in print--being able to do many things ourselves--and maybe we hire an illustrator, give instructions to the printer, but this is a different medium which is much more like film production. There's a director, and then there 700 other people working on the film. You have to give things up, you have to let other people do it, you can't do it all. And I think that's a big cultural problem that designers are dealing with right now. But eventually, it will be worked out.

Q. 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. There's a lot of interactive media that has to do more with verbal communication than with visual communication. Because even though you're showing pictures, and you're using buttons. Ultimately, you're talking about things. Many designers are not good when it comes to talking about things and explaining things verbally. We like the cliché of saying, "we're visual people." You may be designing a poster where the main point is to catch the people's attention visually, and not to really explain what the whole thing is about necessarily. Well that's fine.

However, when you are dealing with an interactive multimedia project, where communication has to happen. Information has to be exchanged. It's really very important that today's student know how to, write a script, understand the structure of linear storytelling, and understand the concept of distributed communication. Things like that traditionally, have to do more with writing a program, or a film/script writing program, and not with design. I think that it is very, very important that we bring some of those issues into design education. Otherwise, we are producing people who are just cosmetologists. I mean, it's also important that you can do other things.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes, collaborative processes and cooperative teamwork is a very interesting situation that we have here. Actually, there's disagreement within the department on how to deal with it. This has to do with the fact that yes, we have to teach students to work in teams. But, should we force them to work in teams or should we focus on them as individuals? Because that's the reason why they came here (for individual focus) to discover who they are, and their voices as designers. Or, should we let them pick up the aspect of teamwork in the place? So, I am just presenting it to you with a lot of contrast: focus on the individual, or focus on teamwork.

My feeling is that we have to focus on the individual more than focus on the teamwork aspect of things. In the educational stage of somebody's life, I think it would be very unfair to be placed in an uninteresting role in the teamwork process just because your name was fifth on the list. I don't think that's fair to a student all the time. Maybe it should happen once in a while. That brings up a lot of problems that have to do with really bringing out the best in a person. If you put someone in a little box, and you tell them you're going to do [this]--for example, in a film school, "you're going to do lighting in this movie." The student may say, "well, I want to be a director, why should I be lighting?" Because you're going to be lighting? I think that's unfair. So that brings up a lot of issues that we haven't had before.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. Yes, 100%. I think that traditionally, graphic designers have this big, big prejudice against things like market research, and things that are very focused on a specific audience. I think graphic designers from the more traditional/fine arts point of view, were supposed to make what you think of as beautiful, which I think is great and very important. But, when you're trying to communicate with somebody, it's not always about showing them a pretty pictures. So you're communicating, and you may have to go out of your way to make sure that somebody understands what you mean. That's something that is not really part of the tradition of graphic design education. It's not the norm. The norm is give me something beautiful according to certain statistical guidelines that we all think are good, in whichever style we like, but that's it. Once you put the poster up, once you make the book cover, you never hear about it any more. Interactive media is not like that. In interactive media if you say something, there has to be a response. If there is no response, that's because you're not explaining yourself. Yes, I think there's a big difference there.

So yes, we require a new sensitivity to how people learn, and how people communicate. The first thing I told students in this visual dialogue course is that you have to be frank with your audiences. You can't design an interactive thing for the world. You have to tell me if this is for children. How old are these children. Is this for adults, or is this for a general audience? Not only that, but is this going to be placed in a public area where everyone is zipping around, being noisy and talking to each other, or is this something that you play in your own room. Many of these issues have never been addressed in traditional graphic design programs.

I think it's been more about if you can see the thing. Is it visible from here? From the signage point of view, is it legible? Will people be able to read

these letters? Is this the right emotion for this book, in terms of the colors? But, there is never the feedback. It's always like, "here's the information, see you later." So, it's different.

In addressing these issues you have to develop new content in your educational programs. You can't go along teaching the very same things, just throwing in a new computer there, putting in a computer lab here, and keep teaching everything the same way. If you want to address interactive media, you have to develop new courses that address new realities. What would I like you to know? The world is changing.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. I think there's no role here. There's all kinds of graphic designers, so I won't generalize. I think that some graphic designers are very good at conceptualizing. Some are terrible at conceptualizing, and very good at production. I mean, I think each person has to find their own role in life. I think it would be very unfair to promise the students: "when you get out of this program, you will always be that or this. We taught you something, good luck." I don't know, there are many ways of doing things. I don't think there is a rule here, because graphic designers are different.

Q 20. As a design educator, what recommendations do you have for the practitioner on the use of newer media: its development, direction, application, etc. (educators)?

A. My recommendation for practitioners would be to think about the effect that computer technology is having in our lives, over all. For example: I think we will eventually catch up with the technical issues. People will learn how to use Quark Express, PhotoShop, etc. Eventually that's happening. The things that are not happening automatically--because people are not forced to deal with them--are things like thinking about health issues. What is it doing to you when you move your finger in the same way fifty thousand times a day? There are health effects. There are ways of going about it. I think we have to keep those things in mind for the long term.

For instance: a junior designer. Is this junior designer going to have to work eight to seventeen hours in a row, everyday, in front of a machine? Is that really the way it should be? I don't think we've really had time to think about it, because everybody's just trying to do it, and everybody's happy when they get a machine. And, everybody wants to do it all the time. But, is that the way it should be? I don't know.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. I think a lot of things are driving the technology. It would be hard for anybody to pick one issue that is driving the technology. Unfortunately, I think that the market is a big force in driving the technology. That is both good and bad. It's good because it forces companies to stay on their toes and think about innovation constantly. That's very good. It's bad because companies have to sale their products. Otherwise, they can't stay in business. Sometimes they sell

things which are not the best, or which are overpriced, because that's just the way the market works. So, the market is a driving force.

But, I think that everybody else and everything else is also a driving force. Users are certainly hurt by companies. The hardware determines what software might do. But, software also determines what hardware will do. So, I think it's a complex interrelational set of forces.

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Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. The most solid introduction, would have been the Mac, when it was first introduced in '84-'85. I think it was '85 that we had a lab. It was fortuitous, but sad in that it was a trustee member of the university who passed away, and in his name a lab was established in the design department. So we had twenty Macintoshes the early, little babies. That was my introduction, in terms of the medium not just for my own work, but also for teaching.

Prior to that I also should say that I came here (Carnegie Mellon) in '82, so that's 13 years ago now. I came here from the University of Louisville. When I came here, I knew that Carnegie Mellon was known for its involvement with technology, computers and so on. I guess I've always been interested in pushing the limits and looking for the boundaries, then pushing those. Whether it be with traditional media, or new media. Literally, I just started looking around campus and began by sort of knocking on doors that had the words design, computing, technology, and/or communication and technology [on them]. Actually, I found out that number one, the word design was not [solely] our property here in the

design department, because there is software design, engineering design, and we have strong CS (computer science) programs, as well as strong engineering programs on campus. Secondly, there was also--even back in '82--this atmosphere of collaboration between departments, and between individuals in these different departments. I found that there was a group called the Communication Design Center which was a group of people from cognitive psychology, rhetoric, and design, solving communication problems, doing user testing, and that type of thing.

Any way, in '83 IBM and Carnegie Mellon started a joint venture to design and implement a computing network for the entire university. Prior to that--and I think that was the case pretty much nationwide--you had dumb terminals around campus that were hooked up to these main frames, if you will. And in the middle of the day, you would have thousands of users working away and suffering from slow response time because they were all hooked into the same big computers. No matter what they had to do, whether they had a simple text editing job, or some serious number crunching, this was the case. This joint venture with IBM and CMU came about because of a study that was conducted that started a few years prior to that. The study basically said that we've got to move from this model of a central computing force if you will--everybody hooked into these few big computers--to a distributed network. In a way, they were looking forward to the PC which had not been introduced yet.

A year into that project, I became involved with a small human factors team. There was a person from psychology, rhetoric, and myself, the visual person. We joined the ITC (Information Technology Center) which is about thirty system developers, and started working with them in terms of helping to develop this system. It was a five to six year project which was being built on a UNIX

platform. I was simultaneously introduced to that platform, as well as the Mac when it emerged. These were happening about the same time.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

A. As an educator, solely with Macs. We have twenty Macintoshes (for undergraduates) in design, both graphic as well as industrial design. I would say that the majority of the users are still graphic designers, simply because there's more software out there that supports what we do. However, we are seeing a rise in the industrial designers using the lab. We have several computers, scanners, output devices, and so on. We also then have graduate offices, and they have Power PCs which we got last summer ('94). Those are the platforms. As a practitioner, I should mention that my wife and I have a small business (Boyarski/Boyarski, graphic design consultants) out of the house, and we work on Macs.

In terms of the graphic design program, we have the same titles. We have Quark Express, PageMaker, and Macromedia Director, HyperCard and SuperCard of course, for some prototyping. We have PhotoShop, Illustrator, and Freehand. Freehand seems to be fading a little bit in terms of its use--Illustrator being the preferred program. Those are the main ones that we use.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. What I did, and in a sense, I think what most of us on the faculty did, is to individually and sometimes together, just explore using the software. We have computers ourselves in our offices. PageMaker for example, was something I started using when it first emerged, and I started using that very early on in my basic typography class, maybe around '86. Because the Mac appeared in '84, and I think we got our lab in '84 or '85. Then the LaserWriter appeared the following year. The appearance of the LaserWriter really made the Mac start to mean something at least within our community. That's when the whole notion of desktop publishing emerged.

But a number of us (the graphic design faculty) would use it, and started comparing notes. A colleague of mine and I team taught this basic typography class for a number of years. We just made it a point that we would just keep up with the changes in software.

What I was trying to do was to incorporate what we use to do in the basic typography class like take some of the issues such as understanding letter and word spacing, line lengths, and whether you're going to justify a column, or make it ragged right. We tried to translate those exercises to the Mac specifically, using PageMaker.

So to answer this question, I think that we explored it ourselves, and I used it as early as possible in the classroom. It's interesting in hind sight, even now when I teach. For example, when we talk about letter spacing, the later versions of PageMaker or Quark are far more sophisticated in letter spacing than the early versions were. Invariably, when you're setting display type you would have to go in and really look critically at the spacing, because there might be a few characters that need a bit of adjustment. I now find that you need to do that less these days, than you did five years ago. So again, I've think keeping up with

the technology is as important as using it. It's as important that we use it, at least to a certain degree, so that we know. I don't see my job as being to teach students how to use the software, specifically. It's helping them develop that critical eye, so that they know that this is poorly letter-spaced, that this is poorly line-spaced, and not simply rely on the software to answer those problems or questions for them.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. We were given this lab so in a way, we got the gift from heaven of twenty Macs, and started teaching with them. We didn't have to say "gee, it would be nice if we could just buy these things."

I will observe that there were colleagues, and I don't mean just here (at CMU)--I look at other people who teach graphic design as my colleagues, I mean we're still are a very small community--a lot of my colleagues were hesitant to start exploring the use of the computer. It was like "come on that's a joke, that's a toy. That's not serious design". I think in a way that slowed things down. Still today, this is ten years since the introduction of the Mac. I will meet colleagues at conferences who are saying: "you know we're just getting into using computers in the classroom, and I'm thinking "you're kidding!"

That has very little to do with budget issues, and a lot of it has to do with mind set. It's like, "I was educated to work this way, and by God we're going to continue working this way." I find that to be a rather unfortunate occurrence. For us, it was accelerated because we got this gift of twenty Macs. There may have been some years when we weren't able to keep up with new releases of the

software, the next version. Then, we were saying: “well, we can’t quite afford that so we’ll just continue using this early version.” I’m not sure that really slows you down.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. Again, we got this gift. Keeping up with the changes in both hardware and software, that may have slowed things down somewhat. There was a period when things did slow down a little bit. In other words, we were not working with the budgets that we should have had in terms of keeping up with just software, maintenance agreements, and with [related] salaries. Because not only is there a lab manager, but you’ve got to pay students, as work studies to be monitors. We keep the lab open from something like 8:30 or 9:00 in the morning, to about 1:00 or 2:00 in the morning. As you know, the cost of software continues to rise, even though we get educational discounts. Maintenance agreements are a costly investment.

Are students concerned about not being able to use state of the art equipment? Is it important to have state of the art equipment, as opposed to just having technology that may be three or four years old?

A. To me, yes. I would say that the latter point that you made is the most important one. I don’t think you need to be using Power Macs necessarily. We have Quadras, etc. that are doing just fine, and are able to run the kind of software we need to run to teach design.

In terms of saying can we show video this and that, maybe not--we're certainly able to do the best. Again there, I think it's critical to have a highly knowledgeable lab manager as that person. We've specifically said to him, "part of your responsibility Chaz (lab manager), is to keep up with the technology." Because I will come to him ever so often and say, "I just read about this incredible new thing, is it worth paying attention to"? And he might say, "Not really, it's just another chip, we're fine as it is." Or he might say: "look, before you purchase the next group of machines, for the graduate students, we better look at what's happening. We now have the option of buying this platform, or we could make all of them this platform. At least, there's some concurrence here, or maybe we should think about moving on up here. The whole introduction of the Power PC, one has to be careful there. Well wait a minute, we just bought a bunch of Quadras, and now we have these Power PCs, and is the software going to be compatible?--blah, blah, blah". I think it's terribly important that somebody make it their job to keep up with what's going on.

Q 6. Was the shift a natural one, or was it forced by competition?

Please explain.

A. I think it was a pretty natural one. And I have to say that it was a natural one for this environment. Again, Carnegie Mellon is quite sophisticated technologically. They are about technology. I mean there is technology being invented on this campus. You have computer clusters available to every student on campus (at CMU). You've got them in different classroom buildings, in the libraries, and

even in dorms. So, all you have to do is go down to the first floor to use a computer. More and more, students have them in their dorm rooms, for crying out loud.

Do the students get a chance to work with any of the technology that's being developed here, like proprietary software for instance?

A. Yes, not everyone, but those few that find an interesting listing on a b-board will go explore it. So we've got students working with different groups on campus in engineering, computer science, etc., that are developing technology, whether it's new hardware or software. So they do have that. So really, I don't think it was competition. I think it was simply a natural thing for us to be doing.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Education: economic affect on design department: funding & funding methods, etc.

A. So far, we have our own lab. Most of the other labs on campus are run by the Academic Computing Service which is a support facility for the campus. However, when you turn over the management of the lab to Academic Computing, the lab then becomes a public cluster, open to the entire university. We feel that our own lab is too small [for that]. In fact, it's too small to support our own students which number about 200 within design, let alone an entire campus. So, we have resisted the temptation of having Academic Computing run our facility. When they run the facility, they then also maintain it. Their policy is to every year,

upgrade one-third of all of the computers on campus. So every year, there is this upgrading of one-third, one-third, one-third, so that they keep the campus pretty current. Basically, that's their goal.

By doing it ourselves, we forfeit some of that. So we have to then be inventive in terms of finding ways to keep up. There was another rather fortuitous occurrence, and I'm not sure that this finds its way into the report. But, I think it is important, because I mentioned it to a number of my colleagues. All departments on campus have an advisory committee that has been appointed by the president (of CMU). The job of the advisory committee is to come in, and review the state of that department every two-and-a-half years. The advisory committee is made up of practitioners and educators from outside of the university. Some of them are alumni, and there are one or two board of trustee members on that committee. The committee numbers about ten or twelve.

When we had our first meeting with this committee which was maybe five years ago now, one of the things that they observed was the rather deplorable state of our Macintosh lab. Because we were still working with pretty old, dated equipment. We made it a point to say that "gee, we really could use some new equipment, we just don't have the budget for this, and so on." When they wrote up the report to the president, one of the top priority items was upgrade this lab. You have a very good department here. You have the potential for an even better department, and one of the things that's holding them back is this lab, you're working with antiquated equipment.

Literally, with the snap of his fingers, he gave us a quarter of a million dollars to upgrade the lab. That was incredible! Now, that's a method. We were able to find a vehicle.

The point is, much like what Mary Ann (Frye at Northeastern University/ Boston) is doing, and what we're doing here, and other places -- one has to be inventive and look for new ways to get the word to the right people that says, "this is important to us, and this is important to our educational mission."

I know that there's been a move--I don't know where it is, because I'm not involved in it. [It deals with] putting proposals together for a multimedia lab. This lab would contain digital video equipment, digital photography, editing equipment, and so on. So it's a lab that might be used not just by design, but also by the [entire] College of Fine Arts. So people in art, drama, music, architecture, and design might use a facility like this. It's going to cost a fair amount of money. So, rather than assigning it to any one particular department, you assign it to a college, lets say. I think that would be similar to Mary Ann's efforts in joining forces with other departments.

Q 8. Did the learning curve or time commitment seem too great to justify the shift?

- Education: training of faculty members

A. Not necessarily. I think the training of faculty members has been more of a difficult issue, as opposed to educating students. Students know that they need to know this software. But again, I think when you're dealing with faculty who are fixed in their ways, then it's a difficult thing. Talking to colleagues around the country, I think that this shift or transition is almost complete. Those belligerent ones, the very few that are remaining, will continue to be belligerent and will not use computers or teach with computers. But there has been I think, a very

successful transition, certainly by the young faculty members--and sort of the middle aged ones--and I'm in that group.

This is where my practice is important too. Because I practice as a designer, I use computers. What I'm learning in my practice, I bring to the class, what I learn in class, I bring to the practice. And to me, that's a very healthy kind of a relationship.

Did any of the other faculty members take any formal classes, or was it more informal exploration.

A. I think it's a combination. There's a lot of informal exploration going on. There's a lot of "hey, let me tell you about what I found" kind of thing. But actually, we have attempted formal workshops for us (the faculty). Chaz in the past, has conducted for instance, a three session workshop on PhotoShop, just so we you know. Frankly, I think that model is something that we could develop more of. For some reason it hasn't worked very well here. But certainly, that's the way professionals work. Somebody realizes, suddenly that there's a new version of PhotoShop, and I'm two versions back here. And I see that this place in town offers a two evening thing on the latest version of PhotoShop, I better sign up for it. That's the way most people work, you know. Or, you bring in a consultant, pay a whole lot of money, and he or she sits next to you and teaches you PhotoShop. I think that's a very interesting challenge, just how to integrate the teaching of software into a curriculum.

Q 9. What are the perceived benefits of the shift?

A. You are certainly keeping current. The students feel that they are that much more valuable as a designer, because not only are they good thinkers and problem solvers as designers, but they are also good constructors, because they are using pretty current technology. They know as we do that a lot of design is being done on the computer, certainly when you get to the production side of things. In some cases, [it's being used] in the exploratory phases. But, they can with pride say: "I'm familiar with this software", and they certainly make that evident on their resumes.

The perceived benefits of the shift also goes beyond just making the students proficient on the relevant pieces of software. I liken it to using sophisticated T-squares, triangles, and so on. What we've been doing within our own curriculum--and even within some of our own work or our own research--is to actually push the boundaries of what design is really about. I'm very much involved in interface design, human-computer interface design, and have been since I started work at the ITC some ten years ago.

Again, this is the IBM/Carnegie Mellon Group that put together this network on campus. I really believe that designers are more than just form givers. While we may be proficient on PhotoShop, Quark, or Illustrator, that's still at the skill or the craft level. I think we also need to teach our students to be proficient at several levels above that.

Earlier, you were asking if they were involved in some other research work such as software, interface development, or even hardware development. The answer is yes. That's really where designers will be making their mark

today, and in the future. That's part of the benefit also of having that technology around, and that is being able to push on the boundaries.

Q 10. What are the perceived negative results of the shift; short and long term?

A. Short term, I think we're in some ways still going through this novelty issue. You know, "isn't this a neat machine! Wow, look at this printout. It's great, I love it." And they're losing that objective eye. That's our job as educators for them not to lose that objective eye. There is something very seductive about a piece that emerges from a LaserWriter, or color printer. It looks finished. As opposed to a sketch, or a collage that is still in the development phase. There's something too finished about LaserWriter pieces that they put up, even when you're going to be critiquing it. I think that this is part of our challenge as educators. It's to have the students move beyond this novelty stage, and not be mesmerized by it.

In terms of long term negative results, I still see there is a lack of the human touch in the work. A lot of the work does look like it is computer-generated, or computer-mediated. I would like to see more of the human hand in the work. I think again that's our challenge, to enable students to see that LaserWriter output is simply another stage in the development, and that they can rip it up, collage with it, copy it, photograph it, and even mix media with it.

That's both short and long term. I think we will look back historically, maybe in another decade, and look at stuff that emerged in the 80's and the early nine-ties and say: "boy that was really computer stuff wasn't it." We'll probably roll our eyes.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A. Both for education and the educator, we have to be flexible and remain open. This is both us the educators and the students. Flexible because things will continue to change. There will be new platforms. There will be new software. There will be new kinds of issues.

For example, we did a project last semester, designing information on the internet. Well, talk about a graphic designer's nightmare. There's nothing fixed really about the internet. That is so counter to the way we tend to think of what we do. It's fixed. It is on paper. It will eventually be printed. There will be 5,000 [pieces printed]. And they will all look alike. Not so on the internet. It is a whole new way of thinking. So, we do have to be flexible.

I think we still have to emphasize exploration. This gets back to this novelty issue and "oooh this looks finished, because it's in set type, and it's great." I keep pushing my students to explore, keep exploring, keep exploring. In fact, that's one of the beauties of this technology. It allows you to explore a great deal. You can select this and say: "lets try this typeface, print it, this typeface, print it, this typeface, print it, and so on." You don't have to trace it anymore. It's much faster, but students tend not to explore very much.

Not all of them but generally, I just find this: "well, I've explored already on the screen." To some degree there is less broad exploration, there is more finessing on the computer: "do I want one point or a half point?" I'll say: "lets not talk about either one right now. Just do you even want a rule under

there," you see? When you work with a pencil and paper, or scissors and paper, I find that the exploration tends to be broader: "lets try this, lets try that, lets try you know, whatever?"

When you're on the computer, it's easy to make tiny, tiny changes that are difficult to do by hand. What happens is that it's easy to put blinders on and say: "lets look at this now, is it going to be this or this." They have not spent enough time back here saying, "do I even want something there. Maybe it should be over here." That's what I've observed.

Again, I'm making general statements, because there are some students who are just as broad in their exploration on the computer. But generally, I don't see the kind of breadth I use to see in students lets say, fifteen of twenty years ago in today's students. And I think a lot of it has to do with this tool (the computer).

I think we (educators) need to continue to highlight, and maybe emphasize even more, the appropriateness of the tool. When do you use the computer? When do you sketch by hand? When do you go to the Xerox? When do you take photographs, and go to the dark room to make some photographs, and so on?

Again, it's very important to keep up with the technology and the literature. It's easy just to keep up with the technology, "oh, they've got a new chip out," and so on. I find it's also important for us--both educators and students--to read about social commentary on what technology is doing to us as a culture, and what the ethical issues are of lifting an image from a book, manipulating it, and now saying: "this is my image", etc. I think that those are issues that we have to be discussing now.

The last point that I'd like to make both about the educator and education is that (and this is something that my colleagues and I keep reminding ourselves of): "we are there to teach design." That has not changed. I think typography is still typography, communication is still communication, and image is still image. Whether it's generated by this tool or that tool, you can still ask the questions is it communicating? What is it you want to achieve? Is it achieving that? That has not changed, and that to me is what's so gratifying about what we do.

Yes, you've got to keep current. You've got to keep up to speed with what's going on. But fundamentally, what we do as communicators, designers, and educators hasn't changed.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. Some of the principles certainly are the old standards: clarity, simplicity, appropriateness of form, and concern for your reader. In terms of processes, I think the design process has not changed fundamentally. There is a planning phase and a construction phase. I'm still doing pretty much what I did over the last fifteen to twenty years, in terms of planning, exploring, evaluating, and in terms of constructing those ideas. That comes from traditional communication design, graphic design. That certainly has been adapted, if you will, to fit within the needs or constraints of new media.

Q 13. How do you define the concept of interactivity?

A. We are interacting. In other words, I am giving, you are receiving and then giving back. You are giving, I am receiving and then giving back. It's interaction between two and potentially more entities, because one of these entities could be a computing device, and not a person. It is give and take.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. In a way, I think they affect each other. Within design education, I don't necessarily see anything radically new about what people are teaching. I think they are teaching them about clear thinking, simple and appropriate form, concern for your reader, issues of a personal voice, the voice of the designer entering into the piece of communication, etc. I think it has been an interesting debate. And I think that's where appropriateness comes in. I think understanding that there are now more and new ways of delivering information, and it is affecting how we teach.

For instance, just the notion of what hypertext linking is really about, hypertext, hypermedia, the notion of randomly accessing information, the notion of nonlinear presentation of information, and so on. I think that what's happening in technology and it is affecting what we're doing in education, and education is affecting what's happening technologically.

In a way, the new platforms are affording design education new questions to answer, now that you don't have this book that is this particular artifact. You still can read a book anyway you wish, unless it's a novel, then you would probably want to read it in a linear fashion. But now, to say that you can have this information available, because when you read this word, your mind jumped to this idea or that idea--and all you needed to do is to click on this, and it will bring you to that--suddenly, it just broadens the definition of delivering information. And I think that this is changing the way that we have to conceive of teaching.

I think you need that, absolutely. I think graphic designers know about and are about visual communication. Because software still has a visual component to it. It's going to be displayed or transmitted on some device that has a screen or monitor. Someone has to think about what happens when the information hits the screen in the very same way that we are concerned about what happens when information hits a page, wall, or sign.

We should be involved at the beginning of that process--not at the end, being called in to make things look good. I am a very, very firm believer and promoter of the notion that in fact, not just designers, but anybody whose going to play an important part in the development of that product--lets say software--has to be involved at the very beginning of it. You don't bring people in only when you think you need them.

Whoever is coordinating this effort, takes on the role of this individual who can answer all the questions that need to be answered. It's just impossible that all the questions can be fully considered, and answered by one person. Questions of cognition, need to answered by the appropriate party. Issues of visual

communication, verbal communication, cognitive processing of information, issues of coding, etc., need to be answered by the appropriate parties.

Get these people together at the beginning of the project, and define your goals, do the planning together. So when you all start doing the work, you will then be doing, you're all headed in the same direction.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. No, that goes back to what we were just talking about. I know there may be occasional geniuses out there. However, one person to control all aspects of a production is I think, self indulgence.

There's also the difference between producing an artistic work, a personal work or piece versus designing software that's going to be used by potentially thousands, if not millions of people in a particular area. Let me turn this around. Designing software for lab clinicians to use is a very different story from a video artist designing a piece that will be displayed at the next SIGGRAPH [conference]. I think we as graphic designers, we need to get involved in the former. There is so much need for us to be involved in developing software, organizing and shaping the media, and then transferring the media. In these arenas, we need to focus great deal.

I think there has been too much of a focus on entertainment, and self expression in terms of works of art, and not enough on designers solving

problems with other folks in the development of educational software. This software could support medical research, engineering, etc. I just think that there is important work to be done.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. This is very interesting. I think we still need people with domain expertise. But we also need individuals who have the ability to work with other people outside of their own expertise. Again, in the development of educational software, a group of people is needed with different backgrounds working together on this. So we need somebody who knows about early childhood development if it's software for that particular age group. This also holds true for the need for expertise in the areas of visual communication, CD ROM production, animation/motion, sound/music, and so on. That is critical here.

It's easy to say we need a jack of all trades versus someone who is an expert in a specific area. I think we still need experts. We also need people who can work well with other people. I think that is something that we've got to do more of in our programs, that is to afford students the chance to work in teams.

As a graphic designer, how much does one need to develop their general knowledge of these other multimedial disciplines? For example: programming.

A. I'll answer that this way. I'm Director of Graduate Studies, in the department. And we are growing two new grad programs which we started back in the fall (1994). One is in computer interface design. The people who are coming in have backgrounds in different disciplines such as graphic design, music, biology, computer science. Those with graphic design backgrounds, since they are under discussion, should be taking a basic programming course, because it is a language. Learn what that language is about, and some of the constraints in putting together a CD ROM. You at least have an understanding. My belief is that a graphic designer doesn't have to be a full fledged programmer, or a c++ programmer, but should know a little about programming.

Even in Director, you can do Lingo which is programming. You can do the SuperCard sequence which is programming. One should understand that this is a language, and it takes a logical mind. This general knowledge helps you to become a much more effective team player. So my students would take a course like that. They would also take a course in human factors. Issues of cognition, seeing, hearing, ergonomics, etc., may all impact the design of this particular software.

While students should have a working knowledge of many areas, having the appropriate expert on the team to address each domain is critical. This general knowledge of various areas gives the student a leg up. When this person starts talking about long and short term memory for instance, you'll at least be somewhat familiar and possess a general understanding of the concepts. There are a number of these subject areas that a graphic designer needs to be knowledgeable of for this same reason.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes, and I would say from early on. If you could do a freshman level project that puts them into teams, that's a start. This will help them to realize that the design activity is not this notion of the lonely designer hunched over their drafting board. The earlier they understand that designers function in different ways, the better. Designers function at a conference table, presenting ideas on a white board, at a computer by themselves, or with someone sitting next to them working together, and certainly on a team. I think collaborative work is critical. I think we need to give them the tools to learn about working effectively on a team.

The university three or four years ago, bought into Total Quality Management (TQM). One of my colleagues is a very good TQM trainer, and I have actually brought him into class to do some sessions with the students on interactive skills. This kind of thing can be done early on, especially with freshman. If you place a bunch of eighteen year olds in a room and say now work together, you've got ego problems, you've got language problems, you've got gender problems, etc. So teach them how to work together.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. We require a cognitive psychology course for undergraduates at the sophomore level, and for grad students as well. So learn something about it.

One of the things that we have consciously done is to use the buzz word or term user-centered design, or human-centered design. It is because whatever the artifact that you're designing, it is going to affect someone else's work, play, or life in some way. So you better know who you are designing for. Well, what does that mean: who you're designing for. How do you do user studies? How do you collect data? Do you go off and do ethnographic research, video taping, interviews? There are all these methods for collecting data, and formulating a user profile, and one has to be familiar with some of these.

How do you evaluate? What does user testing mean? This all ties into the teamwork, and a human-centered design approach. For too long and too often, graphic designers have designed for other designers. We have competitions that only we are privy to which are difficult for non-designers to grasp and understand. I think we need to turn around and look outward, and try to communicate to people out there the reasons we think this is a very good piece of design.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. I would say it could be any of those. A lot will depend upon a number of factors. One is that particular person, and the personality of that person. Some individuals are born leaders and they will emerge usually at an early meeting. It may also depend on how the team is formulated. Because there are times, especially within large companies, when you'll get a memo that says: "you're assigned to this project for the next six months, and your teammates will be this one, that one, and this one." You have no choice. You've got to work with these folks. Even when the team first meets, there may be a leader already assigned, or you might self-select a leader, that type of thing.

Certainly, what we try to promote is that our students become leaders, and that they have the potential to be leaders in their professions. That's why we do expose them to techniques for interactive skills. Public speaking courses are available, courses that will promote clean and concise writing, etc. I guess my answer would be a combination of those roles.

I think it's too easy for the old style designer to say: "you just tell me when you need me. I'll just sit here, you guys meet, and when you're ready for me to do some sketches, I'll do them for you." If you want to relegate yourself to that position, then fine. But that's not what we're promoting.

Q 20. As a design educator, what recommendations do you have for the practitioner on the use of newer media: its development, direction, application, etc. (educators)?

A. I would say to the educators, make sure you teach them about design. Make sure you teach them how to think. You teach them how to ask questions. You teach them how to make presentations. You teach them about good composition, and about good use of color, and so on. Yes, it would be great if they knew Quark, Illustrator, and PhotoShop, because that's what they're using in the office.

First and foremost, I want a good mind. There are too many programs in which the computers are almost ubiquitous. The focus is too much on the computer, and not enough on solid thinking.

[In terms of design practice] frankly, I see a lot of production. They are making things out there. They are doing what graphic designers have done all alone. They are just using the computer now instead of T-squares. I don't see real development going on. In defense of that statement, I could say that a studio in downtown Pittsburgh or Chicago is not necessarily the place for doing R&D.

In terms of using new media, I would look to the practitioner and the educator to find a forum where they could come together on a somewhat regular basis. Maybe this is sponsored by the local chapter of AIGA, to talk about new media in the practice, in education, in research, and so on.

A recommendation I would have for the practitioner is not to focus so much on it (technology). Three to five years ago when the Mac was on its ascendancy, I would have people calling and saying "I know your students are using computers, and we could really use a designer who knows PageMaker really well."

Even now it's like, "looking for a graphic designer who knows Illustrator, Quark Express," and so on. And I'm thinking is that really what's important to you-- that you basically need a pair of hands, right?

A computer operator?

A. Right. And I'm saying it's good to know how to work on the computer. But what you should be getting hired for is what's up here (the ability to think), and hopefully what's in here too (heart, human qualities). Not just that you can move a mouse, and you know what menu items to pull down.

That would be my recommendation to the practitioners. Don't be so focused on the technology. You're still problem solvers. You're still visual communicators. Hire students, or young designers for those skills primarily, and then these other (computer) skills.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. The technology is off and still driving the conception of projects. The marketing person is often still driving what goes and what doesn't. For example, Mosaic and Netscape are still pretty much hacker's tools. They were developed by computer scientists. They're wonderful tools, but they do not have the concern for good presentation of information in terms that we would be concerned with, such as typography, and so on.

I think that it is still the technology driving that. If you look at what's emerged commercially, the designer's response is "ooh, we can try it this way," versus designers going to Adobe, or to Macromedia with suggestions, comments, and/or complaints. For example, Director's very poor typographic capabilities. When are they going to wake up? We need good typography. Why do we have to go into Illustrator, then load type into Director.

When you look at software development back about ten years ago, then definitely technology was wholly driving software development. There is a shift however, that has been slowly occurring. In certain design companies, R&D efforts, and within software/hardware companies where it is now user needs that are driving the conception of these products, as opposed to a new technology in search of an audience.

The Newton is a good example of this. It was a technology that was there. Apple thought the technology was ripe enough to fashion a product around it. They said "it's a communication device, and it's this and that." It fulfills no real basic need that we have. Therefore, as a product, it hasn't succeeded. They did not clearly understand what need it was fulfilling. So yes, I think that it's technology itself that is driving what's happening in hardware and software.

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April 28, 1995

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. I was in graduate school. When I got to graduate school in 1986, they had just introduced the Macintosh to the graduate program. We were using the Mac Plus I believe. That was my first introduction. We used them sparingly my first year at graduate school, and more intensively my second year.

We actually barely used them my first year, now that I recall. We were using real (standard) typesetting machines.

So on the undergraduate level at Yale, you weren't using computers at all?

No, not at all. In 1991, they didn't have computers there.

What type of software were you using in grad school?

We were using version one of PageMaker, the beta version of Quark Express, version one of Illustrator. Freehand hadn't even come out yet, and MacPaint.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

A. In the class room environment most of the things that I deal with directly right now are Quark Express and Freehand. And to a smaller extent I deal with PhotoShop, but not primarily. Next year, I'm going to be teaching a class using Macromedia Director. So in terms of the classroom, that's what I use. My outside stuff, as well as using all those things, I also use a program called Soft Image which is on the SGI system, a high end computer animation package.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. Well, I'm not sure that I ever really recognized that they would be the standard tools of design, in the same way that I didn't necessarily recognize that Plaka was a standard tool of design. I mean, you just used it. And the computer was a different kind of Plaka. To some degree, I think it had to do with the time that I was introduced to it. It wasn't any different than learning any other new thing. As I say, when I got to grad school not only did I have to learn how to use the Mac, I was also learning how to use a letterpress machine. I was learning how to use a Compugraphic typesetting machine, and a Linotype machine. So, all these things were essentially strange technologies to me anyway, and it wasn't any more of a different tool than any of those other things. To some degree, I try to take that attitude to the classroom in terms of introducing it to my

students. That it's really not any more powerful, or more scary, or whatever, than any of the other tools that the kids are going to learn.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. The only critical issue that really slows down the transition is money. For example, you buy a ruling pen, or a Schaedler ruler. I mean, I still have my Schaedler ruler from when I was an undergraduate.

So do I.

A. Your fifteen dollar investment back then has lasted you fifteen years. But when you buy a piece of software, you got to buy the upgrade the next year. You buy a machine, and you want the next best machine a year later. It's impossible as an individual to keep up. You can do a little better as an individual to keep up because you can always pirate some software from somebody, but you can't pirate a new machine. You can't always get that. So you're always behind.

Institutionally, you can not do that sort of thing. Schools are always behind because kids go out and they work on Co-op [internships], and the firm they worked for has the next generation of software. Then they come back, and of course they've bought the software. They come back and they have "version 72" of some software, and the school only has "version 6", and they can't do the work they want to do. Money it seems for me, is the big problem. Everyone seems to adapt fairly well once they get it, if they have the right tools.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. Everybody always wants to do it. It's just a question of "do you have the cash?"

Q 6. Was the shift a natural one, or was it forced by competition? Please explain.

A. It was completely natural. As I said, in the environment of graduate school, it was just one of these other things we learned. In the end, it was just one of those things that didn't get thrown out. They threw out the Linotype machine. They threw out the Compugraphic machine. But, they didn't throw out the computer.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Education: economic affect on design department: funding & funding methods, etc.

A. I think that it does require--especially in the design program where essentially you're not making any money for the university--that you be creative and leverage whatever you are doing through areas. Otherwise, it's difficult to justify squeezing the money out of the administration. As I said, we're not research scientists. So we're not pulling in 10 "jillion" dollar grants. So in that sense, it has caused us to work in a more interdisciplinary fashion with other areas.

What other areas are you referring to?

A. Because of the structure of this college which encompasses design, art, architecture, and planning--though they are separate structures--the tendency is to work within frame work. There's a new program that's going to be developed at this point that may or may not involve other areas of the university. It's an **Electronic Media Design Program**. It's possible that this program will in its design, reach out to other areas like engineering, or computer science and in essence spread the costs. But that is still in the negotiating stage.

Q 8. Did the learning curve or time commitment seem too great to justify the shift?**- Education: training of faculty members**

A. The problem with the learning curve is that as far as students [are concerned], they are in the academic environment and are geared towards learning things. The learning curve is just another part of their experience in school. So it doesn't become any onerous thing that gets in the way of their education, provided the learning of technology is properly incorporated into their aesthetic education.

The problem for faculty however, is that there is to some degree a great rift between those who learned it in school, through grad school, and a relatively older generation who didn't. [Those who didn't] were completely schooled in traditional methods. In my experience, there are virtually no opportunities for faculty to get relief time for instance, to learn these new technologies. If one is engaged in a full time job teaching extensively, the learning curve for technology

is prohibitive. I think that it prevents many more people than necessary within the academic environment from engaging in an understanding of the tools. Because it's not completely necessary for us.

That ongoing technological base is not as necessary as it is say in the sciences where you really have to understand the next level of tools in order to do the next level of research. One can still rely on the traditional methods of design and be more than competent at what you do, and can still teach the important principles. Although there should be--to some degree of necessity--an integration of those technological tools in the classroom. And since you can get away with it, seemingly the tendency is for people to get away with it. That's because they just don't tend to support the kind of effort that it takes to learn these things outside of a student environment.

That's a good answer and I think an important one too, because I think a lot of faculty, especially tenured faculty, are feeling the pressure and holding their ground.

A. If I didn't already know, and feel comfortable with computer technology, learning the new programs that I have to learn would be a big problem. Because it takes time. And if I wasn't already comfortable, and didn't have a basic understanding of the computer, the programs, and how things work; it probably would be somewhat overwhelming, given the traditional or normal stuff that I already have to do.

Q 9. What are the perceived benefits of the shift?

A. I believe it's six of one and half a dozen of the other. Each individual tool influences the other. One tool isn't better than the other, it's just different. The stuff that you can do on the computer, physically would be very difficult to do, maybe even impossible to do using traditional methods. It doesn't mean that particular stuff is any better than working in traditional ways. So, I think that it's (computer technology) really great, but the hoopla about what it can do is in a sense, not completely justified.

I mean, I wouldn't throw away my computer to go back to Plaka. However, if they took away all the computers, and I had to go back to Plaka, it wouldn't make a difference to me.

I could agree with that, because there might still be some situations where you might still use Plaka.

A. Oh, I still do. For me sometimes it's faster.

Is the computer right for everything then?

A. No, I think the best place for the computer is to fix stuff. With traditional tools it's harder to get stuff straight. Using the t-square and the triangle for instance, is sort of tedious. The computer does stuff like that really, really well. That's the perfect place for it. I encourage my students to design it with scissors and tape first, then let the computer polish it up, spit it out, make the plates directly from the file, etc., because you don't need to deal with all that stuff.

But in terms of physically designing it, there's still nothing faster than cutting it out, or taking your finger and moving it to the right place.

Q 10. What are the perceived negative results of the shift; short and long term?

A. I think it exacerbates the tendency of the student to accept easy answers. I think the slickness with which things come out of the computer, makes it too easy for someone to think that they are done. There's a hesitancy to cut up what comes out of the computer and move it again, or a hesitancy to re-output both in terms of economics--it's another fifty cents, or whatever--and in terms of time.

There's an aspect where one focuses on one solution to quickly. You may get 57 variations for that one solution, but you haven't really explored all the possibilities. There almost aren't as many happy accidents using the computer, as there are using traditional methods. It's like sometimes when you spill that Plaka all over your things, it's perfect. It makes the perfect form.

When you have traditional methods, let's just say, photography, drawing and collage. If you're given a problem, you might actually think well, which one is appropriate? You might actually even explore those things. But, the computer sort of levels all those differences. [Students just tend to think]: "I'm just going to go to the library, find some stock (photos), and scan in the pictures." You don't even go out and make your own picture. You just go for stock. If you do resist, "oh, I can't draw very well, so I'm not going to draw," you'll resist using a sort of naive approach to drawing in your problem solving. Nobody seems to think about collage when he's sitting in front of the computer. Obviously, there is that PhotoShop stuff which is a different thing. I think that students very quickly can

conceptualize that sort of slick thing, and they go for that, rather than exploring the different possibilities of different media to combine image and text, or whatever else might be appropriate.

Q 11. What does this information portend (signify in advance) for education and the educator in the future? For instance, the Director course that you'll teach in the Fall may call for additional exploration on your part; something say that design educators fifteen years ago never had to consider exactly.

A. No, I've done a little with Director. But in a sense, I don't see it as any different. At every point, I have to rethink my courses. In my teaching career in general, I've taught typography and always to graphic designers at both the beginning and advanced levels.

Last year, I had to start teaching typography to fashion designers. In one sense, it's the same sort of thing, but in another, I have to sort of rethink what it was that I was going to do, so that they would actually get something out of it. I think I've actually been pretty good about not giving the same problem for "twenty years." Every couple of years, I rethink the problem that I'm giving students at various levels.

I don't really see going into the Director thing as anything different than anything else. For instance, I had to take a class so that I would be forced to sit down and learn it. That's the only way I will do something. But, I don't really see it as anything different than the continuing growth that you need to go through one way or another as an educator or a practitioner. That's on the one hand.

On the other hand, most people are resistant to doing things in a new way. So it's like this big hurdle, and you've got to learn new stuff. I would also say that there is some new stuff that I don't want to learn, or that I don't have a particular interest in learning. I think that one has to take a broadly focused view of what you're going to be doing. For instance, I'm not going to go out and learn Cad Cam. Because it has very little to do with what I do. There could be some interest there, but it really has nothing to do with what I'm teaching. I fairly well refuse to learn illustrator, or actually relearn it, because I know freehand. And as long as I can figure out a way not to learn Illustrator, I will. Because I have a program that's just as good, and somebody else is dealing with illustrator. So, if I don't have to do it, I'm not going to do it. However for instance, if they fired somebody, or my job depended on it then yes, I would do it.

I think you have to be aware of what the tools are in your particular area, and to be acquainted with some form of all of the related tools, so that you're ready to adapt. But I don't think that you necessarily have to know everything.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. Well to some degree, I am becoming one of those old guys who we use to talk about as being set in their ways. I totally do not believe that the problems are any different. I think that the problems might be more elaborate, and might require some more incisive thinking. But I don't really think that the problems are any different. It's still a question of communication.

From your traditional background then, what would transfer, what types of principles?

A. Everything. Nothing does not transfer. Now that's not to say that traditional print design is the same as multimedia design. One could certainly make the case that multimedia design or interactive design is deeper, and perhaps more useful.

But if we go back historically, when they first started printing books, they didn't have page numbers and they didn't have indexes. So if you read through the book, and if you ever needed to look at something again, it would be very difficult. You'd basically have to page through the whole book again.

Then, all of a sudden, someone invented indexes and page numbers, that made most of our knowledge base interactive. You could look in the index, then you could go to the place where the information was. Then when you finished with that chunk, you could go to the index, and find another chunk of information.

That's pretty much the model of the interactive CD ROM. You skip around.

There's a little index or menu, maybe in the front, and you skip around, and go wherever you want. The index model makes it more useful. You can get more stuff, you can get it faster, and you can make different connections. The interactive piece might be setup to lead the reader in the direction you want them to go, or setup to allow them to opt for the path of their choice.

The trend has always been towards a more interactive approach. Going back even further when information was on scrolls, you we're really in trouble if you had to look something up. I imagine you had to unroll the whole damn thing. Only later, were there books, and it was a little easier to leaf through them.

Though one of the problems presented itself if you were going to interact with a

book that was hand written by scribes. You'd get two copies of the same book done by two different scribes, and you knew that the information wasn't going to be the same. Then with printing processes, you printed copies of the book. Now all the information is the same, and you are pretty much guaranteed of that. So all of a sudden knowledge becomes this set thing in the world.

Now you have this problem of well, if knowledge is this set thing, I might want to look it up sometime. So you put page numbers in to make it easier. Then you say heck, I'm a really clever person; what I can do is make an index to reference all the things in it. So that when someone comes around after information, and they want to find out a specific piece of knowledge, then I can go to ten books, and I can look up John Locke, and see where he's mentioned and quote from these ten books. You know, you write the book, and you don't need an index, you know where everything is. That's a form of interactivity that somebody designed for users. But, you're putting that out there for people so that they can interact with the book in a useful way, and make connections.

Now, this sort of interactive CD stuff is that next generation things allowing you to pull from a particular piece what you need, and essentially leave the other stuff alone. For me, it's not a radical new idea or invention. It's a deepening of possibilities that have been inherent for hundreds and hundreds of years.

In terms of principles and processes that transfer, I would think composition, a certain visual aesthetic--that sort of beauty, harmony, and order that has to be achieved in the compositional aspect of things kind of transcends--and is applicable to everything.

On the other hand, there's this sort of functional, logical business that is merely a matter of asking the right questions, and being open to the responses at hand and new ways of thinking. So that when you design something, you're

willing to question it, rather than let it go. How are those two things resolved in a particular piece, so that the form of the thing is appropriate to the questions being asked, the material being presented? I really don't see that as being any different from the way that I approach traditional stuff.

Q 13. How do you define the concept of interactivity?

A. I would say that a piece is interactive which involves the user or viewer, and enables him or her to take part in the decision making process of how one finds one's way through the work.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. Well, I think we're pretty much sucked along by the economics of the world. People invent this stuff and it immediately gets used, because it's cool. A designer also decides that it's cool and becomes a master of that particular thing, then makes something that exploits the potential of that medium, rather than being sort of crappie and slick. Once that happens, everybody jumps on the bandwagon. Then the designer begins to be pulled along because people realize that there are things that are better and worse, and more sophisticated or less sophisticated. So, they actually need designers. More and more people, and organizations decide they actually want a designer to do this, not the promotions person, or heaven forbid, the secretary.

So you think the designer's contribution is the pushing of the technology, and that's his or her contribution to the development of the medium?

A. Yes.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. Depends on what you mean by control.

I suppose it's the idea of a designer sitting down, writing the program, shooting the video, handling the photography. He would be responsible for design and layout, the wayfinding or navigational system; he would control and manage the whole project. Of course, it suggests that technology is now to the point where that's possible. It is that a desirable thing versus having a team work on a piece?

A. If you manage it, that's different from doing it, in my thinking. If you manage it, you might be fluid in what you do. That you might do the film, or you might simply art direct the film that has to go into the piece. You might give the basic direction for the music. You may or may not key frame the animation, but others could fill in, etc.

That sort of management is not the same as actually "I'm going to do the film. I'm going to write the music. I'm going to write the program. I'm going to take all the photographs. I'm going to write the program, I'm going to do all the animation," etc.

Is that desirable to handle all those things using newer technologies?

A. Yes, I think it's desirable to do all those things, but I think it is impossible to actually do them in any one piece.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. I am firmly against designers having to be programers in the traditional sense. Understanding how software and computers work is absolutely necessary, because you have to fix the things. They break all the time. But, I don't think it's necessary at this point, for designers to actually build new, or raw programs. To some degree, using an authoring tool is programming. Yet, you're not necessarily writing the code to make everything work. In the future, I do think it will be possible for designers to more readily do that kind of thing, because of the way programming is becoming more modular, and more visually oriented. But right now, it's nutty.

In terms of developing expertise in a number of disciplines, I think it is an individual choice. Because I think some people are natural managers. In many ways, what happens here is not much different traditionally in what an art director has to do.

An art director has to manage maybe a designer, photographer, possibly if it's commercial stuff, film, or videographers, and maybe music.

Art directors manage that stuff. There are art directors who will not be designers, or film makers, or musicians. But they have the ability to orchestrate these things. They have the intuitive understanding of things, of what to pull together, and to begin to conceptualize--to have a vision about exactly what they need--who is needed in order to make the piece come together.

Other people are people who enjoy doing all those individual things, and will carve out those previously mentioned things that they understand how to do, and will do them. I think that the student needs to have the option of selecting them. I don't think you have to tell the somebody "well, you've got to learn all these things".

So you don't see it as a need?

A. The student needs to develop expertise unfortunately, in a relatively narrow area. Because I believe that by understanding a particular area well, that you then can apply, or transfer that understanding to other areas. I think that there is a danger of becoming a jack-of-all-trades and a master-of-none, just because it's possible.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. I think the design curriculum needs to be flexible enough for both. Because there are people who hate group projects, and there are some people who fly to them. I think that too much of either is not a good thing. I think you need to open up the options in every problem or situation, the possibility of either direction.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. No, I don't think it requires a new sensitivity. I think it requires the same sensitivity. I think there has always been crappie design that didn't pay attention to the audience. And there will always be crappie design that doesn't pay attention to the audience.

It's not a question of a new sensitivity, it's a question of sensitivity period. I think that if you have a sensitivity, regardless of whether or not you're making a poster, or an interactive multimedia piece, you will incorporate that sensitivity in terms of how the audience will interact and respond with that product, and to how you design it.

There are more things that you are going to have to think about. Designing a poster, you don't have to deal with issues of music or sound, and what it might imply or create. But if you create with sensitivity, you will think about things like that.

In some ways, I think the danger of all this technology, multimedia, blah, stuff is this idea that "oh, it's completely different than everything in the past, and we have to become completely new people in order to do this." I think that's crazy, and I think it is a mask for a lack of sensitivity about the basic issues of communication. The idea that we can leave this old stuff behind--never really having mastered it--and go on to this new stuff, because "I've got new sensitivity." Or, "I'm going to develop a new sensitivity." I'm skeptical about that.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. Yes.

All of the above?

A. Probably. I think to some degree, the designer has always been conductor/director. There's a major aspect of the production function that's no longer split. In the past, you had the designer, then you had the guy who did the paste-up who was the future designer. Now it's easier to incorporate the one into the whole. To some degree, if you are setting down at the computer, you may as well do and essentially, it is done. You serve the production function. Also there are

lots of people who are older and who still direct in the traditional way. That's by making sketches, handing it to someone, then they say: "do it on the computer." But, I think that with students coming up today, that will happen less and less. They're just going to do it on the computer. It's going to be just as easy.

Then, the designer has to extend his knowledge into production issues in the practical sense, printing issues, etc. But, I also think that although that's new, it's also old. Because back before World War II, that's what designer's were doing. Designers worked in print shops. They worked with printers, or they were printers. Or they printed their own work, and understood all the stuff. And so they always did everything. So I think we're coming back to a more traditional activity of the designer, as the conductor/director.

Q 20. As a design educator, what recommendations do you have for the practitioner on the use of newer media: its development, direction, application, etc. (educators)?

A. To the practitioner I would say, treat these young designers with respect. More than tell anything to the practitioner though, I would tell the student to beware of getting yourself into a situation where you are the "computer nerd." Don't stay any place where you're not designing, and you're not learning. You need to move and keep yourself growing. I would say, watch out for yourself. Because that's what a practitioner is doing. He hired the computer nerd. He knows what he needs to do, and he's got you [to do it]. I guess I wouldn't presume to tell a practitioner anything, because he has his own particular economic situation. His business is doing what his business is doing. And he should hire what he needs.

Perhaps it's a good thing, because there are students who come out of design school who aren't all that great of a designer, and never will be. Here [as a computer operator] they can find a place for themselves in a field that they want to be in. However, people can get stuck being the computer person now more than they could have become stuck in an entry level position as a paste-up person fifteen years ago. I think it's because older people don't want to deal with the computer, and what they are doing is a thing of designing and handing off. And I think as the non-savvy computer generation leaves, that schism between computer operator and graphic design practitioner is going to narrow--in the same way to some degree--as the schism between the designer and paste up person was relatively narrow.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. Money. It's the next best thing on the horizon. You have to try and stay ahead. Software developers are sitting around in their little rooms, coming up with pie in the sky stuff. They put it out there, and designers use it. If it's good, it's incorporated. If it's not, it's not incorporated. So, I think there's a certain synergy between designers, developers, and manufacturers.

But ultimately, everybody's trying to get a bigger pay check. I mean, that's a consumer society. I'm not saying that it's good or bad, but that's the catalyst to get people to do all this stuff. All this stuff is not beautiful, and people aren't just doing it to put more beautiful stuff out into the world.

Karen Woods Monzel**Design Educator****Assistant Professor of Graphic Design****School of Design, University of Cincinnati****April 28, 1995**

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. I worked very closely with another faculty member here. I began teaching what we call foundation studies which is an initial studio in a sequence that all our freshmen take. This other faculty member, Crystal Wood made me sit at her computer, gave me an introduction, and left me. This was with an old Mac Plus or something, and got me hooked on it. So I didn't have a good sense of what the heck I was going to do with it, but I got a Mac SE. The first thing I used it for was a master's thesis--word processing--that kind of stuff. And I gradually got into more graphic applications with it, SuperPaint, stuff like that. So at the same time then, it's been a process of going back and forth.

As I began to learn more about it in my own professional uses, I was asked to develop a course in computer graphics fundamentals for the School of Design. In doing that, I began to learn more about it which translated over into more and more applications to my professional work. Then it just kind of snow balled where I began to do more and more. I started out--I'm on my third machine now, a Mac Quadra. I'm to the point now where I have the Quadra, I have SyQuest drives, an optical drive (1.3 gig drive), two monitors, and two printers.

This is my equipment within my home office set up which I use professionally. Then, what I do with it enhances and translates over to what I do here (in the design department). It's a two-way street. It's one of those chicken and egg things where it's difficult to say which one came first. Each one has pushed the other. I would say probably what I'm doing here (at the university) has pushed me the most.

Initially, I developed a computer graphics fundamentals course which has grown into a course that's now required of all of the School of Design and School of Art students as freshmen. We have four schools in our college, and two of these schools have bought into this course. Through three sections of this course, we now teach about 70 students a quarter.

We developed a unique way of doing it because we don't have that many lab spaces. On one day, I do a lecture component which is two hours where all students can attend. I don't know if anyone's shown you our Dynacom Room. We have a room that's networked to the computer lab through this Dynacom system where we can access video, cable, slides, etc. So I use that room in order to teach on the computer via an overhead projector, and can access any of the networks that service the lab, bring up things. I teach in that. So we have a two hour lecture once a week, then we break out into three sections for labs. We reach a lot of students that way.

Following that, I was asked to teach an advanced 2-D imaging class which I then developed for the school, and now I'm doing an interactive multimedia design class. So it's kind of pushed me further, and further.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

A. In the classroom, I'm still using essentially Macintoshes, because of the things I teach which are the advanced imaging and the interactive [courses]. I use primarily: PhotoShop, Illustrator, Macromedia Director, and SoundEdit. Although students are allowed to use several things, that's primarily what I teach.

In terms of what I do professionally, I haven't gotten into doing too much with Director, but I may be doing more this summer (1995). Primarily, I use Illustrator, PhotoShop, and PageMaker.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. Basically, that's it. It's a matter of learning certain things, in terms of computer graphic design. Most of what I do is print communication professionally. Although I am starting to get into the Director stuff. But professionally, it's basically been print. Some issues were those of output, how to get the separations I wanted, how to get everything together in one form, and work directly with the printer on that, etc. That's pushed me to learn a lot. And in turn, I'm able to bring that back into the classroom, and deal with those issues in the 2-D imaging classes. Again, it's sort of a chicken and egg thing where one feeds on another.

Do you think that the courses you teach are more of a force in your learning the technology than say, what you encounter in practice?

A. It's both. It's in differing areas though. I can't say if one is necessarily more of a force than another. In certain areas my profession was the force. I have to understand those output issues, and the logistics of fonts and how the whole thing works so that you can actually come up with a finished product. I'm not pushed to do that in the classroom, but I carry it in now because I know it and can bring that to my students. Otherwise, I wouldn't be as pushed to do that because the students aren't actually doing those projects. In terms of multimedia, the classroom pushes me more right now. I'm not sure it will stay that way. So, it's both.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. Money and time. You know, time to learn the software, to understand all the implications, the technical concerns that go along with it. There's just so much to know. The fact that we've gotten moving in a number of different directions was it too. Equipment, follow though, keeping up with it all. It's tough. Those of us (in education) who have pursued it have done it in one or two ways, or both. Either your own money goes into it which is primarily what I have done. My own business then gives me the means to support that. Or grants, grant writing. But the university, in terms of our own teaching mission is not really supporting it. Nobody's buying us computers and software.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. I find “automation” a really strange term, in regards to what I do. Because I don’t use the computer just to automate processes of what I am doing. Specifically, in the multimedia or interactive area. You just don’t do it in any other way. It’s not a matter of automation, or automating a previously manual process. You can’t do interactive any other way but through the computer. It is the process. So automation to me, does not apply there.

In terms of the more traditional print design, it’s partly automation in being able to do it, but it also to me affects the design, it affects the entire process (in light of what you’d do manually. So I don’t see it as automation. But yes, the cost does slow things down some what.

Q 6. Was the shift a natural one, or was it forced by competition? Please explain.

A. Do you mean competition from the business side?

In a business sense, but also what other universities might be doing.

A. I’d say that’s a factor. For me it was that I had a lot of forces behind me pushing me to do it. So I wouldn’t say it was natural. I wouldn’t have just chosen to do it on my own. And a lot of designers are not choosing to do it because they don’t have those forces pushing them. Or perhaps they are a little more resistant to it. I don’t think it was that natural for most people. Because it’s a tough thing.

It changes your entire mind set. We're working with a whole new paradigm, and there is so much to learn and to deal with that I don't think it's just a natural occurrence.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Education: economic affect on design department: funding & funding methods, etc.

A. I don't know that I could give you any (innovative funding methods) at this point. We're looking at some things now because we're beginning to feel like we really can be more innovative. We've got to be. In a lot of ways up to this point, it's [been] out of our hands. We have a college lab. It's actually a university lab, it's not managed by the college (the College of Design, Architecture, Art and Planning). It's a university funded lab, but it functions primarily as a college lab meaning the four schools in this college all use it. The director of that computer center then begins to determine where resources are allocated, and who will get them. So we're in competition for those. We've been very lucky up to this point to get pretty good support from the director we had, and he has just left. So we're kind of unsure as to what's going to happen.

In our school, and I'm using that because we don't have departments. In our school which encompasses several programming areas, economics is an issue because we've had existing programs which are fashion, graphic, and industrial design. They are very concerned about what we're calling Electronic Media Design which will be a new program which will also require resources. So we're having to do a lot of looking at funding, creative funding. How should we

allocate these resources? The divvying up of various scarce resources. How do we begin to do that? So it does have a huge effect.

Q 8. Did the learning curve or time commitment seem too great to justify the shift?

- Education: training of faculty members

- Practice: training of staff members

A. For me personally, it has not been because I wanted to do it. Other faculty members have not. They view it as, they don't have time, they don't have the resources. It's a difficult issue. You're talking about training of faculty members. Nobody provides training for faculty members. The university does not provide that kind of support. Now they're starting to talk about it, and they are beginning to address that. I'll be teaching in what they are calling The Summer Institute for Instructional Technology, which has been set up to provide support for faculty who want to learn about technology and begin to use it. Now this is not in design, this is a university initiative.

But I would say we have a number of faculty members who basically have not sort of jumped on board. They have not really become active, and what I always hear from them is, "well, I just don't have the time, I don't have the money, I can't buy my own computer." That's something that I view as a matter of priorities. I made it my priority to learn it. I made it my priority to buy the stuff. Here, I guess it's an individual matter. In practice, I'm not in a design firm, I have my own business which is essentially free-lance, so I'm not training staff members.

Q 9. What are the perceived benefits of the shift?

A. To me there's a lot of intrinsic value in learning and growing, finding new things and growing, finding new things, exploring. I get a lot out of that. I also feel that I can, and hope that I will get a lot in terms of the position my efforts will put me in within this school (design)--being a leader in the use of computer technologies, understanding it, working with it, etc. I think it's also kept me more capable of being active in my free-lance practice. I feel like I have this opportunity to do the things that I want to do by doing them with computers.

Q 10. What are the perceived negative results of the shift; short and long term?

A. I guess I'd relate those negatives more toward the educational end of things than practice, because I don't really see negatives that much in practice. In terms of the educational end, I'd say the negatives are that we have a lot of divisiveness among our faculty regarding this issue. So I'm placed on one side of the fence, and the other faculty on the other. That has been a difficult issue for our faculty to deal with. One reason is that we made the determination that we would begin this new program. But a lot of (design) faculty still do not believe number one, that it should happen, and number two is the issue of, "how is it going to impact on me? We've already got scarce resources, we don't want this program taking over what we already have." The divisiveness has placed me on a particular side on that issue. So those to me are the negatives.

When did the first computer lab come into the college?

A. The college lab began six or seven years ago, around 1988 or 1989. It started as a very small lab. We actually had one huge computer, but never really knew how to use it. It has since then disappeared. Over the next several years, nothing much happened. About five years ago, we got a new Computer Graphics Center director who was able to make a lot of head way, and really got that lab set up as a state-of-the-art facility. That's where it is now.

The reason why I asked that question was to get a sense for how long you'd been facing faculty resistance to new technology.

A. I would say about six or seven years.

I would think there would be less resistance now.

A. No, no, no. Not at all.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A. In graphic design, I think technology is going to become primary, a primary focus. Dealing with multimedia and interactivity will become a primary focus. Now whether that happens in what's considered a traditional graphic design program, I don't know. I'm really talking about in our school where our graphic design program has been resistant to it. They view themselves as teaching

methodology, teaching theory; not teaching tools. My views of computers are very different from that. I don't view it as just a tool anymore. It goes beyond that when you're creating for interactivity. The tool becomes the process which also is the end. It's part of the creative act. In many cases it is the creative act. And that's where I see it going. I think there's going to be a broadening of the discipline. It's no longer so strictly focused merely on print media or signage, maybe exhibit design. It will deal more with virtual environments. I see it as expanding what traditional graphic design is, and blurring the boundaries. I have a lot of industrial (product) design students who are taking the class. There's a lot of 3-D that's going to come into this, in terms of environments, perhaps architecture. I don't see it as being a strict discipline as much as it used to be.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. That's really a lot of things. I mean there's always the basic understanding of aesthetics, color, and form that help us to communicate; understanding type and legibility issues, all these things that are inherent in print and signage communication. And a methodology of understanding how to approach a problem, determining what the problem is, what needs to be communicated, who the audience is, what their needs are, and an understanding of that whole process and methodology begin to carry over.

Q 13. How do you define the concept of interactivity?

A. To me basically, interactivity is allowing the user to respond and to take control. It's not linear. It's a very nonlinear approach to information.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. I guess I see a number of things happening, such as designers becoming more educated to what's involved in the programming aspect of things. They may have a lot of influence in how the software is created, and what it's capable of doing.

I think we'll be a little more sophisticated in our way of looking at interactive multimedia. Right now, I think a lot of the stuff is produced by people who are not well educated in communication concepts, and theory of learning, things like that, as well as graphic design. Some of them work fairly well in one area, and some work well in another.

I think getting it together is what needs to happen. I think what we're going to do in the Electronic Media Design program that we're developing is have the students understand all of those different aspects and implications of what interactive multimedia means. [We would also have students] understand the communication theory that is different in interactive settings, than from a one shot print piece, or even a book which is primarily linear. It's very different. There are a lot human factors involved. So there are a lot of areas to explore.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. I think it depends on the particular project, and the situation. I think it depends on the level of control. You can have an understanding of a number of different things that are going to be involved or designed in this area, but that doesn't necessarily mean that you have to do it all. An architect needs to have some understanding of structures and engineering, and mathematics, but that doesn't mean that the architect is going to actually develop the structural engineer's work. The architect will work with somebody else in order to bring his or her own insight to the whole project.

I think that's what needs to happen [in interactive design]. I don't necessarily need to know how to do sophisticated sound recording, but I need to know something about it, such as what needs to happen, and who to contact in order to get what I want to have. For example, I watched a show one night on the making of "Jurassic Park." The whole thing that came out of the documentary is that Spielberg of course, does not do everything. However, he knows what needs to be done, he knows how to get the people who can do it, and how to communicate with them about what he wants. So there is this interdisciplinary approach where these people come from all these different areas, and working together on one project to come up with the results that are needed. It requires an understanding of the entire process.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. There's a need to understand at a fairly complex level, what's going on in these other disciplines. And we would expect our students to do that.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes, you've spelled it out there. I think that's one of the implications. It all has to be there.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. The students need to understand cognitive issues. They need to understand something about learning theory. It's a different kind of human factors of how does a person respond to an interface design. It's going to be a huge issue, that will take a significant background in that kind of theory.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. Well, it all has to do with your definition of graphic designer. It's changing and I don't see graphic design as being what I'm talking about in terms of multimedia. I don't know if it will change and we will still call those people graphic designers or not. But I see a multimedia or interactive design which means somebody who might be in the position of the conductor/director, less probably in production.

You know, I do all my print design work, do all the production, and go to the printer. When I worked in a design firm, I worked on the concept and the design, met with the client, and had someone else to do the production. I think you may see the same things happening here. There are a lot of things that will determine what that role will be.

Q 20. As a design educator, what recommendations do you have for the practitioner on the use of newer media: its development, direction, application, etc. (educators)?

A. I guess I'd say the first thing is to get a good education that will allow you to understand the issues of communication, understanding the audience, research methods, etc. I think the practitioners are going to have to get a better education to understand these issues.

So you think that designers in current practice are going to have to be re-educated, or extend their professional development to these areas.

A. Yes, because I think most of them are jumping into the interactive thing, and really don't understand these issues.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. I couldn't say I honestly know. I would guess that to a great degree the consumers are. From what I see from one version of a software package to the next, they generally try to address the concerns that the practitioners (users) express in the things that they see. I don't think that they (developers and manufacturers) are solely determining what people want. That would be my best guess.

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Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. Technically, my initial introduction to computers goes back beyond this. Actually, when I was an undergrad, I lived with a bunch of electrical engineering students. So, computer technology was always the perennial topic of discussion with my roommates. But, in terms of creating graphic design, it was when I was at Pratt (Institute). At the time, the only graphic design on the computer class they offered was a class in the Computer Science Department in a course called Computer Graphics. It was a programming course for how to create images, pixel by pixel. It involved writing algorithms on a VAX minicomputer to draw just the simplest pictures and images. I mean, really rudimentary.

Frustrated with that, I found SVA (School of Visual Arts) had a lab/class using the Mac with PageMaker. So, I applied to the department to take a class there and get credit for it. And it was actually Isaac Kerlow who was teaching this class at the time. It must have been 1985 or '86. It was the first version of PageMaker, and looking back, the tools were very elementary. But it was just amazing what you could do with a laser writer, PageMaker, and Post Script fonts.

You could set type, you could layout type in columns. At the time, this was a revelation from a student's point of view, because of this technology to create that kind of typographic output. Traditionally, the only way you could do it was if you had access to a typesetting machine. So, it was pretty profound. I felt that I had an affinity for the technology and was really interested in it. At the same time, I was taking a corporate identity class. I started thinking that as the technology develops, certainly you would be able to create an identity manual, like the traditional standards manual. Now, you could consider if you wanted to create it interactively or not. You could provide a company a tool to create critical material with, but a control tool that was smart enough to understand what was in the system. And we are finally beginning to see some of that happen.

Q 2. Where are you now in terms of platforms and software as an educator (in the classroom/lab environment), or as a practitioner (in the workplace)?

A. As a practitioner in this office and the graphic design industry, the standard is the Macintosh. And basically the fastest Macintosh you can afford, you know. And Quark Express--there's a suite of programs. There's an imaging program and that's usually PhotoShop which deals with pixel based images. A post script illustration program like Illustrator or Freehand. In this office, we use Illustrator. And then, some form of page assembly [software] where you combine elements from all the different programs into a page layout or a document which is done using Quark Express.

So, do you think that Quark is more the standard now? You know, PageMaker use to be the tool of choice by most graphic designers.

It (PageMaker) was very early on the standard layout program. They were first. PageMaker is actually a little more intuitive, in terms of learning it the tools and the way the tools behave. Like somebody said, "mimic" that of traditional tools. But, I think what happened was that Quark Express very early on after it was introduced, developed tools for precise production. It was a much better production tool, than PageMaker at one point. And I think that's how it got into the design office, and into the type houses. And now it seems, that's where everybody goes. It's like once you start down a path, you don't want to have to learn a different software, unless what you're using is just terrible.

At school (PageMaker) it's gone. Pratt's done a pretty good job of upgrading there labs and everything. But, it's always been Macintosh. When I started teaching there, it was on Mac SEs, and it was just painful. They slowly upgraded different labs with II CIs and that whole Mac II series, and we had just [recently] opened a new graduate design Mac lab when they moved to the Punt building. They moved the department to the Punt building where they're now all using Power Macs.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. I was in Pratt and took this class on the Macintosh. I worked on the Mac whenever I could get access to one. I didn't have one at home. But, I would free-lance and help some people with the setup of systems, or work to debug their systems. And I would go to every seminar I could go to. The AIGA (American Institute of Graphic Design) was producing a lot of things. So there were two formal classes including the one SVA class which was an introductory class. These were the only courses that I've ever taken. Everything else was just hands on experience.

So it was more informal?

A. Very informal, absolutely. And I think for a lot of people that's the way it's been. It may be changing now that the curriculums have caught up, and there are classes. But I think by and large, the people who are really using the stuff today, just learned it by the seat of their pants.

When I started here [at Pentagram], the only Macs in this office were for the secretaries. They were all doing word processing. And I was working with Colin Forbes at the time. Colin had these diagrams that he was doing that were just endless. There were a lot of changes, and they were back and forth. It was just the perfect kind of thing to produce on a Mac.

I would go over at lunch, or whenever secretaries weren't using their Macs, and swipe time on their Macs to produce these charts. That was one of the first times that the partners here, and other designers here, began to see some of the benefits of using a computer to do graphic design and production.

And what year was that?

A. Lets see, I started here in '86 or '87. It was shortly after I started here. And from there, proposals were put forth for ways to buy it, a little Mac to do graphic design. So, we bought one just to see how it would work and hired a free-lancer who had good skills. And between he and I, we did one of the first projects which was an identity standards manual for Neiman Marcus. And from then on, I've had a Mac on my desk, and have been using it to do production everyday.

What program did you do these diagrams on?

A. It must have been an early version of Illustrator.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. I think one critical issue was just the realization of the benefit of it. Also, just getting the hang of it. It took a while to articulate what a computer could do. What the technology is, and how it enables you in an office environment. And also, finding people with the skills to produce it which is not so much of a problem now. Designers coming out of schools now are pretty competent users. So, it's was really building kind of an understanding among designers and partners on staff.

The only other thing is the cost of technology. Graphic design historically has been a pretty inexpensive business to run. Your biggest expense was your rent, and that's why so many graphic designers started out working at home.

It was really just your time and the rent as your biggest expense. Then, you took on people, but you could hire free-lancers when you were busy, and let them go when it's slow. You could be very flexible. Then all of a sudden with the onset of desktop computer technologies, There was this big capital expense where you had to layout a lot of money, relatively speaking.

Finally, over a period of time, you had to keep making it pay for itself. And designer's are still fighting that battle. So, the mentality is still there that: "God, you know. I got to buy another upgrade, or I still gotta . . . !" So, I think figuring out how to finance it is an issue? I think there were three things. One was an understanding and comprehension of the technology, two was personnel, or trained personnel, skilled personnel to run it. And three was just finding funds to keep pace.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

Yes. I think there's always the initial hurdle. At the time, the technology was just so new. It was kind of hard convincing somebody that they should spend six to ten thousand dollars on something that they really didn't quite understand, and hadn't yet experienced first hand.

Q 6. Was the shift a natural one, or was it forced by competition? Please explain.

A. I think it was more of a natural transition. I think once you realize what the technology can provide, you want it: that extra speed, that extra precision, or

that extra control. You know, I think the argument that the competition has it and you should have it, is a weak one. I think a lot of people felt pressured into looking into it because it was a buzz word, like multimedia is now. Everybody thinks: "well gee, every design firm in the world should be doing multimedia," and that's not necessarily true. Plus, if you have systems and processes in place that work for you, it's like any other change. It's tough to leave behind what you know and to try something new. And you're not going to give that up easily, or make that change simply because the competition is doing it.

Today, do you think that a design firm that operates with traditional methods and tools can be as productive, or as competitive as a computer-based firm?

A. No, I don't think so, not and produce the same quantity of work. In terms of production efficiencies, I don't think we're ever gonna realize that we produce design more efficiently now, because we use a different technology than we did ten years ago. What I hope that we produce is better results, because we're able, and we have more control over more aspects of the process. Plus, it enables you to produce more revisions, more refinements, and send them in on time. That's what it's about.

At Pentagram, the standard has always been the quality of your work. And that is the focus of everything we do. So, we're not a publisher in the position of producing a similar type of publication every month. We can recognize increased efficiency and savings as a part of more efficient production. Every piece we do is as new and different as the last one. So, I think that we will never realize the kind of big efficiencies, or costs savings from the technology. I

think what we'll see is that we're able to either maintain, or improve the quality of our work, based on what the technology allows us to do.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Practice: economic affect on the design firm: justification, cost effectiveness, productivity, increased or decreased profits, etc.

A. This speaks directly to decreased profits in one sense, you now also have this capital expense that you have to invest in, or you have to pay for. You either write the check or sign the lease, and the cash has to be there for that. Before, it wasn't always true. The way you do production, has also somewhat changed with the hiring and releasing of free-lancers as you need them for the production. You have to be more responsible in terms of your overall fiscal planning for the company. It also adds a level of management which was never there before. There never was a Manager of Technical Design Services before. That's required now just to maintain the technology, and to stay current. So, I think it proves cost effective. Otherwise, we wouldn't be doing it.

It certainly can be justified and cost effective, because it makes us more productive. You just have to be able to plan more and you have to pay for it. We are constantly battling with the big question of how do you pay for it? And do you increase your hourly rates to cover your additional overhead? Traditionally, designers worked at rates that incorporated the overhead, plus some profit. And now, we have this big capital expense. So, you increase the overhead, therefore you rates. If your rates are already high, they won't take that extra hit from the technology. You know, how do you charge back for it?

Might the technology also reduce the rates charged to the client, because of the time savings and increased efficiency?

A. No.

Do you think that it's eaten up by the maintenance cost and just the cost of technology itself?

A. Yes, like I said, I don't think we have recognized any dollar value efficiencies. We can still spend ten hours, or what ever it takes to design something. We spend that same amount of time. We just get to pack more into that amount of time.

Q 8. Did the learning curve or time commitment seem too great to justify the shift?

- Practice: training of staff members

A. It was tough, and it still is. I think training is kind of big, and the most neglected aspect of it. You will hear this from every group that uses technology to do anything. With technology, the cost of the hardware and software is one thing, but the cost of making people productive on it is another. I think that's one area where for the most part, graphic design studios depend on graphic design schools to provide that education. Beyond that, it's like everything else in this world, you learn it on-the-job. Most designers come in here with a basic proficiency. The designers, probably because their just coming out of school, don't understand the connection between what you're doing on the Mac,

and the final product whether it's print, multimedia, or whatever. They just haven't yet been in enough real world situations to experience all of the ramifications of what they've been doing on the Mac in school. I think you just learn that by the seat of your pants, on the job. The learning curve is still significant, but as a designer, you're just expected to figure it out, and go.

So, the learning curve and the time commitment, you didn't find were too great to justify the shift. But, you just kind of took it as it came, and got the training as you went.

A. Yes, personally I just figured it out as I went along, read a lot, and picked the brain of every free-lancer that we got that understood it. I think we did pay for a three-hour training session for illustrator or something, but that may be the only other formal training that I had. Today, I think most people have basic skills. It's just a matter of talking to people on staff, talking to printers, and service bureau people, etc., and you figure it out.

Q 9. What are the perceived benefits of the shift?

A. Like I said before, it's about control [of the project]. I know if it was really great. I remember standing with Colin working on another project. One of the earlier projects we did [on computer]. It was just a typographic piece, with only three colors. To be able to go in, see a page, break a line where you needed to break it to get the right rag, to get the right flow, then make it really workwell within the design. To have that level of control when you're designing a page was just great. And it still is.

Q 10. What are the perceived negative results of the shift; short and long term?

A. It's always this constant dilemma with, being enabled by technology. As you take on the benefits of the technology, the control allows more and more roles in the production process. You also suddenly take on more and more responsibility.

We kind of went too far at one point, because we suddenly could do typesetting in-house. We thought it was a great idea to put in an image setter and a developing unit so we could do typesetting here. However, we quickly realized that we didn't have any of the work flow processes set up to handle typesetting. We didn't have proofreaders on staff. We couldn't afford a midnight shift, or a midnight to eight am shift to stay and make copy corrections all night, the way typesetters do. As a result, I can remember just working here just incredible hours, and under a lot of pressure to produce the typesetting for an annual report in-house.

Did you eventually go back to an outside typesetter?

A. It's now more of an in-between process. For smaller jobs where it's manageable, we can handle the typesetting. Between us and the client, we can handle the proofreading. We'll do a job in-house, and have a service bureau output it. We don't want to deal with chemicals and maintaining an imagesetter, and the output quality, and all that. It's really a separate business. It's really a different business. So we'll hire out for those kinds of services. However, we might do all the mechanical work--the initial typesetting in-house--but not the final

production. For really intensive typesetting jobs like the annual reports, where the client will dump forty pages worth of corrections on you at 6:00 at night and say: "9:00 in the morning will be fine for these." That really is a different business. That's not design. It's not conceptual thinking. It's production.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A. I think what design educators need to concentrate on is providing students with basic computer skills, enough to be able to get hired. Traditionally in graphic design, jobs right out of school were production jobs. It use to be that if you did paste-up, you needed hand skills, and you needed to be able to ink things. That got you in the door. You needed conceptual skills to advance beyond that. You needed design skills to prove yourself and move up the latter. But to get your foot in the door, you needed production skills. I think that's still true.

But I think what design educators really need to pound into their students is that you still need thinking skills. The computer really is very seductive, because all of a sudden you can now--after ten minutes of training--produce a three column layout with crisp typography and neat columns. And the initial reaction of a lot of students is "that's great, it must be good, because it's perfect." But, in a lot of cases, it's not good because it's perfect. There was no thought behind it, and there was no understanding of it.

The challenge really is to continue to teach students to think about what they are doing. And think about the communication issues. Because hopefully, what we are [still] training students to be is visual communicators. So they need

to learn to be critical of what they're looking at, whether they are using the computer, the hands, or any other form of production tool.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. I'd say, a clarity of presentation of information. We can't forget this stuff is about communication. And what we need to do as designers is to facilitate communication, using visual processes. So, I think it's taking that sensibility whether we're designing a print piece or an interactive piece. Think of the message that is being presented. What is your client trying to say and what information is there? Organize the information so that the message gets presented and communicated properly. Then, design it in such a way that the reader or the viewer can experience it, and receive the intended outcome. It's all about thinking and communication.

Q 13. How do you define the concept of interactivity?

A. I think it is anything within a communication piece that requires a response from the viewer or reader. It requires a response to get the full communication of the piece, like a pop-up book where if you don't pull the tabs, it won't let you receive the intended result. If you don't interact with this thing as you're reading it, you don't get the full impact of the communication piece.

That's interesting because, I know when I was in design school, our teachers told us that we should try to get the audience to interact with the piece. So in a sense, we've been dealing with interactivity all along. It's just that, it's a different medium and output now. You gave the example of a pop-up book. The whole idea of engaging the audience, is not completely new to the graphic designer.

A. Interactivity does not mean pushing an on-screen button. We've dealt with interactivity for a long time. I mean, a book is interactive. A user flips through it and has to understand how to navigate through it. That's why we have page numbers and tables of contents. It has to be produced in a way that they can easily manipulate it and get throughout it. Many of those issues apply that were traditionally used in working with print communication, as well as electronic media production.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. We [graphic designers] are too passive currently. It's a chicken and the egg question. Development in the advancement of the technology is happening so fast. The design community and other users of technology, have a difficult time assimilating it and understanding all this existing media. [Once understood], something new comes along that you have to again figure out and move on.

I think designers and other creative people, when given a tool, will always find new ways of using it. Like Landor Associates, they really developed and refined the identity presentation process. One of the things they did to is bring the client into the conference room, and the walls would just be covered with sketches. I mean literally, a huge conference room with three walls, just floor to ceiling with sketches of ideas. Then, they'd walk a client through, and talk to them about the development. Then essentially say "we did all this work, and this is what we ended up with."

Clement Mok's presentation of the development of a logo using a HyperCard stack is a technological twist on this idea using new technology. So, I think creative people will always find new uses and applications for whatever technology they use. Once they have time to assimilate and really understand it. Then they can start pushing the envelope.

In terms of contributing to the development of interactive multimedia, I think there is a really slow cycle for that. It's not quite closed. I think what's missing is designers taking an active part. The software developers are finally hiring designers now to deal with interface issues and communications issues within the software. I can only hope and expect that they will hold focus groups and user feedback approaches to develop the applications of products, and the products themselves in different areas.

I think at a more direct impact on the technology by the graphic designer is what's needed. Visual communicators need to be more adamant about the technology, provide feedback, and demanding certain things from the technology that they are using.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. This gets back to what I was talking about before. Just because you can do it, doesn't mean you should do it. Multimedia involves so many different kinds of components: video, sound, animation, screen design, illustration, programming, etc. Yes, it's possible for one person sitting at a Mac, with a high video camera, recorders, and other components to produce a multimedia piece. Number one, in man hours it's not very practical, because it would take you much longer to do what a team could do in a shorter period of time.

I think you really need to be more conscious about letting people who are skilled in different disciplines contribute in a team effort. But again, that's what graphic designers have always done. Graphic Designers have always worked with typographers, printers, illustrators and photographers. It's always been a collaborative effort. It's just been confused because all that production can come together in one place. But, the handling of all aspects by one person is impractical, and from a quality and conceptual point of view, it's better to maintain a team approach.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. It's funny, it's like a designer using a Mac. If you have an assistant who is an incredible Mac whiz, and you're an art director who has an incredible sense of design, you can just art direct that assistant to do the production on the production tool. You conceptualize and make aesthetic, and design, and communication decisions, off-line. However, you may not really realize the full potential of the technology if you don't understand something about how it works. So, I think a basic understanding of different disciplines is helpful. It would be helpful to understand some basic principles of video or motion picture imagery and production. The same for sound and animation. This is simply so you to better direct or work with the people who are producing it. It also enables you incorporate the nature of those different mediums into the piece you're producing. You would have to have at least a basic understanding to be able to incorporate it appropriately, or use it to its fullest.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes and no, I think it would be great if they could emphasize that. I'm just not sure how to facilitate it so you could. If you could produce collaborative projects between students studying video, sound, traditional broadcast type media, and

design, and throw them together in a room, that would be great. It's sort of hard to facilitate in a [design] school environment, but I'm sure it could be done. Beyond that, I think what educators can do with students is just make it really clear that when developing this interactive piece, it's OK to pick out video clips from places. It's like when you were studying traditional print, it's OK to use an illustrator, you wouldn't have to shoot it all yourself, or illustrate it all yourself. The challenge as a designer is to make the correct selections, the correct choices. Like choosing a typeface, you've got thousands to choose from, yet you don't have to design the typeface. You just have to choose the right one, and use it appropriately.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. I think so. I think you have to understand a little bit more about ergonomics and the demographic profile of the audience that you're trying to address. So yes, I would say so.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. I think it depends on who initiates the process and who's controlling the project. I think designers can contribute throughout the whole range of creation that multimedia needs, from conceptualizing it to directing the development, or

hiring other team members to produce other components. I also think that designers can be brought in by somebody else who is developing the project. Ideally, they are brought in at the early stages and not at the end. I think that one of the problems of people hiring designers to do multimedia or interactive projects, or even software development, is that they are often brought in at the end to make things look pretty. They're seen as decorators or illustrators, you know: "here is what we have done--make it look nice."

There may be some fundamental structural problems from the communication point of view, or other problems that a designer could have corrected, had they been brought in earlier. Things that making it pretty won't fix--wayfinding and navigating through interactive spaces, etc.--really, when you have 600 megabytes of media on a CD ROM, that's a lot of stuff to navigate through. Without the proper signage direction, or wayfinding--some kind of navigational system that is clear and understandable--the user's experience and ability to access the information can be inhibited. It is absolutely issues such as these, and others to which designers can contribute from the project's inception. So, I think that designers can contribute as part of the team, and may or may not act as the overall director of the team.

Q 20. As a design practitioner, what recommendations do you have for design educators, and the design education process with respect to emerging technologies: availability in the classroom/lab, teaching strategy, etc. (practitioners).

A. The core of what design educators need to include or incorporate is a basic introduction to sound and motion in their curriculums. Those are the big compo-

nents that are missing from many traditional core graphic design curricula. This is some of what the designer has to deal with today in terms multimedia projects. We're great at figuring out exactly where a letter form or image should go on a page, but we know it's going to stay there. It's a fundamentally different experience for the user for that image or that typeface to move around and interact with sound, and other visual objects. I think that including a basic understanding of motion and sound is essential in addition to gaining exposure to other multimedia-related disciplines, such as video, and programming.

They should have a concept of what it takes to actually make something happen. It's getting a lot easier. Programs have really improved, and scripting is not nearly as difficult as it once was. But I think if they're creating a multimedia piece, and they know what they want to happen when a user clicks on a button, then they need to have at least enough of a vocabulary to discuss it with a programmer, in the same way they would with an illustrator or a photographer.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. I think a lot of the technology is driven by feature wars with respect to the hardware and software companies. What we are currently seeing in a lot of areas is the refinement of technology that's been around now for seven or eight years. The core programs that we use for production, everything from Quark, to Director, have been used for years now. Their development primarily has been a matter of adding new features, and just refining those basic programs. I think the software companies do that because they want to add more features than their

competitors. This allows them to issue a new update which they can charge everybody for, and make them one up on their competitor. Then, it (the new release) requires more disk space and a faster processor, because it has all these features. Therefore, you buy new hardware, and it's just this cycle that never ends. Users benefit from all these features. For the most part though, faster processors, etc. It's really great to have all that at you finger tips. I think what has been driving the technology is hardware and software companies or industries.

I think it's going to take more of a dialogue, more of an understanding on both the developers part, and the consumers part. Hopefully, we will begin to see that, because software is beginning to max out in terms of feature sets.

Microsoft Word is a most recent example. Microsoft loaded so many bells and whistles in Word with the latest major release, that a lot of consumers just didn't buy it. It just took up too much space on the drive, and was too slow to open, and had too much stuff that I will never use. So they just put it off.

I hope that this will send a wake up call to the companies developing technology, that they really need to listen to the consumer, and have more of a dialogue about what they need exactly. We're going to see with these coming changes, the hardware companies respond. For example, Apple is incorporating into its operating system--within the next three years--some fundamental changes in the way software and hardware interact. Consumers may have a lot more control over the features they purchase, or are included in software, in the next few years. I think that will be a fundamental shift. Instead of buying some program with a thousand features when you only need ten, you will only buy those ten. It's going to be a really interesting development.

It would be similar to the way Illustrator, photoshop, and Quark to some extent, all provide a base level of functionality, a basic feature set. They can do a lot more, if someone uses the added feature. What they have done is that they have provided developers a way to add features through plug-ins. So as a user, if I need a particular plug-in for PhotoShop, I'll go buy that one plug-in. There are thousands of plug-ins out there, but I don't need all those other features. I just need the function of that one particular plug-in.

We're going to see this trend more and more in software development. That may just provide a way--just by the fact that they tried--for consumers to have a lot more say in what happens.

Paula Scher

Design Practitioner

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April 17, 1995

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. It was all around me. I was working and the computer was becoming more and more valuable as a tool. Initially, it wasn't viable because it was too complicated, but the software got better.

Q 2. Where are you now in terms of platforms and software as an educator (in the classroom/lab environment), or as a practitioner (in the workplace)?

A. Right now I don't touch them, my team does. We have someone on staff who upgrades the equipment on a regular bases. The equipment's gotten a lot faster, much better. The software can do many more things than it couldn't do before. And so we're doing everything on the screen. But, I don't have very much technical knowledge.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. I hired someone else to do it.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. No, I don't see any difference. I mean, one tool is an X-acto knife, one is a computer, the thinking is the same. I mean, I don't think it's that interesting. I'm not a "tech" person. I think technology is a--you want to know my opinion about the technological age--I think we're being over sold; over charged; and there's an over emphasis on it. When in fact it doesn't change society as much as something like say, no refrigeration versus refrigeration. If you want to make a comparison of societal changes, that's number one. Number two, I suspect that the younger generation uses the technology as a mask, to hide the fact that they are political reactionaries.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. Of course. You did what you could afford [to do].

Q 6. Was the shift a natural one, or was it forced by competition?

Please explain.

A. It was more natural.

Q. So, you didn't feel any kind of pressure from outside?

A. Well, it became inevitable that I was going to have to work on it. But, I didn't feel that a gun was put to my head, no. I did it as it became practical to do it, that's all.

Q 7. How has the technology affected you as a designer (practitioner) economically? (In Practice: economic affect on the design firm: justification, cost effectiveness, productivity, increased or decreased profits, etc.)

A. It's reduced the amount of jobs for young designers.

That's interesting. Do you want to expound on that?

A. Yes, [an example is] the time it would take me to do the New York Times. If I designed the New York Times Magazine which I did last year (1994). If I did that in 1985, it would take me seven people and two months. It took me one person in one month with the computer (1994). That means that the other six people don't work.

OK.

Q 8. Did the learning curve or time commitment seem too great to justify the shift? (Practice: training of staff members).

A. No, I don't touch it. My team does. We have training here. We have a guy who runs the computer part of the operation. You know it's a big organization. We hire people to keep us updated on that stuff.

Q 9. What are the perceived benefits of the shift?

A. It speeded up time. You could do things quicker.

Q 10. What are the perceived negative results of the shift; short and long term?

A. It's not as tactile. You don't touch as much stuff with your hands. I like to make things with my hands, everything's inside of the computer. I personally don't find it a very seductive medium.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A. Well, I think it doesn't signify anything. Most students are going to learn how to operate the computer, their whole life time. The most important thing to do is to learn how to design. The fact of the matter is that sitting at the computer making designs is going to be a very low level occupation. If you can't think,

plan, and strategize--if you can't conceptualize--you'll just be a low level operator. So, it really doesn't signify anything. You'll learn it automatically. It's not interesting.

Q 12. How do you define the concept of interactivity?

A. Interactivity is when you push a button. Actually a book is interactive, you turn the pages. It's a "horse shit" word.

Q 13. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. Well, it's really the same as designing a book. You have to figure out how someone is going to respond, sequencing, pacing, and timing. It's not all that. I've designed for CD ROM. It's a matter of how to get the user to know when he has an option to make choices. It's not much more difficult than book design, it just has more choices.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?).

A. Like any other form there are going to be people who are interested in developing interactive media for specific reasons. Exhibit designers probably incorporate that as part of the service they offer when they are designing exhibits. Various corporate communication companies will offer it as a part of their service of annual report design, and somehow make it interactive. It's not that unusual. It's like learning how to design for film or doing television commercials. We were doing that before interactive media, it's really the same kind of thinking.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. Sure.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. It's all the same thing. If you can think, you can do it. I can design a book jacket, and I can design a TV commercial. I can probably make a movie. Because I know how to think. If you don't know how to think, you can't do anything. If you know how to think, you can do everything. If you know how to think, if you know how to sequence, if you know how to put imagery together in such a way that it can entertain, amuse, or inform somebody, it works. If you don't, it can't. It doesn't have anything to do with technology, it has to do with the brain.

Q. Should the designer pursue expertise in all these disciplines or just have a general working knowledge...?

A. The designer should know how to design.

OK.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. There are two things you need to get out of school. You have to learn the rudiments of how to operate the specific media. But, you can learn most of that

on the job anyway. The most important thing you need to learn in school is how to think. And the other stuff will take care of itself. You can do anything you want if you can think. If you can't think, you can't do anything. It doesn't matter how much you know about the equipment. It's very simple.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. No, It's the same as print or TV. One must have a basic understanding of one's audience in order to communicate effectively. Period.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. Hopefully, director.

Q 20. As a design practitioner, what recommendations do you have for design educators, and the design education process with respect to emerging technologies: availability in the classroom/lab, teaching strategy, etc. (practitioners).

A. Forget about the technology, and teach them (visual design students) how to think. Teach them how to reason. Teach them how draw conclusions. Teach them how to make analogies. Teach them to be visually literate.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/ artists, and other users), perhaps both? Please select and explain.

A. The hardware and software developers and manufacturers. I think we are being bamboozled, frankly. Not that I don't work on it or use it. I just think that there is too much attention payed to it. Read a book, you know?

Aaron Marcus

Practitioner

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April 20, 1995

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment, [at home, in a class/lab environment, in the workplace, etc.]).

A. I Have been working with computers for more than 25 years. When I started, I could work only with mainframes. From 1967 to 1982, I had always been dependent on the resources of R&D centers, even after I started my own computer-based design firm. With a research contract from ARPA, the Defense Department's Advanced Research Projects Agency, I was fortunate to have early access to high performance computer equipment, and to perfect ideas and approaches that most graphic designers would not encounter until five to ten years later. Then, with the introduction of the Macintosh in 1984, I could finally absorb advanced technology into my firm, which was completely Mac-based by 1 January 1985. When I bought eight Macs in 1984, I remember thinking that my firm might be contributing a significant amount to Apple's world sales of Macintoshes that first year!

Keep in mind that when I started my business, I was using an Atari 600 to do everything. It was a game machine that had a basic word processor and

graphics-editing tool. That one piece of equipment was all we used for most of our business. The other piece of equipment was a high-performance Perq workstation, which we obtained through our ARPA research project. This machine and its advanced Intran bit-mapped graphics-editing software, was not the kind of equipment to which most designers would then have had access. From the very first day we opened for business in 1982, we were designing a graphical user interface for Intran Software (now a Xerox product). This particular product came out about one month before the Apple Lisa, and a year or so before the Macintosh.

Q. You say that you started the firm in 1982. Before that, while you were in school, did you get any exposure to computer technology as it relates to graphic design, or was it only after you left the formal educational environment?

A. When I was an undergraduate, I studied physics, but I never studied computer programming. I learned how to program computers only after I started studying graphic design in graduate school in 1965. This was at the Yale University School of Art and Architecture. I used facilities at the Yale computer center to learn FORTRAN, and started to do graphical programming in 1966. In 1967, I was able to get a summer research internship at AT&T Bell Labs in Murry Hill, New Jersey. At this time, I did not know that Bell Labs was the premiere research laboratory in the world. I was able to start immediately with state-of-the-art computer graphics display equipment.

Q 2. Where are you now in terms of platforms and software as an educator (in the classroom/lab environment), or as a practitioner (in the workplace)?

A. In our office over the years, we have had a variety of Hewlett-Packard, Sun SPARC stations, and other UNIX equipment. Although we have been a Macintosh office, since 1985, we have gradually acquired IBM PC equipment; first 286, then 386 and 486, and now Pentium machines. Among our Macintosh equipment, we have a Quadra 800, six Quadra 650s, several Mac IIs, and two PowerBooks. I use a PowerBook 540C daily for doing demos, word processing, e-mail, and reviewing staff designs, illustrations, etc.

In terms of software, our design tools are primarily Macromedia Director, AuthorWare Professional, Adobe PhotoShop, Adobe Illustrator, and Aldus Persuasion. Those account for a good part of the cross-platform work that we do. We also use Microsoft Word for document preparation, and maintain four on-line services accounts, and one Internet e-mail account. Additionally, we maintain a home page on World-Wide Web at "amanda@dnai.com".

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step in your investigation and exploration of these tools for your own work (as an educator or as a practitioner)?

A. We recognized from the very beginning in 1982-83 that this technology would be the basis for our design firm. We were one of the first, perhaps the very first independent graphic design firm to be using this kind of technology. We immedi-

ately started preparing documents with word processing software; and electronic design files with graphics-editing software. In terms of investigating these tools, we have always actively canvassed the literature, been in touch with R&D development groups, and presented at five to ten conferences per year. Therefore, we were always aware of what technology was being developed, and could readily take advantage of it.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. In 1985, the unavailability of sophisticated, low-cost graphics editing software slowed us down, for a while. We needed more and more memory. We needed ways to store and transmit large files.

But, we did considerable sketching with pencil and paper of course, and still do. I would say our transition from traditional to computer-based graphic design methods and tools took place from 1982 to 1988. We still have some Letraset, drawing boards, and ink pens in our work area, but they hardly ever get used. For the most part, we are predominantly computer-based in our activities.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please Explain.

A. Certainly, in the first decade of widespread computer graphics between 1980 and 1990. Initially, the cost of hardware and software was tremendous. When we started our firm in 1982-83, we were using a state-of-the-art laser printer workstation, and graphics-editing software. The laser printer cost \$25,000.00,

and the workstation and software cost about \$75,000.00. That's about \$100,000.00 in 1983 for one workstation, software, and a laser printer. By 1993, the cost of comparable equipment was at most \$10,000.00! Now the cost is much more bearable for most people starting up to do professional work.

We still are cautious about some hardware and software expenditures; for example: in computer-based training some programs such as AuthorWare Professional are still expensive. You're talking about a \$10,000.00 investment, in order to start doing computer-based training. AuthorWare Professional software is still expensive. You're talking about a five thousand to ten thousand dollar investment to start doing computer-based training. Incremental costs in the ten to twenty thousand dollar range are certainly ones that require careful business planning, and market analysis.

Q 6. Was the shift to a natural one, or was it forced by competition?

Please explain.

A. When we started, we had almost no competition. There are now many more people, fifteen years later who claim to do what we do. Naturally, we must keep up with the latest hardware and software, because our competitors are going to be keeping up as well. You would have to make the shift to be able to provide clients with electronic files; and to be able to design for current media such as interactive kiosk design, World-Wide Web, home page design, user interface design, icon design, interactive television, icon design, and document design for electronic publishing. All of these distribution and delivery systems require that one be experienced with specific software and hardware. We find it increasingly necessary to know an abundance of technical and business details about our

client's environment. What I am implying is that the ability to do this work is a force itself; to make the shift and to keep up with the latest technology, separates us from competing with other firms.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Practice: economic affect on the design firm: justification, cost effectiveness, productivity, increased or decreased profits, etc.

A. Well, the technology has affected us dramatically. To keep up with the latest technology for a variety of platforms tests us more and more. One must have system or technical administrators; someone skilled in the software applications. All of the staff must maintain and improve their skills with new technologies. There are dramatic economic impacts: the cost of labor, their training; equipment and its maintenance, all increase. So, the cost of operation keeps going up. Additionally, in the eyes of the client; there are more and more competitors supplying equivalent skill. So, one must be very sensitive to rates charged for services. In our practice, we find our rates are quite competitive, and they seem to have stabilized for hiring a contractor to get certain kinds of work done.

The distinctive value we can provide is in the areas of business skill, professional experience, and the quality of the work that we do. Fortunately, our clients recognize this difference, seek us out, and select us because of the reputation we have built over the past decade and a half.

Q 8. Did the learning curve or time commitment initially seem too great to justify the shift? - Practice: training of staff members

A. Again, this major shift took place back in the early to mid-80s. We now face newer versions of the same challenge, e.g. the learning curve and time commitment to learn newer technologies such as HTML, Lingo, AuthorWare, or Visual Basic programming. In general, I believe that development of experience in staff members is usually worth the cost, so that we are better able to compete more effectively, and help our clients. Time for learning is also natural, because our staff members are curious and eager increase their skills. We always have to account for some learning time to gain some new staff skills for a new job.

On the other hand, we are contracting out for special skills. This is because we realize that our main staff can not possibly be an expert in PhotoShop, Lingo programming, Director, Microsoft Word, and every other program that we may potentially require. So, we hire people with specialty skills who are managed by our core team staff.

Q 9. What are the perceived benefits of the shift?

A. Some benefits of the shift are that one is now able to edit material, continually reuse and adapt previous materials to new projects more easily, and do things that couldn't be done with traditional design methods. For example: we use sound in some of our designs which would not have been done with print-oriented, paper-based materials, because they don't make noise or music. Also, there are new design opportunities with newer digital media that were not available before.

Q 10. What are the perceived negative results of the shift, short and long-term?

A. Certainly, one gets into a rat race of continually having to keep up with constantly changing technology. At times it is exhausting. We have a huge amount of information flowing into our firm for our projects, the tools that we use, and the industry environments that support these tools. It is really tough to keep up. We have had to force ourselves to be very organized about how we take in information, process it within our firm, and report results to ourselves and our clients. Otherwise, we would drown in all of the documents and data flowing in.

Another challenge is that we work with more people from different disciplines with various kinds of skills. I don't know if that is negative, but it certainly is a challenge.

Another aspect is that many of today's tools are, and certainly in the early stages were crude. Developers are not sensitive to sophisticated nuances of quality communication and design. So, one of the things that we have had to deal with on the cutting edge has been poor tools. We encounter companies and people who did not know much about typography, but invented typographic editing tools; and people who did not know much about color, yet created color manipulation tools. We often must deal with extremely complicated tools, sometimes created by programmers who don't have enough experience with the principles and techniques of quality visual communication. This situation is another negative result of the shift.

11. What does this information portend (signify in advance) for education and the educator in the future?

A. Although I'm the head of a design and consulting firm, and am no longer a full-time university professor, I still am involved with education. I give tutorials all over the country and abroad; helping product developers improve their skills to achieve effective visual communication skills with computer-based media. Instead of graphic design students, I talk to business people who are using authoring tools to develop new products and services.

Regarding the graphic designers' education, we see many young designers who come out of schools knowing how to operate the commands of PhotoShop or Illustrator, but know little or nothing about the history of graphic design/visual communication, theories of good practice in typography and color, and other classic components of which I learned 30 years ago in my graphic design education. I lament the absence of this base of knowledge. In many schools, there seems to be too much emphasis on how to turn on the tools, instead of how to analyze design issues, and the design process. I'm not referring to experience with sound, or interactive design, but with basic knowledge about typography, color, and grids. This lack of training causes a problem for us, because our work is information-oriented design for large, complex systems, so we need emerging professionals who are able to handle this complexity. We find people who can knock out a couple of icons quickly, but have insufficient experience in how to design a systematic set of icons. They don't understand the dimensions of the problem that is the lexical, syntactic, semantic, and pragmatic aspects of designing a set of signs that must communicate well, be appropriate for the technology, and be consistent.

Some schools seem to focus on teaching students how to be competent with the basic tools, and forget to teach the core subject matter.

Q 12. How do you define the concept of interactivity?

A. I guess I would define interactivity as the set of actions by which people can affect displays with tools to express human desires or intentions. Keep in mind that even books are interactive display environments; they just have a very limited set of interaction techniques. The kinds of interactive displays and tools that we have now are much more complex; much like the complexity of an urban experience of moving around, touching, twiddling, pushing, etc.

In the past, graphic design education did not provide much experience with interactivity. I was fortunate as a graduate student to work under Robert Venturi and Denise Scott Brown on the redesign of signage for the Herald Square Subway station in New York City. The station was a dynamic interactive reading environment; a kind of three-dimensional book. It was like designing a virtual reality environment; or a typical user interface application today.

We find that a lot of designers do not have sufficient background in thinking about systematic aspects of interactivity. For example, we have worked with illustrators who have never done multimedia, or user-interface projects. They are unfamiliar with the concept that a picture should have several states, or that it should be decomposable into parts. They usually think of creating one static image for a magazine illustration. In a user interface, because people can interact with a display, the display itself may have to signal back to the viewer that the computer or some equipment is in a certain state of hearing, or paying attention to the person, or about to change, or has just changed. Not only are there tech-

niques for moving a mouse, clicking buttons, or entering keystroke sequences, but all must work together as a systematic set. That's a very great challenge for use in our interactive design work; something that we find we have to train some designers to think about more effectively.

Q 13. Traditionally, the work of the graphic designer primarily took the form of print communication and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. At this point in time, we are primarily involved in interactive design. From the traditional graphic design education and background of our staff, we have incorporated the practice of developing story board sequences as we think out a systematic assignment of visual attributes to objects in our designs. Also, from the very beginning, we were quite familiar with what is now called in the computer industry: the interactive design process; that is the rapid prototyping process. This process is one of the most typical things that every print or signage designer knows; you do a sketch, then you do it again, then you revise it, and then you do it again, then you show people, then you do it again. Whether you show it within the office, to the client, or to potential viewers or users, this practice was an essential part of our design education, and it is extremely important in developing complex interactive systems. In interactive media design, we must find ways to simulate the entire product or service, then revise it; each time making more complete prototypes, until we are actually producing or implementing the final version.

Q 14. What overall trends in design education and practice contribute to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does education and practice, affect the development of interactive multimedia?)

A. It seems to me that a lot of design education is moving to eclectic personal expressive statements that are sometimes magnificent and interesting, but not particularly useful for some of our design practice. In American design education, there has always been much less interest in information design, or structured design which is important for a technology-and-information-oriented society. Another trend in education seems to be students emerging who we can not use for our projects. We can't use the skills of people who have not been educated to think about systems of signs, and to respect functionally-oriented projects driven by very practical needs.

The lack of graphic design education among people who have created much of the initial interactive multimedia is giving it something of a bad name. People (viewers) are beginning to notice that multimedia titles may be hard to understand, confusing to navigate, and have a very short shelf life with respect to interest and/or use, because makers have not been particularly sensitive to design issues in interactive multimedia. We will be seeing improvements in the years ahead, in that titles will contain more sophisticated content and depth. This will require that greater attention be paid to a large scale systematic design process. Multimedia and on-line services and products require a tremendous number of skilled professionals; and hopefully, they will be people coming out of some design schools that can meet the challenge.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. As mentioned previously, interactive media design requires a team approach. The musician must understand how her/his contribution interrelates; how the sound or music track is to work in harmony, or in support of the visual track. An instructional designer working with instructional paradigms may need to work with a graphic designer and/or an illustrator to determine the kind of visual material that will be displayed in any of the interactive sequences. In each case, a design specialist needs individual control. At the same time, there is a need for planning and orchestrating these contributions.

What multimedia production currently lacks is the next phase of software development to help teams of people integrate their individual areas of expertise, to feed all files to a common base of imagery, text, and sound, and manage version control. Fortunately, there are now people working to develop that next generation of software.

The multimedia industry is like the auto industry prior to Henry Ford. There is no established mass production system. There are insufficient processes for enabling individual professionals to work together to quickly and efficiently produce products with reliable quality. So, the short answer to the question is yes, it is desirable to have sophisticated, detailed, professional control of individual multimedia design and production. In the long run, it is even more important to manage all these people so they can work together in concert.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. From the perspective of the individual professional, one needs to have core competencies in some disciplines, and the ability to span a few others. Also, one should have some people who are experts at managing the teams of specialist. That's the way a movie gets done: there's a director who has a vision, and there are specific professionals who coordinate all the stunt people, all the props, etc. If you just look at film production, you will see that there is a suite of people, and managers of suites of disciplines that are all working together. Or perhaps, look at how a Boeing 747 gets put together.

What we interactive multimedia designers need is our own model of what it is like to design interactive graphical imagery and text with sound and motion. In the 1920s, 30s, 40s, and 50s, graphic designers could know the printing technology, design something, and rely on a few professionals to get a printed job done. In the interactive multimedia industry that's just not possible.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes, I think they should. You've got to have people who know their design discipline well, but also know how to work together respectively with other people; recognizing that the graphic designer may not be responsible for everything. In my own design education, there were few experiences of that kind of activity. It just wasn't emphasized very much. For instance, on my first design projects, I was completely in charge of everything; being the typesetter, the printer, and getting the job done.

Now, many of our team projects involved five to twenty people. Someone might be just a project manager, keeping everybody on schedule. A graphic designer might handle typography and color, set design standards, and work with an illustrator. Also on the team, there may be programmers, sound experts, instructional designers, cognitive scientists, and human factors specialists. The ability to work and communicate with these people is a given on large-scale, complex projects. Mom-and-Pop designers can still try to do everything on a small scale without the contributions of other disciplines. But, in most situations, larger team efforts are the norm.

Q 18. Further, Does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. Yes, absolutely! By having design students learn about such things as testing and focus groups, getting feedback from potential users, awareness of different cognitive preferences, and cultural habits, they become better designers. In the past, the model of a graphic designer was: I am going to design things for all kinds of people, and I know best what they want. I know how they think, live, work, and play. To some extent, that's still true; but in many of our projects, we really can not know for sure, how certain people are thinking about specific tasks. We must seek them out, and ask them, test them, etc.

For example, in a current project, we are designing the user interface for a travel agent's reservation system. We spent two months talking in detail with travel agents, understanding how they do their work. Interviewing subject-matter experts requires skills that I certainly did not acquire in my own design education. These skills need to be introduced to students, along with some tools, resources of information, and professionals who can teach and provide that expertise.

Q 19. What is the role of the graphic designer on this interdisciplinary interactive multimedia design team?

A. It varies. My idea of an ideal graphic designer is a design professional who has broad understanding and interests, is articulate, and a good manager of people. That person can be a design director, run programmers, run subject-matter experts, run illustrators, etc. A person with fewer skills might just

be responsible for establishing layout standards for a CD-ROM title or a kiosk. Or the graphic designer might produce layouts per the specifications, or maybe even write specifications or guideline documents. In the last scenario, the graphic designer would spend most of her/his time writing or editing documents, not "designing." As you can see, it may vary considerably. I don't think you can speak of a universal graphic design function or capability for an interdisciplinary team. It will depend upon the nature of that team, the makeup of the project, and the particular individual's personality and willingness to go beyond a traditional graphic designer's role.

Q 20. As a design practitioner, what recommendations do you have for design educators with respect to emerging technologies?

A. I think educators should not become mesmerized by all the technology and forget the classic components of a good education. It is too easy to become seduced by technology, and to spend too much time trying to cope with constantly changing hardware and software. If educators can acquire basic equipment, they can focus students' attention on ideas, quality, and the classic, perpetual issues in designing effective communication. At the same time, they can expose students through lectures, and visits. Help them understand where to go for information resources so when students get out into the work world, they have essential skills in certain software tools; enough to get a basic job. If they have enough of a solid design education, they can be more than just another production person. They will have a basis from which to assume leadership in the design process, and to provide insight into key strategic issues that are fundamental to successful product and service development.

I taught graphic design for ten years, at Princeton University, the University of California at Berkeley, the Bezalel Academy of Art and Design in Jerusalem, and the Hebrew University in Jerusalem. As an educator, my bias is to recommend that practitioners think about information design, the visualization of structure, and process in their design practice in an effort to go beyond providing a cosmetic, beautician-like service. In their projects, they should solve problems from a more fundamental perspective or philosophy, one that looks at communication, and the design process. Particularly, the practitioner should think about information transfer as part of communication design.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers or consumers?

A. I think this question is who's driving design hardware and software technology? I would say in general that the society is technology-driven. There are political and economic forces at work that figure out some new piece of hardware or software, throw it out into market and hopes that it survives; and that enough people are intrigued or believe that new is better. As a result, there is a tremendous amount of innovative development. Some, of it not especially good. Development does have to bear in the mind the tolerances of consumers, and does pay attention to some of their needs and wants, but developers take a while to listen to, and understand the concerns of consumers. Of course, some manufacturers do go out and listen to consumers, and find out what they need. Then, the tools get better. That process takes three to five years. Initially, a product is

technology-driven, for better or worse, then things get significantly better for users. This process requires patience, and it takes perseverance from the user to approach and master these new things.

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April 26, 1995

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. My initial introduction to computer technology was with the Macintosh platform. I took a 12-hour series at a local desktop publishing center that had just opened. This was in January of 1986. So this was the whole desktop publishing bureau phenomenon at that time. My twelve hours were divided into three sessions. The first session was on the Macintosh operating system, file management on the Mac. The second session was on word processing, and perhaps spread sheets. The third session was on Macintosh graphics. There was an emphasis on bit map graphics, object-oriented graphics, and post script graphics. The actual software I covered in the graphics session was MacPaint, MacDraw, and Adobe Illustrator. There was a word processing session using MacWrite. Again, this was in a desktop publishing setting. It was a one-on-one tutorial.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

A. In terms of software as a practitioner, we predominantly are a Macintosh based design studio. There are four of us all together in my studio. We have about seven or eight Macintosh computers. We have one PC. We have lots of Modems, a couple of scanners, digitizing tablets, a laser and printer. We have a server, and an internet network. Though we develop products for Windows and Macintosh platforms, we tend to do the vast majority of our development on Macintosh computers, because we like them more. We think they perform better. The actual graphics development is better. There is some kind of sentimental attachment to Macintosh computers I think. Concerning the actual software that we use, we are limited to specific packages. We use PhotoShop, Macromedia Director, and Studio 32 which is an Electronic Arts 32-bit paint program. There are developer tools on the Macintosh, and ResEdit which is a resource editor. We also use Act Studio on the PC side which are developer tools basically for editing interface elements.

We all have Internet access, including e-mail. We have several electronic accounts. We have directed on other accounts. We use America On-Line, and AppleLink. We do a lot of file transfer using these services and also using FTP on the other note. So that's another major tool for us. To once again replay the software, we use Director, Photoshop, HyperCard, Studio 32, Act Studio, ResEdit, and actually there's a debabalizer for image processing.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. I'd been working at a design business, The Understanding Business here in San Francisco. It was an office which Richard Sole Warman created to undertake a very large single project. Although other projects were to come, this initial project was the redesign of the yellow pages for Pacific Bell. It was approximately 100 directories, covering parts of Nevada and all of California. This was a major editorial redesign. It wasn't simply taking yellow pages listings, and doing them on the computer. At the inception of the firm, around '87 or so, the office was working with traditional techniques. Although very, very rapidly--almost from the very beginning--it began making making the transition to a Mac-based office. I think at its height, it was the largest Mac-based design studio in the country. There were about 60 staff members at its peak point that were either contractors or employees. Even though I began initially as a free-lance designer actually doing fairly small jobs--some for non-profits--I eventually went to TUB where I worked as a graphic designer.

In the course of that time period, I became more and more interested in my personal relationship with the Macintosh computer. As a designer, I sort of deduced that human beings must have designed the Mac interface, and I began to seek out that field. You know, exactly what was it. How did you get into it? What did it consist of? And what did you need to know? So, I decided that this was what I wanted to do. I quit my job. I started working independently as a free-lancer, to try to gain expertise in this area. I read all the literature I could find,

which was small, and a bit hard to find. I joined the Association for Computing Machinery (ACM), and also joined two of its special interest groups: SIGCHI and SIGGRAPH. SIGCHI is the Special Interest Group in Computer Human Interaction, and SIGGRAPH is the Special Interest Group in Graphics. I started going to the CHI conferences every year. Concurrent with all of that self-study, I got the opportunity through Clement Mok--working as a free-lancer for him--to do two major laser disk and CD ROM projects for Apple Computer. So Clement who I'm very grateful for actually, gave me my first opportunity to do interactive products with interface problems involved. I just proceeded to find other jobs that would basically give me an opportunity to do interface design. After about a year of being on my own, Apple Computer heard of me, and recruited me to be part of a small group that they were forming whose charter was to do electronic documentation for networking communications products at Apple. I began at Apple in 1990. Actually, my first laser disk projects with Clement Mok was about seven years ago, or so. Any how, in 1990 I became an interface designer at Apple. They were two very tumultuous years, actually. I was laid off twice within 15 months which was a good introduction to the high-tech arena.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. I think to some extent the critical issue that helped my transition was the opportunity to work at Apple. It was very important for a number of reasons. Because at that time, it was relatively hard to get training in interface design. Some of the best opportunities to gain knowledge and expertise were through the industry. Certainly, Apple was a pioneer in the field of interface design. The fact

that I was able to work for this firm, and learn a lot from the resources at Apple was instrumental in developing my own knowledge and expertise. I also think working at Apple in this particular field, gave me credibility, a lot of credibility. That credibility has basically set me for my own studio (U dot I) which I formed in 1992, after layoff number two from Apple. So, we've been in existence now for three years.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. The cost of hardware/software did not slow my decision to change. Simply because it was absolutely essential in the kind of work that I wanted to do. So it was, either you get the right kinds of tools you need to do the kind of work you need to do, or you're not able to do the work. So there was no hesitation on my part to acquire equipment. However, another interesting thing was that as an Apple employee, there was a program called "Loan to Own" by which you could get major systems, significantly discounted. That certainly helped me get a very high end system at home that I could work on. Anyway, that was nice and I was able to get that as a perk from working at Apple. Although my very first Macintosh was actually bought used, and was a Mac Plus which was then a high end machine in the Mac line. It's hard to believe now. I actually worked for several years on that Mac Plus as a graphic designer. So, I worked on this tiny little screen.

Q 6. Was the shift a natural one, or was it forced by competition?**Please explain.**

A. The shift for me was entirely natural. Again, I was really motivated entirely by my own curiosity, and again, my personal friendship with the Macintosh. I didn't feel like I needed to compete. I wasn't at all forced competitively. There was an extreme level of comfort there, in terms of the naturalness for me to move into this field. I was motivated by curiosity and personal interest.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Practice: economic affect on the design firm: justification, cost effectiveness, productivity, increased or decreased profits, etc.

A. I think the technology in practice has affected me as a designer very positively. I basically carved out a niche doing interface design which was not available to me before I decided to move into this field. I became interested in this field long ago, about seven years. So at this point, I have a lot of expertise that a lot of my competitors can not challenge me on. Because I simply have a lot of years of practice under my belt. For me, the technology has afforded an entirely new business and design opportunity which is entirely positive. I'm able to maintain a salary for four people. I'm on the verge of hiring another person in a couple of months, so I can only say positive things about the economic affect.

Q 8. Did the learning curve or time commitment seem too great to justify the shift?

- Practice: training of staff members

A. I think the learning curve and time commitment has never seemed too great, because again it's absolutely mandatory. One of the ways I position our company is to claim that we're experts, and I believe that we are. In order to cultivate expertise, a lot of attention has to be paid to training and the development of that expertise.

I think one of the major challenges I see is in finding the right people. It is extremely, extremely, extremely difficult to find the right mix of skills. Not just the right mix of skills, I think it's also the right temperament. Because I think this kind of work is very ambiguous. Most people I know who were traditionally trained graphic designers, find this work often too demanding. I think at a conceptual level, there's a lot of analysis involved. For instance, I took a class in systems analysis, basically to understand data structures, how data flows better, and to actually use those techniques in developing designs. This work is often too dry for a lot of the people who I know who are graphic designers.

On the other hand, not most of the work, but a lot of the work that we do is visual. As a visual design studio, we need people who are extremely conceptual and analytical, but who also have visual design skills. I think another unusual thing about us is that we actually do a lot of writing. Often what we deliver to our clients is writing. We do a lot of technical specifications and documentation on how to implement the designs that we are recommending. We also write technical specs for programmers to use to implement the design, and we write standards documents.

Even though we do multimedia work, that really isn't our specialty. We have a sub category of expertise which is user interface design. For instance, now you find a lot of people in the market place who have an interest in multimedia. Relatively few of those people are interested at a more abstract level, in human-computer interaction. So I find it extremely hard to find prospective staff members, and even contractors to work with. That is frustrating. It means that I have to make more of an effort to try to find people. The search for the right people is a major obstacle. It's very hard to find a person who can design, and who is extremely analytical. It is difficult to find the right people, and we kind of struggle with that.

So you look for people who are already trained, as opposed to doing training on the job, or is it a combination?

A. That is right. That is actually what I hope for. It hasn't always been the case. I think a good example is my very first employee here, Isabella Koena. She graduated in graphic design at Cooper Union in New York City. She had done some work as a graphic designer, and really had no experience at all doing interface design, and I hired her a year ago. It's funny, I don't think of myself as having trained Isabel, because she took a lot of initiative to simply approach projects and applying what knowledge that she could apply to them, sort of being directed and aided by me along the way. I think she took a tremendous amount of initiative to learn how to do these projects. So, I don't think of myself as having trained her, because she was so pro-active in doing her own learning.

I do however, spend a fair amount of money for my place to take classes, to go to conferences. I would say as a design studio, I'm unbelievably generous.

I think remarkably generous. I mean, having worked at design studios, and knowing how cheap they can be. So I pay for employees to go to conferences and take classes and workshops. So I definitely do "foot the bill" for a lot of professional development. But again, I think as a company, one of our primary competitive advantages is expertise. And it costs money to develop and maintain expertise. That's a price I'm willing to pay.

Q 9. What are the perceived benefits of the shift?

A. Again, I think I've already described that. I've basically been able to found a company that's based on technology design. I've been able to carve out an entire opportunity that I didn't have before.

Q 10. What are the perceived negative results of the shift; short and long term?

A. Both in the short term and in the long, again, it's very aggressive, accelerated work, and extremely demanding. It's very demanding at the production level. The actual task of software engineering is still relatively new, and it's a much more arduous process, than the process of developing something for print. Actually, debugging software, and quality assurance against software is very difficult, and tricky. So, the negative results are not so much from the shift. I'm just sort of describing some down sides to the actual nature of the work.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A. That's a really interesting and deep question. I think one of the fundamental issues is--and I don't really know many educators, so I don't know how savvy educators are or aren't--the very nature of visual and product design has really changed radically, because there is a new place in which to design. And that place is virtual. I mean it is literally cyberspace, it's digital space. That kind of information space is an extremely different one from paper. And interactive computer products, is very different from static media, video tape, film, or anything else. So the actual design problems to be solved within that space are fundamentally different from design problems that traditionally-trained designers have faced in the past. That's something that I still do not think, and I'm just guessing, that most traditional educators do not realize this fundamental shift.

I think more often than not, I hear generalized comments like: "oh well design is design is design." To some extent, I also agree with that. However, I do think that good, deep, and profound design education--and I feel fortunate enough to say that is the kind of design education I had--does teach a student enough generalized principles that they can in fact be applied regardless of what the design domain. This kind of deep teaching isn't widely available. I think you're only going to find that through a few very talented educators, at a very, very few good schools.

So, I do think the nature of the design space has changed, and I don't think that design educators really realize what the similarities are versus the differences. I think that's really an important thing to know.

The other thing is something that I myself kind of--I don't know that I struggle with it--but it's something that I think about and it's curious to me. I was trained in the same way that you just described doing Plaka boards and ruling pens, this was about 20 years ago. My teacher tended to have a traditional Basel design training. My initial teachers were Basel people, and again this was at Yale. I would think that my deepest design experiences came at Yale actually, and not so much at RISD (Rhode Island School of Design). My instruction at RISD was very good, but it was just different. But at that time, Yale was sort of the center of the Basel pedagogical technique. All of my instructors were of that type, and it was among the most profound teaching that I ever received. It was very amazing--and I do think that one of the things I have been unable to do, and have hoped to be able to do--to use more traditional design techniques in initiating designs. I mean, actually mixing gouache, working with paper, and collage. I took a design workshop in Maine two summers ago where I was actually able to study with three Basel people, one of whom was my very first design teacher at Yale, Inga Drugrey. It was an experience that was filled with revelation for me. It was really wonderful. It was so nice just to work with cut up paper. We didn't work with computers at all. We worked with gouache. We worked with black and white paper. We worked with Xerox machines. We worked with tape. And it was really, really wonderful.

For me, it was the first time that I really realized how much I missed the tactile experience. Intellectually, I know I miss it. It really confirmed for me, not just how different the experience was, but how different the outcome of the experience was--how different the work was--the actual work that was produced. I wish that I was able to kind of meld in my own design process to include traditional techniques with computer-based ones, because I think that they can really

shape the outcome of a digital product, in a different way. For what ever reason, I haven't been able to attain that level of rhythm in my own practice. I think that is a nice goal to strive for, a nice balance of pedagogical techniques that address a full spectrum of tools.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. It funny, because people interested interface design, or several people that I've met, tend to come from a lot of different kinds of backgrounds. In the area of design, I've met people who are interested in product design, and I've met people who are interested in graphic design. And I would say for myself, knowing graphic design much better, that of the basic skills, I think layout is required. There's a lot of layout involved. It can be extremely tricky because you're usually laying out screens, and they also have to appear serially, in some kind of order. Simple layout skills are extremely important to have. So, I think that is one of the fundamental skills that my graphic design training prepared me for.

I find that a lot of people who are interested in multimedia are people who are interested in information design. Another traditional element is the use of color to actually color code classes of information, or types of information. Often a multimedia product actually has an underlying data base associated with it. There are certain data types that end up getting displayed to a user upon invoking different commands. Actually presenting all of this coherently with some typographic, color-based scheme, consistency in layout, and consistency in

control representation is the task. A lot of the actual skills of creating a visual language, I basically learned in my visual design training. These are very directly applicable to this kind of work.

Q 13. How do you define the concept of interactivity?

A. Well, I think in the simplest explanation, in terms of the kind of work we do, is to say it is a dialogue between a human being and a computer, very, very simply. And designing for that means creating circumstances, a setting, controls, and designing the space in which that dialogue can take place.

That's the computer-centric way of describing it. Now as part of that dialogue, many classes of objects might be involved and some of them might be media-oriented objects, different types of media, text, video, and/or sound. I think that one of the challenges of doing multimedia is really figuring out exactly what kind of dialogue you actually want to enable.

I think that most multimedia is kinda weak, and is merely focused on the turning off and on of media elements. I think that's a crude circumstance to create for a human computer dialogue. And it's vast and much more fluid than that.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. We (interface designers) design the technology.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. I think the answer is yes and no. No, from the idealized creativity side. Yes, from the engineering side. As I said earlier projects are nightmarish to manage. They're difficult to manage from a staffing stand point. They're difficult to manage from just the implementation stand point. They're difficult to project manage. They're difficult to do on time and within budget. It's difficult for clients to understand what the potentials are. It's difficult to get large numbers of people to be cooperative in terms of the creative control issue.

I do think though that collaboration is something that is natural to desire in doing a multimedia project however. For instance, I think this is another slightly unusual thing about us, and that is that we collaborate a lot. Because we do tend to be involved in the technical side of implementing a product. As an example, we did a lot of interactive television work for Paramount. The work that we did basically involved the technical specification for how this interactive TV product would work. We did the technical specs against two hardware and software platforms. We actually are deliverable to the client, apart from just consulting time, thick documents of specs, or written documents.

Because we were working with interactive TV, there was certainly a desire on the part of the client to have a TV look. I don't know much about doing broadcast graphics. We actually worked with some firms in Hollywood who are doing broadcast graphics. Here, we are fundamentally a visual design firm, but again

we're really not that because we do so much writing and technical specifying. And in this case, we had really wonderful, wonderful collaboration with a company called Nagasawa and Hahn in Los Angeles. They are really outstanding broadcast graphics designers. We technically specified the design, and gave them the parameters that they needed to work within, in terms of how they needed to prepare the art in order to perform on this given system. They did the visual implementation. That I thought, was a really wonderful collaboration, because we got the best of all possible worlds in terms of bringing together the expertise that we really needed to get the project done.

Certainly from a creative/aesthetic end, each medium has kind of developed somewhat independent of other media, and there are certain kinds of standards and production values. There's a certain type of expertise that's known by practitioners in that area that are unique to that domain. I think that a collaborative environment makes for the best product from a creative side.

One of the things that can be difficult is implementation. That is, actually going to market, weaving everything together, and getting the whole thing engineered. One of the things that really saddens me increasingly--and I think that this is a lot because of the influence of Hollywood and the media--is that multimedia's been hyped up a lot. From my experience, a lot of people who are media-oriented really don't have enough respect for software engineering.

At the creative end, I think a lot of media-oriented people look at software engineers as people who are just suppose to grind out stuff that's already preordained. I've had the opportunity to work with some really brilliant software people. I know how much creativity is there. There's a lack of understanding, and I think consequently, a lack of respect. Using this extraordinary talent really makes for good products. I will pick a well engineered software product over a

good TV show any day. I think there's a qualitative difference, and there's a level of passion there that media-oriented work just doesn't approach.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. I think that it is really critical that expertise be developed, and this kind of harkens back to your question number eleven. I think that there are some key skills that need to be developed more and need to be included in curricula. I think that the best designers have always been multifaceted in their ability to approach a design problem. I think increasingly with interactive multimedia, you see the term "producer" used a lot in titles. If you look at staffing charts of various organizations that have multimedia departments, there's a title that's called producer. From my experience, people who bear that title come from a broad spectrum of backgrounds. I know people who are producers who basically have book publishing backgrounds. I know people with the title producer who have programming backgrounds, or media production backgrounds. I myself have been hired to be a producer on a CD series, and I think that the title producer inherently carries with it knowledge of all of the areas of expertise that are required to pull off a multimedia product. Anyway, I do think it is critical that people have knowledge of what these sub domains are that typically comprise a multimedia product.

Now what level of knowledge would that be? Would that be just a general knowledge and understanding to the point that you can have a dialog with say a programmer?

A. I think so, and again I think typically. I'm basically describing myself in this, and others that I've worked with. Most people I know of who have directed multimedia products typically have one central area of expertise. It may mean content development, maybe media production, programming, or interface design. But they have a working knowledge of what the other disciplines are that need to be developed. For me, the primary issue is one of being able to communicate with your team when you have a group of people working together. When you have a team of people working together--as a producer, you need to understand what all the different players are doing, and how to actually give them feedback on what they are doing as the product takes form.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Most definitely! I think that one thing also, and again I'm rather out of touch with design education. I know a little bit that I hear here and there. I know a little about Cranbrook, and I sort of know about where design and typography are going in general, just from reading magazines. I'm not that involved with design

pedagogy right now. But I do think that there is one thing that is now lacking and I would guess, has always been lacking. That is the ability to pragmatically make work. And I do mean pragmatically make work.

OK, when you say make work, what do you mean?

A. To actually produce a product within the time and budget available to produce it. I think one of the things for me that was really irritating when I was a student is hearing other students talk about "well, if I only had--well, what I was going to do if I had more time was I was going to make it like this." Too many students and too many design programs still deal with design at a very theoretical level. Then they (students) actually get out into the world and have to deal with clients, make products, and have them debugged and shipped. All of that is totally meaningless. So I do think that collaboration, and team-oriented projects, particularly for multimedia, it's just a natural. It's just a requirement.

Designers need to learn how to manage, and manage with a vengeance. The majority of work that I do now is managing, and it's extremely arduous. I also think the fact that project management skills aren't a part of design training is really sad. I would say it is the most important skill, actually.

I notice you say "in addition to traditional methods." I also think that traditional methods are also extremely important. I certainly don't think that the pragmatics of implementing work should override theoretical investigation and all of that. But I do think that there needs to be a balance.

Q 18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. Yes, and I would guess I'd say by taking a class in interface design. Offer one from the stand point of training. Again, the design space (cyberspace) as a space, and the actual problems to be solved there have a unique quality. Some of these do have to do with usability and interactivity. This is purely from a cognitive stand point, not from a "is this content right for this audience" view. Content-specific questions have been there ever since there was media. The actual cognitive thresholds of what people can tolerate, and what people can actually endure are really fairly unique. These are the issues that emerge for designing for virtual spaces.

There is plenty of literature available, and it's possible to learn on one's own. If I were in school, and my goal was to do software and interactive media, I would certainly pursue some formalized training in that.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. Theoretically, it could be anything. Practically, I think it depends on how skillful that designer is. Basically I'm a designer, but I know what is involved in producing fairly complex software products, so I tend to direct work. I think it's really entirely dependent on how much the designer knows, and how skillful they

are about design. But again, I think more importantly, how skilled they are about managing projects, and developing software.

Q 20. As a design practitioner, what recommendations do you have for design educators, and the design education process with respect to emerging technologies: availability in the classroom/lab, teaching strategy, etc. (practitioners).

A. Again, I think there needs to be management courses on how to literally manage the production of an extremely complex piece of software. I would say that is the most important practical skill. Again, I think collaboration is extremely important.

I think the other thing is that graphic designers are somewhat new to this domain. I do continue to feel that graphic design practice in general--at least in the way it's represented in the media, and propagated by the AIGA, or whoever--is still primarily concerned with style. And every time I say that everyone gets upset and goes, "No, no we're not just stylists." Yet, when I look at the design press, that is primarily what it's about. Designers I think, at least the ones that get published, tend to design for each other, and I think people want to be design stars or whatever. Again, I don't think there is anything wrong with that. It's like human nature of something. But I do think there are cognitive issues that are involved in designing interactive pieces. Some of the issues that come up really are very independent than stylistic issues. The style could be handled in any number of ways. I wish that design practice--at least as it exists in this country--were less oriented toward creating pop stars.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. I think it's both. Initially it was unbelievably hyped up by the computer companies who wanted to create a market. I think they have managed to do that. I'm kind of amazed, because I did my first multimedia piece seven years ago. At that time, not many people were doing it, or interested in it.

Now there definitely seems to be a market there. There's been a boom in CD ROM title development, distribution, and just a tremendous interest in the internet now. There seems to be real interest there on the part of consumers, because a market is actually emerging that's fairly robust. So, I do think it's both right now, pretty clearly.

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Columbus, Ohio
April 30, 1995

Q 1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)

A. Most of it was the Macintosh, when I was a senior at art school. The first time I encountered a Mac was in '86. I was going to school for my bachelors. I was interning at Steelcase in their corporate communications department. They needed to get rid of some budget, and purchased the Mac IIs right when they first came out, which was like a big deal. I had already used the Mac Plus' at school. So between school and Steelcase, was when I got initiated with it basically. What was interesting is that there was more of an emphasis then on it in school than there was in the work place. So it was a real struggle to get the people at Steelcase to realize that this was the future, tomorrow in communication design. It was very interesting.

So there was a resistance to computer technology.

A. To them it was kind of a toy, more of a thing to do mock-ups on, than it was an actual implementation tool, which is interesting because it has actually flip

flopped. There's probably two reasons for that. One was that the tools were not what we needed them to be. A second is that you had a much older sector of the design community at that time who really didn't want to change. So they really resisted it.

What software were you working with at that time?

A. Oh God, MacPaint, MacDraw, MacWrite. I think there was only three. In fact, we had no hardware in the machines at that time. Well the Mac II did, but the Mac Plus, if I remember correctly, or maybe it was the one before that. The one before that, 512s didn't have any hard drives. We had 400k floppies that contained your system software. Then your three pieces of software: MacPaint, MacDraw, MacWrite, and a file that you worked on, and usually there was only one disk drive, so you were constantly switching disks.

Q 2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

A. Just about all over the place. I still use the Mac for eighty percent of my implementation work. This one here is a Power PC 8100 AV system. We just ordered 7180s which are new. We're replacing all of our systems right now. All of them have a minimum of 40 megabytes which is nice. I do an awful lot of delivery on Windows though, and I can't stand Windows. But I'd say that for eight out of ten clients, the delivery platform is Windows which is interesting. So we do have a number of Windows machines here. It's OK, but it usually hurts my one side of the brain that I don't usually think on.

What types of software are you now working with?

Pretty much higher level authoring tools such as Director, HyperCard, and SuperCard. Novell had a system called AptWare which I think unfortunately, probably isn't going to stand up much longer. It's a great piece of software, and it's cross platform. It's very similar to AuthorWare actually. I think it's very much more robust, but they have not pushed it, and are having some marketing problems. They've been trying to get it out there for two years. So eventually, I don't think it's going to fly. For high level authoring tools, those are pretty much about it. Then for actual visual tools, we've used things such as Illustrator, PhotoShop, Canvas, SoundEdit, you name it, there's just a real eclectic mix of software.

Q 3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?

A. It was real natural for me to move into computers. So, I just got addicted to it. Back then, there were no classes or seminars. So it was pretty much "oh, a new piece of software", and manuals that weren't very well written. So it was just your own time. In the early days, the exploration of the computer was more at home, but now it's more on-the-job. But I still don't attend any classes, or seminars really on software.

The manuals have become surprisingly much better written in the last few years. Usually, if you go through there, you can get all the major components of the software down. But there is still so much you can do with software that they

don't even put in the manuals. So it's just a matter of digging through it, and trying to find out what it's capable of. In Director for example, I know a few years ago we were doing some things, and we called them up to ask how to do something and they said, "Well, it can't be done". And we ended up doing it, and then called back and they were sort of like, "You can't do that. How can you do that"? Their software was not supposed to do that, but it does. It's a matter of digging through it, and finding little tricks.

Q 4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?

A. I think the major critical issue for me was the delayed acceptance [of the computer] in my own field was what probably slowed the transition from the traditional, to what we have today. To refer back to what I mentioned earlier, that we had a lot of people resisting the fact that the computer was coming into our industry, and who didn't want to switch. I think this slowed how quickly technology moved into design. The tools are not what they use to be, like kerning and tracking. [Back then], nobody knew what that was. So, we were just kind of set with whatever kerning and tracking that were set in the files. Acceptance within the field I would say, was the most critical issue. However, now it's the complete opposite, and everybody is just hungry for anything. It has accelerated quite a bit now.

Q 5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.

A. It did not for me, but it did for a lot of businesses. They didn't want to invest that type of money in hardware and software until somebody else did it and decided that it worked for them. Nobody wanted to be the first one out there. Personally, the first system I bought was when I was still in school. I had an apartment, with this room, a bed, a table, and this computer system. So the priority was the computer, then everything else.

Q 6. Was the shift a natural one, or was it forced by competition? Please explain.

A. Very natural. It was very obvious to me that it would become an integral part of design. I actually felt bad for people who didn't see that. Because they could have really lashed onto something that could really help the industry and their careers. In fact, I can't even tell you when it happened. It wasn't like during this phase in my life, I switched to computers. It just started to weave its way in.

However, I did make a conscious decision to get out of communication design, and into interactive design. This was right after I was interning at Steelcase. Somebody at Steelcase slipped me a version of HyperCard, the beta version. And it was like, "I'm hooked, this is communication." Because you could get into the very intricate levels of information that you could not see in a 2-D format. So I think that was the most conscious decision that I made.

Conceptually, In my mind I always thought that way anyway, and was really frustrated that you could not get information in a nonlinear format. Although there are ways to write in a nonlinear way, but for the most part, communication design didn't work that way. But you could see it in your head when you're designing something, you can see how the linkages should be. It was very hard to get that into communication. So when there was finally a tool there, you could start to find the find linkages, the details within things, and deal with the time and the space issues of information design. That was just perfect.

Q 7. How has the technology affected you as a designer (educator or practitioner) economically?

- In Practice: economic affect on the design firm: justification, cost effectiveness, productivity, increased or decreased profits, etc.

A. It's interesting because I think it's six of one and half a dozen of the other. For most of the firms that I have worked, it was hard to invest thousands of dollars in technology, until they could really see how it's was going to be returned to them, global wise. It is true that you can increase your production's return. But I think that the design and conceptualization is still the same. So economically, in terms of conceptualization, that has not changed.

It still takes the same amount of time to get an idea formulated. But production wise, and implementing your ideas, it's much quicker and you can go through a number of variations faster. Technology is like a balance. I guess before, you spent so much time trying to implement something or prove it when you didn't have the tools. Now, you have the tools to spend supposedly less time, but then you still try to implement more ideas.

We can definitely take on more work than we could before, but we only take on quality work. We don't want to become a do it and kick it out the door house. So I wouldn't say that we take on more work. I think we take on higher quality work.

Q 8. Did the learning curve or time commitment seem too great to justify the shift? - Practice: training of staff members

A. It's never been too great, but it's been difficult at times to justify the shift. The old director here, Steve. He and I have worked together for seven years at different firms. We have worked together to create teams, interactive teams, at different places, and get them rolling. And there does seem to be certain people who have a natural fluency with what interactive design is. These people seem to ramp very, very quickly into some of the finer details of what you do on the interactive side. These include things such as how to deal with space and time. Then you have people who still struggle with the whole issue, and those people tend to take a longer time to ramp up into the interactive realm, if they ever really do.

I think I really found that we've tried to bring in people especially in communication design. It's really interesting that I find a lot of people in the industry [who] tend to draw a very solid line between interactive design and communication design. I tend to draw a more solid line between product design, and interactive design. However, I've found that product designers tend to get ramped up more quickly than communication designers do. And I think a lot of that is because product designers deal with things in space, and time already.

Unfortunately, communication designers, even though they should deal

with time, space, and sequencing, a lot of them don't. They still rely on the visuals to impact the message instead of what it is you're handling, what you're doing, and what the sequence of events are. So product designers seem to ramp very quickly. In communication design, there are those people who ramp very quickly, but then there are people who just probably won't become good interactive designers. They are very good at the communication design side. They could be great communication designers, but to get them into interactive design that sometimes just doesn't work. I think it's flipping the stuff up from the page to deal with the time, space, and sequencing issues that presents a problem for them.

When you say people ramp very quickly versus someone who doesn't ramp quickly, how much time are you talking about?

A. Somebody who ramps quickly is almost like there is immediate skill they have that they can apply. And there are a number of different skills within our processes, in a number of different areas. I think the first and most important thing in interactive design is the information underneath it. It's not how it works, nor what authoring tool you use. It's really how it feels, and how it reacts with an individual, the user basically. The people in communication and product who ramp quickly generally understand those issues a little bit better, and they can come in very quickly on an interactive project.

When you can take information and design information, and chunk it back out, then that's only information design. You then have to make that information usable. People who ramp quickly understand that very up front skill that's needed to begin an interactive project. They can look at the information, and

understand the linkages, and they can see, at least an early assumption without using feedback, as to what's usable and what's not. And these people are immediate, they're immediately billable. You can really get them on jobs right away and they do great work.

There are people who tend to take a long time. I mean there are people who take a long time, but eventually work out which are very, very few. Then there are people who take a long time who just don't work out period. It just isn't a good match. But the people who work out after a while, they tend to take about six months. And that's really hard to say because you just never know, because it could depend on the nature of the project, and where that person's at. I think they approach it from the back end first. They look at it from sort of "how will it look in the end" instead of "what's underneath it that runs it". They focus on the visuals. That's difficult because you need people to focus on the vision of the product and the visuals of a product. The people who take longer, are focusing on what it's going to look like. Issues like, how does it feel? How does it work. And what benefits do people gain from it? These are the important issues.

Q 9. What are the perceived benefits of the shift?

A. The biggest benefit in general, just in interactivity, is that technology enables us to create interactive products that are usable. We have time to make them very user-friendly. That's probably the greatest benefit of the shift. That technology allows you to test out various scenarios that maybe before you didn't have time to test out. You can now test with various users under scalable conditions. You can test them very much up front as far as information goes, and how that's linked and chunked out. Or wait to the end as to what their perception is of say,

an Author version of a product. I think that's probably the biggest benefit of the shift. You can test the usability of a product quicker, more efficiently, and more often.

Q 10. What are the perceived negative results of the shift; short and long term?

A. Fitch is very good at focusing on quality products. I don't do something that's not a quality product, or at least we try not to. But I do know that there are a lot of people out there now that are jumping on the bandwagon, for instance, and are just kicking the stuff out. The short term negativity of that is that I think these products are low quality products. Quality suffers in the short term in the majority of interactive products out there. They have taken the tools off the shelf, slapped something together, and say "oh, by the way we do interactive design." It's more like, "no, you do interactive stuff". I don't know what it is.

Long term negatives remain to be seen. This industry has no long term. You can't think past tomorrow. It's constantly turning on a dime. Even to try to forecast, is a difficult thing. As I said, it probably comes back to quality, but I think the design industry will grab that back over time.

Q 11. What does this information portend (signify in advance) for education and the educator in the future?

A The greatest impact on the design education is that designers will be brought back to their true roots of what design is. And that is to make something that is very appealing, usable, and original. I think design is being brought back to its

roots. What is it we're doing? And what's the value of what we are doing? Instead of, "how cool does it look?" So I think for education, it's going to involve educators with the technological tools, to knowingly I hope [though it could be done unknowingly], bring their students back to a place where they look at design as being a pure function again. Instead of a situation where some design students go down and check out the latest annual from the library, and they copy the look and the trends. That's a mistake, and I know that there are a lot of design schools that unfortunately, don't really do much about that. So you see a lot of portfolios that look alike depending on what year you're looking at them.

And I think that interactive technology will bring design education back to its pure sense, because the students can copy a look, but you can't copy a feeling. Knowingly, educators will take them back to the raw basics of what it is you're doing with design. You've got to make this valuable to the person who uses it. You've got to know who that is. You've got to know what the context of that situation is. I think that will bring the students back, maybe even unknowingly too. Even if the instructors don't know, maybe they are still focusing on the end result. I think the students will unconsciously have to go back to that level in order to create anything that works. They will hit those information structures.

Q 12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

A. As a communication designer, I always did look at the structure of things. When people gave me copy, I always ripped it apart before I reformatted it back out. So I think that at least from my personal experience, I've always taken the information design with me, and brought it to a more detailed level in terms of interactivity. Some of the visuals you can bring over too, such as following certain systems, grids, and typographical usages. In interactive design out there before, there was no real concern for typography. People would put 4 point type on the screen for like 3,000 pages of text. Now when you see that, most people say "OK maybe 14 point type with at the max and 500 words is more usable than the 4 point type and the 3,000 page essays you use to see.

So, I think as far as previous processes go--from some of the original information design--I'm use to doing that be it communications, brochures, corporate identities, etc. Type can really be stomped all over, and people do it in communications design just as much as they do interactivity. That can pretty much make or break a piece.

Q 13. How do you define the concept of interactivity?

A. I look at interactivity as more of the interactions. I look at it more as being a translator. To me, it's more of a translation device, or experience. It's what happens after you get in the car, but before you get there. That's the interaction part. Like a door knob in many cases is an interface, and you interact with the knob to open the door. So that's the most basic level of interfaces translated as interaction, which is just a translation device.

Q 14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

A. It (design) forces it (technology) to become a present day solution. I think the design industry, be it practitioner or educator, forces the technology to begin to work for us, instead of us working for the technology. So, I think it forces its evolution.

Q 15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

A. It is sometimes, and sometimes not. Most of our people have to be very much multidisciplined, in a number of different skills. They're not all just from communications, or from product [design]. They all come from a lot of different areas. We pick up a lot of people who have hobbies doing video who now use it in everyday life. It's desirable to come in up front on a project where you have a number of different challenges in front of you. So you have multidisciplined talent there working on that. It's easier for them to see the big picture, than if you have someone who is not focused from beginning to end. I may start on one project, and do information structuring and design. On another project, I may just push pixels, and on another, I may even do some code. In many cases it just depends

on whose available for the project, whose the best fit for the project and in what area. But it's good, because then you have overlap.

Q 16. What is the affect of this technological revolution (interactive multi-media) on the need to develop expertise that spans a number of disciplines?

A. I have a lot of people who are in the visual field that want to come in with us, and think: "well, I'll learn director, and I'll move into it. It's strange, because you can't design for interaction unless you design interactively. Students need to learn these skills, in order to design properly. If you just draw screens in say, Illustrator or something that you know of, and then try to hook them all up. It doesn't usually work. This is because you're missing all the time and space issues that you deal with through these tools that you wouldn't need to know otherwise. So usually, it's much better if the people know Director, or have some video background, photographic background, or God willing, have some cinema and film in their background.

So those are the kinds of courses that you would recommend for design students interested in interaction.

A. Yes, a real eclectic type mix of anything. I mean, there are so many different skills that go into the creating of interactive multimedia.

Which ones would you say were absolutely mandatory?

A. I think it is imperative to know a tool such as AuthorWare, Director, etc., so that you can design interactively. That way, you're not designing flat, and trying to imagine and envision that.

Q 17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, co-operative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

A. Yes, especially here at Fitch. We have a lot of interdisciplinary design teams. It's interesting, because I worked for a lot of firms, and very good design firms. Fitch is the only one that I know of that really, truly works collaboratively. A lot of places say they do, but Fitch does it very, very well. But we also pull from a lot of our traditional methods, especially in research.

Our research team does a number of different methodologies, and they have very easily moved those methodologies into the technical arena. And as far as collaborative processes, the whole company networks collaboratively. If we design a kiosk, we may not want to design the entire product, but we will design the cabinetry, the environment it goes into. In others, we design the communication pieces that go behind it, and do all the research to see how that will be anticipated, plus how it will be evaluated.

Q 18. Further, does the design of interactive media require a new sensitiv-

ity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

A. Yes. It absolutely requires a new sensitivity. One of the things is that you're now appealing to individuals, you're no longer appealing to mass markets for audiences. You're appealing to an individual which makes it much more difficult. Before we were perhaps appealing to more of a large market. This market would probably want to see something more like this [printed piece]. But now with interactivity, we have the added responsibility of having to design and create for an individual.

A number of ways to address this issue is that we do tons of usability studies, and talk a lot with end users. We really design a place around the user. And we try not to even launch onto something until we have some user research done up front.

Q 19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

A. It's a combination of roles. Just like I was explaining before, most of the people in our group have some experience in communications, graphic design, and some projects they may direct. On other projects they may produce. Sometimes they're just the project manager, but it's really is a complete combination of roles. It's interesting, because my title here is Director, but sometimes I'm not. Sometimes I'm project manager, and sometimes I'm the visual design person. Everybody else on the team works that way too, very much in combination.

Q 20. As a design practitioner, what recommendations do you have for design educators, and the design education process with respect to emerging technologies: availability in the classroom/lab, teaching strategy, etc. (practitioners).

A. Educators should enable students to design towards a vision, and not just a visual, so that they can keep the vision of the project and interactivity in mind, and not be asked to address the visuals too soon in the process. I think that's what my highest recommendation would be.

If you have a large challenging project, break out all the details of that, and begin to rechunk the information. Not just in the logical sense, but in the interactive sense. And that's something you do away from technology. You don't have to have technology to do that. I think that is imperative toward the end in a technological solution. That also addresses getting back to the vision, not the visuals.

Q 21. Finally, who do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

A. Essentially, I think technology as a whole and in general, was driven by the defense industry. That's really where we got our technology. And now we don't have as much need for defense any more, at least we we don't

think that we do. So now, I believe the entertainment industry drives the technology. The design industry and the entertainment industry, I would say, are beginning to merge.

Entertainment now drives technology. However, we got a lot of our new hardware and software before, from defense which is good. As far as what is driving entertainment, it's consumers. Consumers need to see something different, see something more. More excitement, more explosions. And with all that, it's helping to develop some technological solutions. The entertainment industry really comes up with some pretty interesting ways.

Many of the off-the-shelf products that we use in design, are based on some very complex technological solutions that were originally driven out of the entertainment industry. These previously had been driven out of the defense industry for flight simulations, and so forth.

APPENDIX B
SAMPLE HUMAN SUBJECTS RELEASE FORM

THE OHIO STATE UNIVERSITY

Protocol No. 95130114

**CONSENT FOR PARTICIPATION IN
SOCIAL AND BEHAVIORAL RESEARCH**

I consent to participating in (or my child's participation in) research entitled:

Graphic Design Educators and Practitioners in Transition: From Traditional
Tools and Applications to the Computer-based Tools of Interactive Multimedia

Brenda Smith Faison or his/her authorized representative has
(Principal Investigator)

explained the purpose of the study, the procedures to be followed, and the expected duration of my (my child's) participation. Possible benefits of the study have been described as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Further, I understand that I am (my child is) free to withdraw consent at any time and to discontinue participation in the study without prejudice to me (my child).

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____

Signed: _____
(Participant)Signed: _____
(Principal Investigator or his/
her Authorized Representative)Signed: _____
(Person Authorized to Consent
for Participant - If required)

Witness: _____

HS-027 (Rev. 3/87) -- To be used only in connection with social and behavioral research.)

APPENDIX C
PARTICIPANT SEARCH LETTER

February 3, 1995

Professor Isaac Kerlow
Chair, Computer Graphics Department
Pratt Institute
200 Willoughby Avenue
Brooklyn, New York 11205

Dear Professor Kerlow:

As per our telephone conversation on Tuesday, January 31, I am seeking participants for research which I will conduct as a part of my doctoral studies within the Department of Art Education at The Ohio State University.

I am writing you to ask for your participation in my research. The study calls for a series of case studies which will address the transitional process of graphic design educators and practitioners. The study is entitled "Graphic Designers in Transition: From Traditional Tools and Applications, to the Computer-based Tools of Interactive Multimedia".

My goal is to conduct one hour, face-to face interviews with five design educators who teach interactive multimedia in support of graphic design programs and five practitioners who perform interactive media design on the job.

To date, I have secured one educator, and three practitioners. The educator is Dan Boyarski of Carnegie Mellon University in Pittsburgh, Pennsylvania. The three practitioners include Sherie Bauer of Fitch, Inc. of Columbus, Ohio; and Jim Anderson and Paula Scher of Pentagram Design, Inc. of Manhattan, New York. I am still searching for four educators, and two practitioners.

The basic criteria is that they all must have studied and received their BA or equivalent in graphic design during the time when traditional tools (plaka, t-squares, technical pens, etc.) were used. Additionally, they must have made an effective transition to the computer-based appliances of interactive multimedia design.

If you are interested in sharing your perspective and experiences via this study, please contact me by E-mail, fax, phone, or in writing: E-mail - bfaison@magnus.acs.ohio-state.edu, fax - 614/292-7641. If you choose to write or call, please use the address and/or phone number printed on this stationery. Feel free to contact me with any questions, comments, and/or suggestions.

Sincerely,

Brenda Smith Faison
Doctoral Student

APPENDIX D
TWO SAMPLES OF PARTICIPANTS' ACCEPTANCE LETTERS (E-MAIL)

Magnus telnet - Tue, January 31, 1995 3:57 PM

Page 1

Message 1/5 From Dan Boyarski

Jan 30, 95 09:43:21 am -0500

Date: Mon, 30 Jan 1995 09:43:21 -0500 (EST)
To: Brenda S Faison <bfaison@magnus.acs.ohio-state.edu>
Subject: Re: Dissertation Research
Cc:

Brenda,

I would be happy to participate in your research. At this moment, that last week in April looks fine; in other words, I will not be out of town. I do have a rather heavy teaching schedule this semester, so the earlier we nail down the time, the better.

Thanks for asking. Please say hi to Susan Roth for me.

Dan Boyarski

Command ('i' to return to index):

Marcus.1@AppleLink.Apple.COM (Aaron Marcus & Assoc, A Marcus,P,2/12 1

>From MARCUS.1@AppleLink.Apple.COM Sun Feb 12 19:36:14 1995

Date: 13 Feb 95 09:33 GMT

From: MARCUS.1@AppleLink.Apple.Com (Aaron Marcus & Assoc, A Marcus,PAS

Subject: Re: Interview

To: BFAISON@MAGNUS.acs.ohio-state.edu

Dear Brenda Faison:

If your interview is only for an hour, I would be happy to participate in your research. Please contact Ms. Lynne Ching to arrange the detailed schedule. I look forward to participating with you. If you need more information about us, please contact Lynne.

Sincerely,
Aaron Marcus

cc: Mr. Joe Dobrowolski, Administrative Assistant (and email harvester), AM+A
Ms. Lynne Ching, Business Development Manager, AM+A

Mr. Aaron Marcus, President
Aaron Marcus and Associates, Inc.
1144 65th Street, Suite F
Emeryville, CA 94608-1109 USA
Tel: 510-601-0994, Fax: 510-547-6125
Email: marcus.1@applelink.apple.com

APPENDIX E
REMINDER AND NOTICE OF SUBMISSION OF QUESTION OUTLINE

March 29, 1995

Ms. Paula Scher
Pentagram Design, Inc.
212 Fifth Avenue
17th Floor
Manhattan, New York 10010

Dear Ms. Scher:

I am looking forward to our scheduled interview session on Monday, April 17, 1995 at 10:00 am.

I have enclosed a copy of the outline of questions which will be asked in the interview. By providing the questions in advance, all participants get the opportunity begin to consider in greater depth, the questions that will be posed. This also assists me in keeping the session to the one hour time slot we have agreed upon.

Please take the time to review and reflect on the questions before the interview. If there are any questions or comments on the information contained in the attachment, please contact me by phone at 614/292-6650, or 614/421-1012.

In my dissertation, I would also like to include a biographical sketch on each participant to precede the documentation of your responses. If there is any information that you would like included in this section (your background and/or current activities), please send it to me via the address printed on this stationery.

I appreciate your willingness to participate in my study, and am excited about our meeting in April.

Sincerely,

Brenda Smith Faison
Doctoral Student

APPENDIX F
INTERVIEW QUESTIONS

Interview Questions

Section 1: Introduction to Computers

1. What was your initial introduction to computer technology as a potential medium for your own work? (what platform [Mac, PC, Amiga, SGI, etc.]; software; and environment [at home, in a classroom/lab environment, in the workplace, etc.]?)
2. Where are you now in terms of platforms and software as an educator (in classroom/lab environment), or as a practitioner (in the workplace)?

Section 2: General - Technology and Graphic Design

3. Once you recognized that these technologies would become some of the standard tools of design, how did you proceed step-by-step, in your investigation and exploration of these tools for your own work (as an educator, or as a practitioner)?
4. Were there any critical issues that slowed or accelerated the transition from traditional graphic design methods to computer-based methods?
5. When first considering automation, did the cost of hardware/software slow the decision to change? Please explain.
6. Was the shift a natural one, or was it forced by competition? Please explain.
7. How has the technology affected you as a designer (educator or practitioner) economically?
 - In Education: economic affect on design department: funding & funding methods, etc.
 - In Practice: economic affect on the design firm: justification, cost effectiveness, productivity, increased or decreased profits, etc.
8. Did the learning curve or time commitment seem too great to justify the shift?
 - Education: training of faculty members
 - Practice: training of staff members
9. What are the perceived benefits of the shift?

10. What are the perceived negative results of the shift; short and long term?

11. What does this information portend (signify in advance) for education and the educator in the future?

Section 3: Interactive Multimedia-specific Questions

12. Traditionally, the work of the graphic designer primarily took the form of print communications and signage. What processes and principles have you incorporated from your traditional background toward the transition to a medium based on interactivity?

13. How do you define the concept of interactivity?

14. What overall trends might be found in design education and practice contributing to the development of interactive multimedia as a technologically-based medium? (Or, to what extent does design education and practice affect the development of interactive multimedia?)

15. Sophisticated interactive multimedia has been described as a multidisciplinary endeavor requiring diverse skills formerly in the domain of disciplines such as film/cinema, music, animation, and computer science. Though individual control of all aspects of multimedia production is now possible, is it desirable? Please explain.

16. What is the affect of this technological revolution (interactive multimedia) on the need to develop expertise that spans a number of disciplines?

17. What are the implications of the interdisciplinary design process for design education, e.g. should the curriculum emphasize collaborative processes, cooperative teamwork, and distributed production, in addition to more traditional methods of research, design, and production?

18. Further, does the design of interactive media require a new sensitivity to the cognitive abilities and preferences of the audience? How might one begin to address these issues? (issues in questions 15-18)

19. What is the role of the graphic designer on this interdisciplinary team? (conductor's/director's position?, production function?; a combination of roles?, what exactly?)

Section 4: Recommendations/Speculation

20. (P) As a design practitioner, what recommendations do you have for design educators, and the design education process with respect to emerging technologies: availability in the classroom/lab, teaching strategy, etc. (practitioners).

20. (E) As a design educator, what recommendations do you have for the practitioner on the use of newer media: its development, direction, application, etc. (educators)?

21. Finally, who (or what) do you think is driving the technology: the hardware and software developers and manufacturers; or consumers (designers/artists, and other users), perhaps both? Please select and explain.

APPENDIX G
THANK YOU AND FOLLOW UP LETTER

May 4, 1995

Paula Scher
Partner/Graphic Designer
Pentagram Design, Inc.
212 Fifth Avenue, 17th Floor
New York, NY 10010

Dear Ms. Scher:

I enjoyed our April interview session, and found it informative and thought provoking. It will be a valued contribution to my study on transition in the graphic design industry.

Enclosed, please find a copy of your transcribed interview. I am sending it as a proof copy. When you get the opportunity, please read through it carefully. For application to the dissertation, the interviews will be analyzed, and later presented as raw primary source data.

They will be documented as an informal dialogue which the reader can listen in on. So as much as possible, I have avoided paraphrasing. I've tried to indicate unclear areas with parenthesis and question marks. Occasionally, I noted if something was blurred on the tape, or if a voice dropped or was lowered, and prevented clear representation.

Grammatical issues here are not as important as content. I think that different ways of constructing thoughts verbally add contrast from one participant to the next, and makes the reading more interesting for the reader. The main purpose of the proof is to check to see if the intent and/or meaning of your response has been accurately documented. Feel free to make clear any discrepancies.

If you make changes or corrections, return the marked proof to me at the address on this letterhead by May 26, 1995. Otherwise, I will proceed with what is on the proof. I have received background information (resume, or biographical sketch, etc.), a slide (of interviewee), as well as company or school literature from most participants. I'm trying to collect these by May 15, 1995. Literature on all academic institutions has been received.

I would like to continue to keep in touch with you as the study proceeds in order to follow up. Any additional follow up can be handled by e-mail, fax, phone, or letter. If you have any questions, comments, suggestions, or concerns, please feel free to contact me at 614.421.1012 (hm), 614.292.6650 (campus), 614.292.7641(fax), bfaison@magnus.acs.ohio-state.edu (e-mail).

Again, thank you for your participation.

Sincerely,

Brenda Smith Faison
Doctoral Student

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