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**COMPUTERS AND CREATIVITY IN THE THEATRE**

by

Virginia Lee Salmon

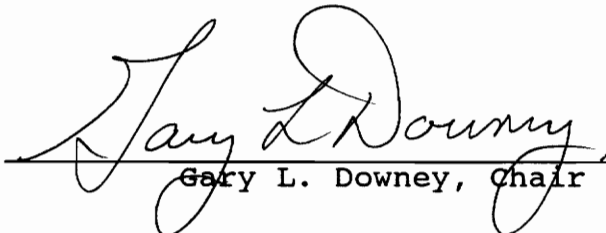
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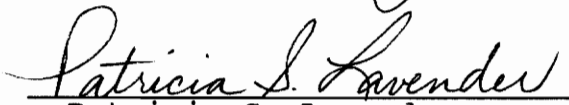
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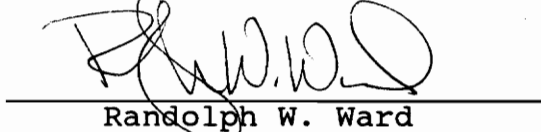
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## COMPUTERS AND CREATIVITY IN THE THEATRE

by

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Science and Technology Studies

(ABSTRACT)

The social definition of the theatre as an expressive art and a place for individual creativity shapes the introduction of computers in the theatre. In a study of the development of computer usage in theatre, the issue of creativity must be addressed in order to fully understand technological implementation.

In other areas of society, such as business, industry and government, computer implementation does not have to address the issue of creativity. In these areas, the issue is integrating the computer into established activities with the least amount of disruption.

In theatre, however, the creativity issue is an underlying concern for the integration of computer systems in some areas. Computers are more readily accepted in administration, where the work tends to be more structured and repeatable. In the design areas, with the emphasis on individual creativity, the computer has been adopted more slowly.

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## **Chapter 1**

### **Introduction and Computer Use in the Theatre**

This thesis is a study of the development of computer usage in the theatre and the issues raised by the introduction of computers. These issues are related to the social definition of theatre. Computer usage is shaped by the unique identity of the theatre as a site for individual creativity. In the arts, computer advocates are users who are able to incorporate the computer as an aid to creativity. Problems arise when the computer is perceived as a replacement of or challenge to creativity. Creativity is a defining characteristic that makes the theatre unique from other institutions such as business, industry and government.

The public and professional social perception of theatre views theatre as an art form which entails uniqueness. Theatre is perceived to be a craft which follows traditional methods in order to present a creative endeavor. This perception does not extend to other industries in which design is important. Generally, people expect architects and engineers to use computers in their work. Computer use in design in architecture, engineering and other industries is a team effort, with multiple designers. In theatre, design is very individualistic, with a single person responsible for the design. The contributions of individuals in terms of the

final product creates a social and cultural understanding of the difference between the products of architecture and theatre.

Theatre is composed of a group of individuals who collaborate to produce the final result. In theatre, there is an emphasis on and encouragement of individuality, perhaps because of the traditional nature of theatre as a craft. Webster's New Collegiate Dictionary (1980) defines craft as "an occupation or trade requiring manual dexterity or artistic skill" - both characteristics defining theatre. The computer advocates in theatre, unlike in other industries, are users who deal with the issues regarding computer use on an individual basis which is not dependent on their official roles and responsibilities within the theatre organization.

Theatre's distinctive problem is that of integrating technology while preserving creativity. The social definition of theatre has a creative mind as the source of development, and theatre people understand the importance of reserving an area for creativity - the human contribution. Each theatre production is an original, one-of-a-kind collaboration of individual creative efforts. The production is an art which does not rely on manufactured products as the source of creativity.

The introduction of computers in theatre is shaped by the social definition of theatre as an artistic, creative institution. Computer usage in other institutions, such as

business, industry and government, is not affected by the issue of creativity. Even within theatre, some areas more readily adopt and modify computers and software than others.

The major distinction in computer use in theatre is between use for data management versus use for creative expression. In administration, for example, the majority of the work is routinized and can be computerized with few difficulties. With lighting, sound, and set and costume design, two different yet interconnected aspects are involved. One aspect is that the creation of the concept is an individual expression or interpretation of an idea. The other aspect is the execution of this creative concept. The execution may lend itself to computerization. For example, in lighting and sound, the designer must work with set constraints such as physical space and available equipment. The decision of how to use the space and equipment is a creative one. The actual execution of lighting and sound cues, however, can be more efficiently and accurately controlled by computer.

The adoption of hardware and software in the various areas of theatre depends on technological developments outside of the theatre and how readily these developments can be modified and implemented. Originally, computer technology was developed to make routine tasks involving data management faster and more efficient. The more creative aspects of theatre design and production could not be addressed by such

technology. As faster and more powerful computers become relatively inexpensive and software is developed to assist design, the theatre is able to integrate this technology into traditional creative realms.

### **Development of Computer Usage in Theatre**

What follows is a brief overview of computer application in theatre. This survey focuses on the technology available, more than on its actual use. The majority of the published information suggests that computer usage is widespread and equipment is readily available. Economic factors strongly influence the amount and availability of hardware and software, which varies greatly from regional/local theatres to universities to major Broadway and rock and roll productions.

Theatre practitioners use computers mainly in the administrative and technical areas. The development of computer usage is relatively recent and limited in technical theatre, although hardware and software have become more readily available in recent years. Technical theatre is the area that focuses on the technical aspects of a production such as lighting, sound, set and costume design and construction. The performance area of theatre, where the major use of computers at present is word processing, is concerned with the acting, directing and stage managing aspects. The administrative section of theatre includes

payroll, box office, public relations, publicity, and other duties related to the management of a theatre.

Computers initially appeared in administrative areas, since use in these areas required no special modification of existing hardware or software. The theatre adopted computers in lighting in the late 1960s and early 1970s when the modifications necessary for implementation had been made. In these instances, the available software facilitated the completion of routine tasks. Since computers were successfully utilized in lighting, they are more freely accepted in other areas of the theatre and, as theatre personnel develop and modify software programs for these various areas, the computer can be utilized more efficiently. Computerization is relatively recent in areas that require more specialized programs, such as set and costume design, and areas that require more complicated execution, such as sound. The theatre has adopted and modified hardware and software technology during the last three decades, but implementation of the equipment often depends upon economic factors.

For some time after the introduction of the computer in the technical areas, theatre practitioners used the technology only in the production planning stages. As the software became more flexible and theatre specific, however, technical personnel employed computers more often during productions. Some technical theatre personnel have written

software programs in order to take advantage of the computer's ability to manipulate large quantities of information at great speeds and so make technical tasks less time-consuming and more accurate. The needs of the rock and roll touring industry for fast, dependable lighting and sound effects has greatly accelerated the development of computer software in these areas. "Computers excel at handling repetitive tasks accurately, every time. They never get bored or distracted and miss a cue" (Sisk, 1986 p. 76).

### **Administrative Use**

The administrative area of theatre was the first to adopt computers because of the accessibility and applicability of existing programs. Theatre people use computers in administration and for management purposes in much the same manner that the computer is utilized in other organizations - for repetitive and/or routinized tasks. Although few software designers create packages specifically for administrative theatre, many software packages are readily available and can be operated with little or no modification. Administrators employ computer technology for routine paperwork, accounting and payroll files, and for maintaining fundraising and subscription lists. In addition, existing available programs maintain costume and materials inventories, which allows easy access and reduces the potential for unnecessary duplication.

Computer software programs have been developed for the theatre box office. These programs maintain ticket information, including ticket purchases, reservations, and seats available. For organizations which keep ticket information for several events, a computerized system reduces the potential for mistakes and confusion (Bay, 1983). The information is also valuable for publicity people who want to target specific audiences for promotional material for an event or series of events.

In recent years, people working in publicity have taken advantage of desktop publishing packages in order to produce professional quality newsletters, brochures, programs and other printed materials. These software packages can significantly decrease production costs and allow greater flexibility in production of time-sensitive materials (Smith, 1988). As with all areas of theatre, the utilization of desktop publishing depends on the budget for equipment and an interest from the publicity people in using the computer. "While many people expressed interest in desktop publishing," says one observer (Smith, 1988, p. 36), "the reality is that few theatres have a budget that can accommodate the purchase of a system."

### **Lighting**

Computer memory devices for controlling the intensity of lighting (dimming) have been in use in the theatre for almost

twenty-five years. In the seventeenth and eighteenth centuries, candles were used for lighting. Gas lighting became more common in the nineteenth century, and theatres began installing electrical lighting in the late 1800s and early 1900s (Parker, Smith and Wolf, 1985).

Prior to the introduction of computerized lighting control, theatre practitioners used various dimmer control systems. The earliest systems were direct control dimmers, which required an operator to move handles that were mechanically attached to the devices controlling the power going to the lamps (Bellman, 1983, p. 352). These systems tended to be large and required a great deal of coordination and exact timing in order to execute the cues. In the 1930s, the autotransformer dimmer (ATD) was invented. The ATD is a lighting control device still in use in some theatres and the most common dimmer in portable control boards until electronic control systems were developed. Remote control systems, where a small unit tells a far removed electrical dimmer to raise or lower the light intensity, allow for more precise control of dimming and are safer than direct control systems (Bellman, 1983).

With the introduction of computerized lighting control in the late 1960s and early 1970s, theatre personnel could execute effects previously considered too difficult or even impossible. As further modification of the software made the computer more desirable for lighting control, lighting

designers and technicians began utilizing the computer during productions. With computers, lighting designers gained more flexibility in lighting and took advantage of the potential for more complex and sophisticated effects (Parker, Smith and Wolf, 1985). Bellman (1983) notes that ". . . the introduction of computer techniques has opened the way to still more sophisticated concepts than are presently in use" (p. 356).

The computer stores and recalls predetermined dimmer levels and time fade rates and executes changes faster and more accurately than a person using a manual or preset console. By using the computer, the lighting designer can carefully plan and control lighting effects in order to achieve a specific mood or atmosphere. Because computers are very accurate at handling repetitive tasks, more and extremely subtle lighting changes can be consistently and efficiently achieved. For example, a computer can smoothly and accurately execute extremely slow fades at the end of a scene or a series of lighting changes too rapid for a person operating a manual console.

Computer use in the preliminary design aspects of lighting are a later adaptation, mainly because the necessary software and hardware have been available only within the past four or five years. Existing and developing software assists in the creative process by acting as a tool to save time. Some software enables designers to access information

about lighting instruments, types and locations that previously had been entered into the computer. The lighting designer can test possibilities and store the information, as well as use the computer to illustrate the beam spread pattern of a lighting instrument hung in a specific position (Brooks, 1983).

Advocates introduced the computer in theatre lighting as a logical step in controlling the more routine tasks associated with a production. The computers drive the same kind of voltage-controlled dimmers as remote console units, but use digital-to-analog (DAC) converters. The DAC converter is a miniature electrical device that generates a low voltage analog signal which is applied to the dimmer's control-voltage input, determining the final output of the dimmer. An operator enters information about dimmer levels and lighting changes into the computer memory. The lighting computers can compile and manage lighting cue level readings, rearrange lighting cue sequences, and record the intensity levels of individual dimmers. The video display provides a visual indication of the program data, in addition to the execution of the internal program commands. Data displayed on the screen includes information about dimmer levels, the length of time-fades and presently active cues.

## **Sound**

The nature of theatre sound requirements is such that program modifications in computerized sound systems have been more difficult, and it is only within the last five years that computerized sound systems are becoming relatively common in the theatre. The lack of software providing for the specialized sound requirements of live theatre is the reason that the utilization of automated sound systems in the theatre is a relatively recent development. Recording studios have employed computerized sound systems since the mid 1970s, but traditional resistance to new technology, limitations of the system, and expense has resulted in few sound systems in the theatre until the mid 1980s (Sisk, 1986). Theatre personnel had to adapt the main advantages of computer-controlled sound systems - repeatability and flexibility - to the more complex needs of live theatre, such as the needs for certain sounds from specific speakers and the variations which occur in every live performance. At present, the theatre requires further developments in software for sound systems that are more affordable and adaptable to the needs of the theatre. Sound designers are encouraged by the advances made in computerized lighting. They continue to discuss desirable features in computerized sound systems and to modify existing programs (Richmond, 1988, Part I).

Theatre sound designers have found that developments in digital technology make the utilization of computer-controlled sound systems more appealing for both production and creative design. In the production area, there are two types of digital mixing units available. A digital control console processes program material in analog form, with faders, mutes, routing and equalization controlled by a microprocessor. An all-digital console, which is more common than the digital control type, has an A/D converter at the console input and signals are processed digitally, instead of in analog form. The mixer unit accepts signals from several inputs, such as taped dialogue, music, sound effects and/or live microphones, and feeds these signals to a common sound distribution system. The computer operator controls the signal from the input devices and then routes the signal to recorders, special effects devices or power amplifiers (Finelli, 1989).

Advocates introduced MIDI (musical instrument digital interface) from the recording industry, a move which encouraged the utilization of specialized performance controllers and sequences, as well as computers, with sound systems. These systems are standard control signal interfaces which allow one or more instrument(s) to be controlled from a master controller. By the summer of 1982, advocates had introduced MIDI to the music world and theatre personnel have gradually incorporated MIDI into the theatre

because of the recognized advantages of the interface. Eddy (1989) remarks that "many universities and regional theatres have been adding MIDI to the tools of their sound designers, allowing them previously unequalled freedom in creating effects, scoring shows, and real time control" (p. 32). The interface has a communication language which allows digital devices to communicate with one another, and codes can be transmitted at a rapid rate that allows almost instant communication and response (Finelli, 1989). MIDI codes are not actual sounds, but the representation of the mechanics of how the sound was created. Computers serve as the sequencers to control the output of multiple MIDI devices and so achieve extremely accurate and rapid sound cue changes.

Basic computerized sound systems can alter, play back or permanently store data, features which are shared with computerized lighting systems. In terms of creative tools, computer sound systems have various software packages available for composing, score writing and sound synthesis, which allows the computer user to create and perform entire compositions. This feature can be utilized to create original musical scores. Designers and technicians employ microprocessors increasingly for programmable delays, effects processing and digital control, which means that the operator can execute sound cues quickly and smoothly, and can control the movement of sound on stage by automatic panning and output selection (Finelli, 1989). The computer is ideal for

flexibility in sources and locations for sound reproduction, as the operator can use it to adjust levels of microphones and speakers within the parameters established by the sound system and the physical space. Although designers have made numerous modifications in computer-controlled sound systems in order to adapt them to the theatre, they are still perfecting the systems to be more accurate and efficient.

### **Scene and Costume Design**

Scenic and costume design have been challenging areas for theatre computer advocates. The software programs have to be flexible enough to allow individual creativity, yet offer enough features to make the design process faster and the design easier to modify. Computer advocates have been and are now developing programs for scenic and costume design. The advent of microcomputers such as the Macintosh, Commodore's Amiga, Compaq and others in the mid 1980s addressed many of the obstacles for using computers - prohibitive cost, "lack of sophisticated software designed for the theatre's rather specific needs, the great amount of time and specialized knowledge necessary for writing appropriate programs and using them to generate computer graphics, and the general lack of sensitivity and refinement in such programs (Reaney, 1989 p. 23). As in all areas, programs in scene and costume design are still developing. Existing programs provide designers with fast and accurate

depictions of stage space and sets, as well as period and innovative costumes.

When the concept of using computers for graphic design was first introduced in the early 1980s, software had to be specifically designed for the special needs of the theatre, since no ready-made graphic programs were available (Ness and Fleming, 1983). With the availability of computer design programs now, designers no longer have to rely on slower drafting methods (if the programs and computers are available to them). Theatre instructors still teach traditional drafting techniques, since students must learn the basic concepts in order to create designs, whether manually or with computer assistance.

Some scene designers use computer-assisted design programs, which allow the designer to store and access the theatre's dimensions. A three-dimensional model of the set can then be created and viewed on the screen. "Three-dimensional representations, once created, can then be combined, moved, rotated on any axis, viewed from any distance or angle, shown in orthographic projection, or even animated" (Reaney, 1989 p. 25). The designer can rotate the computer model so that different audience viewpoints can be checked for potential sightline problems. By using the computer, set furnishings can be placed and moved by pressing keys, allowing the designer to view different combinations before the pieces are physically moved (File and Joy, 1983).

Costume designers now can use computer graphics for flat pattern drafting, and some programs allow the designer to construct a costume on the screen. This construction can be altered before the actual garment is created. With available programs, the costume shop personnel can keep measurements of the actors on file, as well as historical information about clothing styles and materials, which the costumer can utilize in creating the costume. One of the most useful programs available off-the-shelf is designed for costume inventory, providing information such as size, color, condition and storage location on each costume (Bays, 1983).

### **Outline of Chapters**

The social definition of theatre as a craft which emphasizes and values individual creativity shapes the introduction of computer technology in the various areas of the theatre. At present, in the American theatre community, computers are more or less accepted on two levels - for repetitious, routine tasks involved in administration and production, and for assistance in the actual portrayal of the creative vision.

Various other factors affect computer adoption in theatre. These factors may include ability to experiment and create programs and the availability of materials, equipment and instruction. Such factors are not unique to theatre,

however, and may play important roles in determining the extent of computer application in any industry.

The second chapter examines the introduction of computers in other institutions. Although they share some similarities in terms of advocate and user characteristics, other industries do not consider creativity as a defining factor that must be considered. Computer implementation in business, industry and government occurs in a structured, relatively uniform manner within the organizations. In theatre, however, computer implementation is much more informal and haphazard because of the individual nature of the craft.

The third chapter presents information obtained in interviews with practicing theatre professionals. Their responses to open-ended questions reveal the importance of the individual and creativity with regards to computer implementation in theatre.

The final chapter summarizes how the social definition of theatre affects the introduction of computers. Creativity plays an important role in the introduction of technology in the theatre.

**Chapter 2**  
**Studies of Computer Use in**  
**Business, Industry and Government**

This chapter presents a survey of the existing literature on computer introduction in various industries and offers a comparison between theatre and other industries. The literature dealing with the introduction of computers in organizations does not address the issue of creativity in business, industry and government contexts. The majority of the research concentrates on the attitudes of computer users and factors which make them more or less resistant to computerization. Information on the characteristics of computer advocates is not extensive. The main focus of the studies is on the integration of the computer into the organization and how the computer merges with existing roles.

Several studies involve the social psychological aspects of computerization (Kling, 1974; Kling & Iacono, 1988; Morrison, 1983; Lee, 1970; Hill, et. al., 1987; Elder, et. al., 1987; Jonasson, 1980). The majority of studies focus on effective business and management practices for implementing computer systems (Danziger & Kraemer, 1986; Lasden, 1981; Weir, 1977; Callahan & Fleenor, 1987; Rockart & Flannery, 1983; Howard & Smith, 1986; Doll & Torkzadeh, 1989; den Hertog, et. al, 1980). The studies outlining

effective business practices also include varying degrees of emphasis on the psychology of the user and how to overcome resistance to computerization.

### **Computer Advocates**

Computer systems are popular because of the computer's ability to repeat tasks precisely and rapidly. Widespread organizational computer use began in the early 1950s and initially the expense of the system, reluctance to abandon familiar procedures, and suspicion of the new technology limited its use. After an initial slow start, however, computer use spread rapidly. "Few technical innovations have ever grown so fast or so broadly as the computer, and few have been accompanied by such far reaching effects and intensity of change" (Withington, 1969, p. vi).

In the 1950s and 1960s, the advocates of change in business tended to be the people in charge - the administrators and/or managers (those who controlled salaries and employment). Managers introduced computers for reasons of efficiency, and implementation in the early days was dictated by the cost of the equipment. ". . . the leadership of the actual change process is in the hands of those who manage the activities that are changing. Ultimately, he who controls salaries and issues day-to-day instructions controls the course of events" (Withington, 1969, p. 53). Jonasson (1980), who studies the introduction of computers in European

organizations, believes that the leaders in the computer revolution in the workplace are the inventors, the manufacturers of computers, and the organization managers who implement the computers.

The advocates of computerization in business, industry and government in the mid 1980s tended to be middle and upper class professionals who portrayed computer use in a very positive manner, emphasizing the advantages of efficiency and productivity. In their study of computerization movements, Kling and Iacono (1988) identify strongly committed advocates as the force behind computerization in an organization. These advocates develop and encourage ideas about computing advantages and how people "should manage and organize access to computing" (Kling and Iacono, 1988, p. 227). These advocates emphasize the acquisition of advanced equipment, since the presently available equipment is too limited. By stressing the inadequacies of presently available systems, advocates present "a focus on future technology [which] helps deflect attention from the problems of using today's technologies effectively while offering the hope of salvation soon" (Kling and Iacono, 1988, p. 236).

The King and Iacono (1988) study recognizes that computerization is not only related to economic factors, but that "the adoption, acquisition, installation and operation of computer-based systems is often much more socially charged than the adoption and operation of other equipment such as

telephone systems, photocopiers, air conditioners, or elevators" (Kling and Iacono, 1988, p. 227). The attitude and support of the advocates is a factor in how the users accept the technology. For example, when computers were first introduced in industry, employees depended on their supervisors for instruction about and leadership with the new technology. If the supervisor was not enthusiastic and supportive of the new method, employees were less likely to accept it (Withington, 1969, p. 54).

The major difference between theatre and other industries in terms of advocates is the manner of computer implementation. In theatre, it appears that there is no organized administrative effort to introduce computerization and no sense of anyone being forced to use the computers. The belief that creativity cannot be mandated is very strong. In business, industry and government, computer advocates tend to be administrators and people in positions of authority who make the decision to computerize. The end users are expected to adopt the technology. Although the administration attempts to make implementation as smooth as possible, there is no question of whether the end users will utilize the computers. The administration mandates computer use and end users either comply or find other employment.

## **Advocate Strategies**

Weir (1977) compares different management strategies for implementing computer systems. She identifies three major types of approaches which cover the various strategies - the paternalistic, delegative and participative approaches. In the paternalistic approach, computer specialists design and implement systems with little or no feedback or input from the end users. The paternalistic approach is most frequently used and, since the users have little or no involvement with the system implementation, they are often unenthusiastic and may take a long time to fully accept the new system. With the delegative approach, the user departments do a lot of the planning and preparation work while the specialists deal with difficult, specialized tasks. With the participative approach, the users do the planning and design of a system which is very specific for their needs. User expertise and knowledge is recognized and applied directly in the systems design. "Such close participation by users in creating their own system usually results in a much greater willingness to cope readily with the extra work and upheaval of implementation and a speedier and smoother changeover to the new system" (Weir, 1977, p. 9).

When managers "push" systems without fully understanding the social and psychological needs of the users, the change often causes disruption and inconvenience, and heightens user resistance to further change (Jonasson, 1980). In addition,

poorly designed systems are inefficient and cause user resistance and dissatisfaction. When computer systems do not fit the social system or the needs of the organization or users, organizations are faced with problems such as "resistance to change; inefficient use of the systems concerned; conflicts between groups and departments; dissatisfaction with the work situation; planning data and budgets for automation projects being exceeded; [and] customer complaints" (den Hertog, Wielinga and Heine, 1980, p. 111).

In the theatre, the development or modification of software packages depends on a few small companies or the person within the organization who sees a need for the program. The users are the advocates of the systems. There is no concerted effort to computerize and, as noted earlier, no overall authority to direct an organization-wide implementation. Theatre practitioners, for the most part, are anxious to acquire computers and most organizations have a few different types available (mainly IBM and Apple). In addition, the needs of various theatre professionals cannot be met by any one software package. The production and administration aspects require different software functions than designers require.

## **End-Users**

The largest amount of research on computer use focuses on the "end user," whom Danziger and Kraemer (1986) describe as a person who uses the computer or its products in the performance of his/her activities, whether work related or personal. In their book on computing impact on users in organizations, Danziger and Kraemer (1986) find that the impacts of computing are occasionally related to personal traits such as education and age. The more important factors seem to be the person's experience with and attitudes toward computers, professional orientation, length of service in the job, and sense of competency with the computer. The most active user has experience with computing in the workplace, is computer competent, and has a positive working relationship with computing (Danziger and Kraemer, 1986, p. 69). Utilization and "positive effects" of computing tend to increase as the end user develops experience and a sense of competency.

A study by Rockart and Flannery (1983) identifying end users in business and their needs indicated that there is no stereotypical end user with a defined set of characteristics. End users tend to be diverse, and so need differentiated education, training and support. Danziger and Kraemer (1986) comment that, in addition to the previously noted characteristics of computer users, people who are "younger, more professionally oriented, more computer competent and

more positively oriented toward computer specialists might be expected to use computing more than those who are older, less professionally oriented, less computer competent, and less positively oriented toward computer specialists" (p. 62).

Doll and Torkzadeh (1989) study end user involvement in the design of computer information systems, specifically management information systems. They find that some end users quickly adopt new technologies and develop considerable skill, while others seem to have difficulty learning to use computer systems. The difference between these two types may be because of a great diversity in skill and motivation, computer anxiety, and/or beliefs about the person's own ability to master the computer and the potential benefits.

Theatre end users/advocates fit the general descriptions presented by Danziger and Kraemer (1986), Rockart and Flannery (1983) and Doll and Torkzadeh (1989). The major differences between theatre end users and their counterparts in other industries are the individual emphasis on creativity, independence in deciding about computer utilization, and the individual's role as an advocate of implementation.

### **End User Attitudes**

People tend to view computers in one of two ways - as a "beneficial tool of man," an instrument to help speed up

progress and achievements, or as an "awesome thinking machine," a machine that is smarter than people (Morrison, 1983). Morrison replicated Robert Lee's survey in order to see if computer attitudes had changed since the publication of Lee's survey in 1970. His subjects were 412 Australian students who responded to a questionnaire. Lee's survey was actually conducted in 1963 and involved a survey of 3,000 respondents. Lee's survey is regarded as a standard guide for measuring how attitudes towards computers have changed over time.

From the information gathered in his 1963 survey of people's attitudes toward computers, Lee (1970) articulated the two distinctions among people that Morrison used in his 1983 study. Lee notes that people who view the computer as a thinking machine react with awe and a sense of inferiority. They have the idea that the computer can perform human thinking functions and thus downgrade humans. People who are intimidated by computers tend to be "those segments of the population characterized by low income, low occupational level, and poor education" (Lee, 1970, p. 57). On the other hand, the people who view computers as an instrument tend to have a higher educational level, which apparently increases their ability to deal comfortably with ambiguities and uncertainties. A person's "view of computers is fostered by (1) an overall cognitive receptivity and curiosity about the new and different, (2) an attitude of generalized trust and

optimism about people and social institutions, (3) a curiosity about mechanical things, and (4) familiarity with the world of business" (Lee, 1970, p. 58).

Users give different reasons for utilizing computers, including a recognition of the potential of computers for improving decision-making and productivity. With recent improvements in technical capabilities, computers are easier to use and more readily available at lower costs. Users feel that computers meet the need for effective analysis, planning and control of more (and more detailed) information because traditional information systems cannot meet the users' perceived needs (Rockart and Flannery, 1983).

In their survey, Hill, Smith and Mann (1987) administered questionnaires to undergraduate students in beginning psychology courses in order to investigate the relationship between people's expectations about controlling computers and their decision to use them (p. 307). In their survey, they indicate that some people find that "the computer's ability to process large amounts of information at high speeds makes it irreplaceable for facilitating a variety of tasks," while computer illiterates and "techno-phobics" see computers as too complex (Hill, Smith and Mann, 1987, p. 307). The techno-phobics feel that they cannot control the computers, and so avoid them. One of the reasons for a person's negative attitude may be that (s)he is afraid of the computer, even though (s)he is willing to learn. These

studies suggest that, in some instances, rapid technological advance has been overwhelming and made the person feel that the computer is uncontrollable. Also, the user may have been frustrated with the initial experience with the computer. An individual's feelings of competency with respect to computers is often an important factor in terms of the decision to use them. An individual who has a negative attitude towards computer utilization can change his/her feelings with more experience. Often, "'direct' experience of control over a previously avoided task or object is likely to reduce anxieties and induce the individual to change [his/her] behavior" (Hill, Smith and Mann, 1987, p. 313).

#### **End User Resistance and Technostress**

Employees may initially feel anxiety about and resistance to computers, but computers do improve productivity and employee motivation over time. Callahan and Fleenor (1987) looked at computers in business. They discuss computer resistance and note that "work is an important element in people's lives, and any change in it is at least mildly threatening. Couple this human feeling with the introduction of an unfamiliar technology and there is significant potential for disruption" (p. 78). User resistance to computers may arise from different viewpoints between management and the employee, the user's fear of "de-skilling" (that the computer will make his/her knowledge and skills

obsolete), and the user's fear of layoffs, job elimination or demotion. Additionally, the user may perceive the computer as a threat to his/her self-esteem or others' image of him/her. Computers may also appear as a threat to the existing power structure or established procedures.

Elder, Gardner and Ruth (1987) conducted a study of gender and age factors in technostress, a "'computer-generated form of physical and emotional burnout' resulting from the 'inability of an individual or organization to adapt to the introduction and operation of new technology'" (p. 17). This study found that of white collar workers, women more than men and older people more than younger ones are affected by technostress. Women are more affected because of a generally greater anxiety towards the computer and mathematical processes, which is often a result of early education, training and expectations. Older people did not grow up with computers and so may feel more threatened by and resistant to the technology. They conclude that for almost all but the most severe cases, training can alleviate the stress and anxiety associated with technostress.

Although there may be computer resistance within the theatre, some of the reasons for this resistance are different from those found in other industries. Theatre practitioners realize that they cannot be replaced by a computer. The creative nature of theatre demands human input and flexibility. Another reason for resistance or hesitancy

in the theatre is that the individual is not convinced that the computer can do the work faster, better or more creatively than (s)he can using traditional methods. The individual nature of the theatre also means that there is not a great deal of pressure from the administration for everyone to use computers.

### **Strategies Used to Overcome User Resistance**

Withington (1969) notes that "a change in ways of doing things may force many individuals to adjust their behavior. Many of them will not be enthusiastic; they will have to overcome ignorance, suspicion and inertia" (p. 50). Change is often greeted by fear, discomfort, lack of understanding and resentment, and these sentiments can lead to impaired morale and a decline in productivity.

User resistance can be dealt with through training, education and communication. When users are psychologically prepared for change and understand the system, they are more accepting of the change (Lasden, 1981). Users also tend to adopt changes easier and more willingly if they feel that they have a say in the system design (Weir, 1977). When end users participate in systems design, they show reduced resistance to and greater acceptance of the system. The benefits of participation involve the user's greater feelings of control, better understanding of the system, better utilization of information, greater trust in the system and

greater ego involvement, all of which increase productivity (Doll and Torkzadeh, 1989). These studies conclude that the major factors in overcoming user resistance include user involvement in the design of the system, user friendly and flexible systems, and an integrated approach to job and computer system design.

Callahan and Fleenor (1987) also recommend solutions for reducing resistance. Their suggestions include management leading by example, whereby management offices are computerized and serve as working demonstrations of computer capabilities. They also advise management to encourage and reward employee interest and curiosity, to provide thorough training, and to keep employees fully informed about the system under consideration.

In theatre, as in other industries, training and education help prepare individuals for computerization. While other organizations may sponsor special training sessions or pay for classes, computer instruction in theatre tends to be informal. Very few universities or colleges presently offer special classes dealing with theatre specific computer use. Students receive informal "hands on" training, limited training included with other class material, or go outside of the department for more general computer courses. Other theatre practitioners have taught themselves. The high level of individual effort in learning various software packages and applications give the users in theatre a greater

sense of accomplishment, as well as frustration with having to learn on their own with no formal assistance.

## **Conclusion**

The research on computer use focus on computer advocates, users and user resistance in business, industry and government. This research addresses industries defined by mass production, uniform repetitive tasks or enormous amounts of paperwork. Institutions such as the theatre, which is defined by creativity, are not included in the scope of the research.

According to the research, the role of leadership in computerization falls mainly upon management and system designers. Perhaps this view is correct in regard to structured authoritarian organizations such as business, industry and the government. This situation does not apply to the theatre, however, as the information in Chapter 3 indicates.

Computer advocates in business and industry are identified as administrators, managers and strongly committed advocates in a position to develop and encourage ideas, such as middle and upper class professionals (Withington, 1969; Jonasson, 1980; Kling & Iacono, 1988). There is only brief mention (Lasden, 1981) about influential users serving as natural leaders. Even in cases where there are natural

leaders, however, these people are encouraged and supported by the management.

Most of these reviews concentrate on user resistance and how organizations recognize and deal with this problem. The strategies offer management a way to handle negative reactions, as well as make computerization less stressful for the employees. Most studies identify the management of the organization as the introducers, with motives of greater efficiency and lower costs. "In short, people view computing as a tool to cut costs, help coordinate organizationally distinct but substantively related activities, and help rationalize organizational decision-making" (Kling, 1974, p. 6).

The studies do not agree on general characteristics of users, except for a few which argue that education, age and sex make some difference as to how easily an individual accepts the new technology. Most of the studies do agree, however, that these are not necessarily determining factors. The studies seem to indicate that people who view the computer as a tool and have adequate training and encouragement adapt easier to computerization.

The majority of the studies also recognize major factors in resistance to computerization. These factors include: anxiety; fear of new technology; feelings of lack or loss of control; fear of de-skilling; fear of job loss or demotion; sense of a threat to the person's self-esteem or others'

image of that person; lack of knowledge about the system; and the person's perception of his/her own ability to manipulate the computer. Most, if not all, of these factors can be resolved through education, training and communication.

### **Implications for Theatre**

A survey of the general literature dealing with computerization has not yielded any studies dealing with computerization in the arts or humanities. The closest research presents information about office workers' attitudes. The unique needs of the arts, in terms of the emphasis on performance and creativity, are not addressed in available studies.

With the exception of administration and lighting, the theatre has only computerized within the last ten years. If generalizations from business and industry (including government) can be applied to the theatre, questions which must be asked include: why has computerization been implemented so slowly? Were there few leaders or strong advocates, or was user resistance so strong? How does the creative nature of theatre affect computerization? What other factors are significant? Chapter 3 reveals several possible answers, some of which also appear as reasons in this chapter. Computerization in theatre has changed the way theatre professionals work and create productions. Their attitudes toward computers affect the extent and type of computer usage.

### Chapter 3

#### Computers and Creativity - Study Results

The following material provides support for the argument that the social definition of theatre affects the acceptance of computers within the organization. How theatre personnel view computers influences their perceptions of the advantages and disadvantages of computer use, and plays a role in user hesitation towards computer technology. There are two different aspects of computer use in theatre - one aspect includes administrative and concept execution and the other involves the portrayal of the creative concept.

The social definition of theatre as a creative craft may lead people to assume that theatre professionals will have an anti-technology attitude and so reject new technology. The results of these interviews indicate otherwise. Theatre practitioners in general tend to be educated, curious and interested in technology, factors the studies in Chapter 2 list as important in terms of user acceptance of computers. These characteristics are necessary in an organization which adapts most of the technology it uses from other industries. In reality, the theatre uses more technology than the public may realize.

The information presented in this chapter was gathered in interviews with thirty-three practicing theatre

professionals. Their responses give some indication as to who is using computers in theatre, how they utilize computers in their daily work and why computers are important, as well as indicate the role creativity plays in connection to computer attitudes and use.

### **Methodology**

The literature about computer usage in the theatre tends to be very positive and enthusiastic, and may lead the reader to assume that all theatres are heavily involved with up-to-date computer applications. Interviews with practicing theatre professionals indicate that this impression is not correct. In addition, existing literature usually does not address resistance to or nonuse of computers in detail. Two surveys (Cleveland's 1986 and Gill's 1990) developed to determine the use of microcomputers in theatre, however, did indicate obstacles to personal computer use as well as current and future applications and equipment use. The information obtained in the personal interviews reflects the responses in Gill's larger survey, especially in terms of obstacles and applications.

Because of the lack of adequate written material, the information for Chapter 3 has been obtained through personal interviews with theatre professionals throughout the United States. The design of the study is to produce a representative picture of current computer usage and

attitudes in the theatre. Due to time and budget constraints, the study is limited and no attempt is made to present a comprehensive portrayal.

The taped interviews ranged from one-half hour to two hours and resulted in 109 pages of written notes and over twenty-two hours of tape. The interviews covered seven basic open-ended questions designed to ascertain the type and amount of computer utilization, size of the institution, amount of hardware and software available (in a general sense), who uses the computer, why and for what activities (See Appendix, Table 1). In addition, the questions reveal the individual's perceptions about the advantages and disadvantages of usage, as well as why people may or may not be active computer users.

### **Interviewees and Responsibilities**

The two main categories of interviewees are technical director and designer. The distinction emerges because designers are responsible for the creative vision of a production whereas the technical director is mainly concerned with the implementation of this vision. The degree or type of responsibility for creative vision makes a distinction among the types of theatre personnel. This distinction is reflected in how computers are used and in concerns about computers affecting creativity.

Of the thirty-three people interviewed, all but eight were employed in college/university settings at the time the survey was conducted. The remaining eight were either independent, in the television industry, or were associated with a regional theatre. More than half of the respondents (18) were technical directors, assistant technical directors, production managers, shop supervisors, or had positions with responsibilities closely related. For the purposes of this study, the above positions will be referred to as "technical director." The technical director category includes people who are responsible for implementing the production design, overseeing all technical aspects of a production, and managing all aspects of the shop, including ordering and maintaining supplies, materials and equipment, as well as supervising labor. The majority of work seems to be administrative with a heavy emphasis on generating and maintaining the paperwork associated with coordinating the production.

Of the eighteen total in the technical director category, four of the respondents are included because several of their responsibilities resemble those of technical directors or production managers, even though their titles are very different. One of the respondents is a program support manager, the second is the head of the design and technical production areas at a large university, the third is a master

electrician and the fourth is an assistant lighting coordinator.

The people in the technical director category often have additional responsibilities including teaching, administration, and/or university and national committee work. Of the eighteen, seven are also responsible for designing or supervising student design of lighting, scenery, sound or costumes. Some of the other technical directors/production managers (2) teach classes in design, which makes feasible the idea that they also design for productions. This information was not made explicit in their description of their responsibilities, however, so for the purposes of classification it is assumed that they do not design for productions.

The next largest category (13) are designers for lighting, scenery, costumes or sound. The majority of these respondents are responsible for more than one area of design. Although many designers may also serve as technical directors or administrators, the members of this category do not overlap with the members of the previous one. The designers in this category do not serve as technical directors; rather, their primary responsibilities are design and (possibly) teaching. The technical director's major responsibility is the implementation of the creative vision as expressed by the designer. Designers are concerned with the expression of the concept and vision of the production, as well as how the

director and actors interpret the production. Although this division of creativity is not absolute, as technical directors and designers must be aware of (and often perform) the other's work, their creative responsibilities for a production are different.

The remaining two respondents work in marketing and the television industry. The person in marketing is responsible for publicity, public relations and audience development for a university's departments of theatre and music. The respondent involved in the television industry is presently a set designer for a game show and previously taught scene design while working at a regional theatre.

The categorization of interviewee responsibilities represent a certain degree of arbitrariness, as the responsibilities of the interviewees varied to a considerable extent and individuals often had duties which overlapped the categories. The respondents are identified with the letters A-GG. The designers are represented by the letters A-M. The technical directors are represented by the letter designations N-EE. Respondents categorized as "other" are represented by the letters FF and GG.

### **Education and Background of Respondents**

Several of the respondents had been involved with theatre since high school, although others became interested in college and then went on to receive undergraduate and/or

graduate degrees in theatre. Six originally pursued other programs, such as physics and/or mathematics, mechanical engineering and wildlife ecology before becoming theatre students.

All of the respondents were trained in the theatre by traditional methods. Many had no exposure to computers at the undergraduate or graduate level, although those in school in the 1980s, when personal computers became popular, had varying degrees of exposure to computers. Several of the respondents have become interested in computers within the last five to ten years. Four of the five people with backgrounds in the sciences had worked with computers at the undergraduate level, and a few (3) have been involved with computers since they were teenagers.

### **Personal Interest in Computers**

All but two of the respondents (one technical director and one designer) have worked with computers in some capacity, and the two who do not have other people in the organization who use computers and benefit from this use. The most often cited function of computer software is for paperwork, especially budgets, spreadsheets and word processing. This utilization of computers is most readily accepted by the majority of theatre practitioners. Computer use for conveying the creative vision, however, is still an area of limited practice.

The majority of the people brought their own interest in computers into their workplace. Whether they had always been interested in them (since high school or college) or recognized the potential for computerization of their work, many of the users learned the computer system and software on their own, with little or no formal training. Computers are most prevalent in administration for paperwork and in production for implementation of the creative concept. Although many designers may not use computers specifically for portraying the creative concept, they may use word processing and spreadsheet functions.

The majority of the users are self taught to some extent. Nine people specifically mentioned that they had had no classes in computers and had taught themselves to use the hardware and software. They either were exposed to computers when they began working professionally (and had to learn them in order to work) or became aware that some theatres used computers, even if their organization did not. Their concern with being computer illiterate and personal interest provided an incentive to learn. For some, their organization provided computers and, since the respondents had specific needs that they felt could be met by computerization, they taught themselves how to use particular programs and sometimes wrote their own or adapted existing programs.

Many of the people using computers as aids in implementing design concepts (specifically lighting) acquired

some computer experience through classes or because they were encouraged by a relative, friend or co-worker. For some people, access was the major factor in developing computer skills.

### **Computer Use at Present**

At present, five respondents are not using computers in their daily work (two technical directors and three designers). One person is a confessed technophobe who is computer illiterate and happily functions without a computer. Another person is a technical director who supervises people who use computers and feels no need to use one himself, although he is knowledgeable about their current applications. The third does not need a computer in his present position but does have a computer at home for personal use. The fourth and fifth people would like to use a computer, but presently have very limited access to hardware and software. They are able to function professionally without computers at this point in time, mainly because they have to do so.

As previously mentioned, the main uses of computers in the theatre are for routine tasks, ones which do not involve creative production design. Computers handle all of the paperwork necessary for a production. Respondents have indicated that their organizations utilize computers for budgets, schedules, calendars, forms, flowcharts, word

processing, contracts, box office/ticket sales, public relations, publicity, inventories (scenery, costumes, props, materials), work/study and student hours and payroll, desktop publishing, mailing lists, class materials such as syllabi, lecture notes and grades and advising sheets. Many of these programs are available off-the-shelf, but some have been specifically designed for the needs of the department.

Although twenty-five of the respondents are located at colleges or universities, not all have equal computer facilities for the students. The students mainly use word processing features, although a few places have design software available for student use. At all of the colleges and universities, however, the instructors train the students in the traditional methods of design, which everyone recognizes as the basis for further development. If there are available computers and software, the students receive training on them also.

The majority of the students' training on computers is informal, although a few of the universities offer theatre specific courses in computers (Yale) or include computer application as part of an existing course (University of Kansas, Southern Illinois University, Radford University, for example). Most universities offer access to full computer labs, either departmental (Cornell, University of Indiana), within other departments, or on the university (University of Missouri, Kansas State University, Cornish College of the

Arts). Professors E and BB are among the few who take their students to their homes because their personal computing equipment is more current than what is available at their universities.

Some designers are using software packages such as computer aided design (CAD) programs to assist in recording their creative designs. CAD is used in scenery design and shop drawings, and programs such as Lightwrite and Candlepower for lighting plots and paperwork. Several programs are available off-the-shelf and do not require a great deal of modification for theatrical use. For instructional purposes, K feels that the computer "helps students develop art skills faster and builds confidence [because the computer] allows for experimentation and quick changes in the images without having to redraw." The computer can be used to help train people in developing color and composition perspective.

Computer programs in costume design are still too expensive for widespread use. Additionally, very few organizations are able to use computers in sound for more than sound cues as the equipment and necessary memory is still very expensive in this area. Computerized sound systems, where the computer generates the actual sound or the cues, are relatively rare except at larger budgeted repertory theatres (Seattle) and a few universities (University of Florida at Tampa, Yale University and Kansas State

University) where there is an active commitment to implementing computerized sound systems. Other colleges and universities are interested in the systems, but cannot commit the funds and/or time to develop one at present. As soon as the equipment and memory becomes affordable, these universities will implement sound systems.

Various other programs have been or are being developed. David Wedin of Virginia Tech has developed a trigonometry program to assist in set construction. Software developed to assist with portraying the creative vision is in process at a few universities. Patrick Finelli at the University of Florida at Tampa is developing a computer program to be used for the "thinking sketch," the rough sketch done initially when formulating the production. He is also working with multi-media integration, as is Otis Sweezy at the Southern Illinois University at Edwardsville. Mark Reaney at the University of Kansas is working on a computer 3-D modelmaking program which can easily be turned into renderings. At present, the program is useful only to him because the models are still too rough. Rob Shakespeare at Indiana University is working with software technicians and computer science faculty in developing applications for computer visualization and accurate lighting simulation for a stage model. Such an application would allow the control of hundreds of simulated light sources on shapes and human forms. These programs are

being developed at universities and are not yet available from a software manufacturer.

### **Characteristics of Computer Users in Theatre**

The respondents in this study range in age from the mid-twenties to late-fifties, with the majority between the ages of thirty-five and forty-five. This range was determined from other answers, as age was not a direct question, and only a few specifically volunteered their age.

Although several respondents indicated that age was not a factor in terms of computer users, many agreed that younger people are more comfortable with computers because they have had more exposure and access to them while growing up. M is among the respondents who expressed the view that in general, older people may be more hesitant or reluctant to get involved with computers. They have had less exposure to computers and may feel that there is no need to learn something new when traditional methods work well. Even those respondents who agreed that age may be a factor in computer use indicated that they personally know people in all age ranges who are or are not using computers.

The age factor does not affect a person's ability to produce or implement creative designs. How a person views the computer in connection with creativity, however, often depends on the individual's personal qualities. Several

respondents indicated that how the computer is presented to a person makes a difference in whether (s)he will be comfortable using the technology. The person's attitude towards him/herself and his/her confidence in his/her own abilities is also a factor. Anyone who wants to learn how to use a computer can be taught (E and V). R commented that overcoming hesitancy is often "a question of access and exposure - when someone is exposed to the computer long enough, the intimidation factors wear down." As the person becomes more familiar with the computer, the more likely (s)he is going to use it (AA). R remarked, and E concurred, that often the "people who were initially resistant become 'hooked' once they learn how to use the computer and then become active and vocal proponents of computer use."

E, P and V, along with several other respondents, commented that using computers requires a different frame of mind or mindset, and people who are more open-minded and curious are more adaptable to computers. The emphasis is on a different way for the individual to be creative, not that a machine or tool is creative. Several respondents remarked that computers are just a different way of approaching creativity - a different kind of pencil. I notes that "the process of creativity is changing; that does not mean that it is less, just different." S concurs, remarking that creativity is not adversely affected - the change is in how the work is done, not the quality of the work. Computers are

seen to free up more time for the person to be creative because they can spend less time on the drafting of the idea.

G and GG commented that people who like puzzles and word games, and who like the challenge of getting the computer to do what they want, are more responsive to computer use. People with a science background, technicians and technically oriented people are perceived to be more adaptable to computer use because they are not as afraid of and are more comfortable with technology (G, M and BB).

Many of the people using computers in theatre now, however, are not necessarily technically oriented, but do enjoy and recognize the capabilities of the computer. G remarked that "the people in theatre who have computers are people who would probably have them anyway." These theatre people recognize opportunities for using computers either for administrative functions, to implement creative designs, or to assist in the portrayal of the creative vision.

#### **Advantages Associated With Computer Usage**

Since computerization in the theatre is not mandated by the upper administration, as is often the case in business and industry, the perceived advantages of computer use is an important factor in explaining their use. The perceived advantages of computer utilization depend on whether the computer's function is administrative, for implementation of the creative design, or for assistance in creating the

design. In theatre the most frequent response to the question of computer advantages is that they save time, which is a limited commodity in the theatre industry. By saving time, the computer can also save money and free a person for more creative thinking. The computer can act as a medium for expressing creativity.

E, I and V are among the respondents who qualified the time saving answer with comments to the effect that computers are not time saving initially, at the learning and information input stages. The user has to invest time in learning how to use computers before (s)he can save time in the long run. The computer's time saving function is most evident for long term, repetitive tasks. In administrative functions, which usually involve such tasks, time expended in learning software programs and entering all the information once in order to produce the necessary paperwork is well justified. For example, programs which assist with lighting paperwork require that the information be entered once and the program then generates all the related paperwork. The person is freed from having to manipulate the same information over and over again.

On the other hand, creative visions are unique to every production and are generally one time projects. Short term projects, where the information or material is needed only once, are often more efficiently done by hand (B, F, H, L, W, FF). F commented that "it is sometimes not worth spending

the time to put the information in [the computer]. It is not always time and/or labor saving." Designers must be convinced that spending time to learn a computer software package will allow faster expression of their creativity, without compromising this creativity. The major advantage in such packages seems to be the ease in which changes can be made to the design.

Other mentioned advantages in both administrative and creative vision functions include the flexibility to easily make changes to existing work, accuracy and reliability in terms of manipulating data (especially numerical data), and consistency and clarity in the results. AA comments that the work he produces on the computer "is better in the sense that it is less subject to misinterpretation and is more accurate to start with since it is easier to make corrections." In administration and implementation of the creative vision, the computer's ability to efficiently handle repetitive functions is its main strength in the theatre industry, as it is in all other industries. Available programs reduce paperwork and remove the tediousness associated with record keeping. In addition, the quick accessibility to data reduces the amount of paper files and provides easy reproducibility of the data.

P, W and BB commented on one advantage that is limited at present - communication with other professionals via computer linkup. Some organizations have no internal communications system yet, while others are able to share

information within their organization and/or nationally and internationally. The ability to immediately communicate with other professionals allows for the exchange of ideas and help in dealing with problems, while reducing the frustration of "telephone tag". Creative, innovative ideas can be shared visually with other professionals if a computer linkup is available. Actual implementation of creative vision may cause technical difficulties, and communication with others who have solved similar problems is invaluable. There is a need for better communication among all theatres because some are rather isolated. Technical problems have always been difficult to communicate, and "not everyone knows what is going on in terms of computer applications - and they want to" (K).

The computer does permit some activities to be done faster and better, and also allows for actions which are impossible to do manually. In executing the creative concept, the computer becomes a means for achieving the creative vision. For example, the extremely tight timing of cues and most theatrical lighting changes now expected in the theatre cannot be effectively accomplished manually (G and U). The computer, when integrated with lighting technology, allows greater creative possibilities for the designer. With the additional potential, designers are less limited in expressing their creative vision. An added consideration is that computer controlled cues reduce rehearsal time because

the cues are done consistently each time, no matter how difficult. Since rehearsals are costly, any reduction in rehearsal time saves money.

I and K are among the people who are using computers as a teaching tool to help students learn the concepts of perspective drawing and three dimensional visualization. The instruction on computers is not to teach creativity. Students learn design concepts and another method to express creativity, besides the traditional methods. Computers encourage an exploration of possibilities and allow easy changes and corrections, so students are more comfortable with trying new ideas.

Although there may be a perception that computers will lock a person into a specific way of working, BB reflected many of the respondents' feelings that, properly used, the computer actually encourages creativity because people can try different possibilities without spending a lot of time making changes. The respondents realized that the temptation to let the computer control design choices or serve as a barrier to emotional expression may be present, but they also realize that they cannot let themselves be limited to what the computer can do.

Theatre practitioners define theatre as an art form, and so are quick to define computer use in design as just another tool. The realm of creative vision remains a very human function which the computer can help express, but not

replace. D remarks that a truly creative person will never be replaced by a computer and will never take the easy way out by relying on a tool. Most of the designers express the idea that the creative concept takes place in the mind, and the computer is a tool, like pencils and templates, to express the ideas (A, L). "The computer is as much an artist's tool as is a pencil or chalk" (P).

D expressed the opinion that the computer offers a more prolific way to express creativity and will enhance the natural tendencies of the people who use it. If a person likes to use the same drawing or shape over and over, the computer will allow it. For truly artistic people, "the computer will help unlock more creative abilities by giving them a medium which expands their time base" (D).

#### **Disadvantages/Obstacles Associated With Computer Usage**

Although no one presently using computers would give them up, user advocates are not blind to the obstacles or problems connected with computer use. By recognizing the problems, the user advocates are able to work towards solutions for dealing with them. The most often cited disadvantages/obstacles associated with computers include cost, lack of equipment and software and lack of time.

The theatre's identification as a creative art form influences practitioners' perception of disadvantages or obstacles connected with computer use. With limited overall

budgets, investing in computer technology may mean cuts in production budgets and thus the materials used to represent the creative vision. Although the cost of computers and software tends to fall over time, there is still an initial expense and then the expense for maintenance of equipment and technology (H, O, GG). M, Q, R, and V are some of the respondents who expressed frustration in terms of needing equipment and not being able to afford it. For administrative and implementation functions, the trade-off may be well justified in the long run. For designers creating original ideas for each production, the expense may be more difficult to justify, especially since the work can often be done as quickly (or quicker) by traditional methods.

Additionally, the majority of the interviewees feel that they have so many job responsibilities to accomplish that they do not have enough time to learn about programs. Time spent on learning how to use the computer is time not spent on creating or implementing designs for a production. Theatre personnel may feel that they cannot invest the initial time commitment for learning and working on the computer. E comments that "when learning programs, especially CAD, a person has to spend a lot of time, and I just don't have it." Y asserts that there is no real savings in time or money unless the person really needs the amount of detail the computer provides. For some purposes, people can accomplish more with the computer, but must invest time

in terms of learning the system and imputing data, and money in terms of the initial expense, maintenance and training personnel.

Another disadvantage is that many organizations do not have the people power or expertise to fully utilize the available technology. This disadvantage generally is felt more strongly by practitioners involved in administration and production aspects, rather than designers. L comments that "the theatre cannot afford to hire people especially for programming and development, and so have to rely on the personal interests and determination of their own faculty and staff." In some instances, the organization may not have anyone who really knows the program because the people using it are learning independently when they have time. In order to productively use the system, people need workable software and someone who is willing to spend the time effectively and quickly teaching it to the main users. F remarked that "it is easy to get a 'computer type' who does not understand the actual application [of the program] and will not teach people what they really need to know."

For designers, computers offer a potential disadvantage with which other areas of theatre are not directly concerned. Some designers feel that the computer can be too precise and potentially create a design devoid of life and spirit. Others feel that the available CAD programs do not allow them to be as artistic on the computer as they can be manually.

Two respondents, both of whom use the computer, expressed the feeling that computers can be a barrier to creativity. One person feels that when he works on a structured task he has to be concerned with the machine's requirements for the manipulation of data and his own concerns with how he wants the data to be used. T feels that "if I have to change my own way of working in order to use computers, in order for it to do what I want it to do, then that is restrictive." The other person feels that he does not have the same kind of freedom designing on the computer as he did with pencil and paper, but he remarked that he was just learning to design on the computer and may change his mind as he became more competent.

An added concern for theatre practitioners is that an end user may become too involved with the technology to the detriment of the creative concept. H noted that there is the possibility that too much reliance on the computer would cause people to "unlearn the strength of technical drawing." G and Y are among those people who are concerned with the level of accuracy because a product looks so finished. People tend to trust the results and do not double check numbers and drawings for errors. This problem can be resolved by teaching people to check the information. I remarked that "although they are quick to recognize that it is not right to compromise ideas, students especially may have a tendency to sometimes change their designs because the

way they are originally conceived is hard to draw on the computer."

I, L, N and CC commented that people can get so caught up in the idea of technology for technology's sake that they lose sight of the objectives of the tasks at hand - the creative processes associated with a production. People also may have an unrealistic expectation of what the computer can do and not realize that the computer does some activities, like one time projects, more slowly and less effectively (W, X, EE). Some activities lend themselves to computerization and others do not. Too much time and labor can be spent imputing information that would be better spent in doing a quick drawing and then attending to other matters.

Another possible disadvantage of computers is that some people may sacrifice creativity for technological effects. A few of the respondents felt that a plausible disadvantage was getting "hooked" on the technology, spending too much time working on computers to the neglect of other activities, and always wanting more in terms of the technology (J, R, BB). I felt that a potential pitfall of computer technology is that people may have the urge to be compulsive since they can be extremely accurate with the computer. They may tend to worry more about accuracy and appearance rather than the actual design. To some, computers are also fun, which can be a drawback if people spend too much time playing and do not get their work done. The respondents overwhelmingly

agreed that the user is responsible for determining whether the computer stifles creativity. The computer is viewed as just another tool to achieve the final product or carry out the creative ideas. GG remarked that "computers always have to be a tool towards getting the work done, not an end in themselves." H and J agree that the technology can assist and encourage creativity and open up resources, but is not a substitute for creativity. E, N, P and CC agree, remarking that computers will only stifle creativity if the user so permits. P comments that people will find it difficult "to disguise poor work or incompetence by blaming the computer." S concurs, noting that the computer will not make a bad artist into a good one.

The respondents realized that most of the disadvantages, except for cost and lack of equipment, software and time, can be resolved as long as the users are aware of the potential problem and take steps to eliminate it. Several of the organizations are attempting to resolve the shortage of equipment by pursuing grants and requesting funding, but the state of the economy recently has made financial matters more difficult, especially for colleges and universities.

### **Resistance/Obstacles/Hesitation to Computer Use**

The creative and individualistic nature of theatre affects how theatre practitioners perceive resistance or hesitancy towards computers. Expense and time are frequently

cited factors as obstacles to computer use, but these factors can also be viewed as taking resources from creative activities. Funding for technology often must be obtained by careful planning and possibly reducing material budgets. Time spent learning computer systems is time that is not spent on creating or implementing design concepts. The nature of theatre and the absence of mandated computer use mean that computer usage in theatre is behind that of other industries. J remarked that the theatre is seen as an expressive art which uses a direct people-to-people connection as the prime means of communication. Because of this communicative method, "the theatre is likely to be slower to see the advantages of a dispassionate tool like the computer" (J).

Most of the respondents (22) specifically mentioned or agreed that expense is the major obstacle to computer use. Funds for computers, software and peripherals have to come from budgets that are, in many instances, already strained. The quality of the productions, which represent the creative vision, cannot be compromised. P summed up the sentiment with the comment that "economic factors are the primary reason there aren't more computers in use in the theatre." FF concurred: "Actually, the only limit that I see at all to people using computers is financial." (At least two people felt that expense was not so much an obstacle as the reluctance to explore the potentials of new technology and

the lack of time). Although the respondents recognize that the cost of computers is decreasing, making them more affordable, many theatres cannot afford the systems that they want or to upgrade existing equipment. In addition to not being able to afford the initial expense for systems and programs, they have no budget to hire people with computer experience to use the system. Most theatres cannot afford high quality technology. DD commented that "part of the problem with computers in theatre, and part of the reason it has been so slow in being picked up in the use, is the fact that the technology has been so expensive, especially when you get up to things like full scale draftings."

Time is the other most often cited reason for lack of computer use. People need time to learn a new system and often it is easier to represent creative ideas with the traditional methods than to stop and spend the time learning something new. AA notes that motivation is a factor in learning. People are not motivated to learn the system because "they do not need it enough to take the time to learn it" (AA). Also, the traditional methods work fine and people are simply too busy getting the work done to learn the new skills. Why should someone learn something new when (s)he is comfortable doing things by hand? A, M, P and V are among the several respondents who invoked the adage "teaching an old dog new tricks."

In the theatre, some practitioners may feel that centuries of traditional methods of expressing creativity are being replaced by a machine they do not fully understand. D remarked that people may perceive the computer as slightly threatening because they do not understand it and how it works. Perhaps they have been frustrated because the programs are difficult to use or understand and they cannot get the computer to work the way they think it should. They view the computer as all knowing and perfectly logical, and may be afraid of appearing stupid (G and W). Since the theatre is an expressive art form, some theatre practitioners may feel that the computer is too logical to express creative concepts. Q remarked that "theatre is an expressive art form and computers are too logical to be expressive in terms of making an interpretive, personal statement."

Closely related to the lack of time to learn is ignorance of what a computer can and cannot do. By not understanding the computer's abilities and limitations, people may have unreasonable expectations and believe that the computer cannot be used without sacrificing creativity. People are often reticent about learning new technology because they are afraid they may break the equipment. They may be intimidated by having "to learn a new set of procedures and new way of thinking about information" (D).

The ignorance is present because most people in theatre have not had enough available training or instruction in

computers. User-friendly machines with enough power and appropriate software have become affordable to more people only within the last several years. Many people have had to learn on their own, with little or no formal training. Q notes that most people now are expected to be able to use computers in some capacity. G concurs and continues with the observation that "people in the arts, more than any other area, have little preparation for computers. In other disciplines, people come out of school knowing that they will have to deal with computers."

P remarked that people have to get used to the concept of working with computers, and "all professions have had to deal with the transition from manual activity to computer use." In most other industries, computerization has had the support of the administration. In theatre, the administration sometimes is not as sensitive to the administrative and managerial needs of production (P and CC) and/or the list of needs is so great that computers for the theatre are not a priority (I and K).

### **Data Summary**

The degree of responsibility for the creative vision influences the acceptance of computers in various areas of the theatre. When the computer is used for administrative functions, such as routine paperwork and word processing functions, there is a general acceptance of the technology.

When computers are used for implementing the creative vision, such as in lighting and sound, theatre personnel are interested in technology which makes the work faster and more efficient. The area of theatre where computers have been adopted most slowly and with greater reluctance is in the creative design functions.

Based on the information in this limited survey, it appears that theatre personnel who have served only as designers tend to be more reluctant to accept computers in the design process. These people recognize and are enthusiastic about computer advantages in other aspects of the theatre such as administration and design implementation. With limited budgets, software and time, there is little incentive for theatre personnel to explore various creative opportunities with computers unless the individual has a personal interest. Computer advocates are those users who have made time to learn and/or develop new software and then prove its usefulness to others.

In theatre, there has been no active, organized attempt by administration to eliminate resistance or hesitation involving computers, as has happened in business, industry, manufacturing and the government. Even so, resistance to computers in the theatre was much more widespread five to ten years ago (E, V, X) and is almost nonexistent in many theatres today (E, EE) for most applications.

Software development for design has been slow, and use of this software is justified by theatre practitioners as a tool for recording the creative vision and for making changes and revisions faster and easier. Computers in theatre are justified as tools of the craft and not as a substitute for creative human input.

## **Chapter 4**

### **Conclusions**

The theatre understands itself as a craft, where individual creativity is valued and encouraged. Individuals work together in a creative atmosphere to present a final result - the production. Within a theatre organization, some people are responsible for producing the creative vision, while others are responsible for making that vision a reality. Administrators and instructors are responsible for ensuring the smooth operation of the organization and the training of future generations of theatre practitioners. These roles often overlap in the same individuals, with seemingly little internal conflict.

Until this point, no definition of creativity has been offered. From the information volunteered by the interviewees, however, the following definition emerges. In theatre, practitioners have a shared understanding of creativity as the expression of a thought or vision. Creative control resides in people, not in the technology. Technology is seen as a controlled tool to express creativity. When a person begins to rely on the technology, (s)he starts to lose control. This concern with maintaining creative control affects how readily technology is accepted. In the theatre environment, practitioners realize that

computer technology as it presently exists is not productive for all activities, specifically those requiring creative input.

For people not directly involved in the technical theatre aspects of design and production, it may be difficult to understand the importance of the creative vision. No two productions, or even two performances of a play, are exactly alike. Different interpretations of the same material result in unique productions. Individual creativity is responsible for the differences in interpretation.

Throughout history, the theatre has been slow to adopt technological change. Often, the reasons for the hesitancy include factors such as the lack of funds and the need to adapt the technology to the specific requirements of the theatre. Less often have people pointed to the identity of the theatre, and hence to the relation to creative vision. Any technology seen as challenging the individual creative aspects of theatre has to be viewed by practitioners as a tool or "helper," not a replacement for creative vision. "New" technology has to be proven before it is adopted and computer technology is no different than any other in terms of acceptance.

One technical director remarked that it is not surprising that the theatre is behind the "outside world" in terms of computer technology and expert systems or knowledge based systems. S remarked that "theatre is basically a craft,

. . . and the essential nature of theatre is to probe the world of the imagination." S continued the observation by noting that theatre people equate technology with glitz and do not always recognize the ways that technology can make the real theatre creative process more productive. Another technical director expressed the view that theatre is still seen by many theatre practitioners as an old technology, "an antique art form," that is not moving as rapidly into computerization as are other areas of society (Z).

### **Computer Introduction**

The theatre's role in society as an expressive art form and the emphasis on individual creativity make the introduction and use of computers very different in several aspects from that in other industries.

In business, industry and government, as mentioned in Chapters 2 and 3, the computer advocates are people in positions of authority. Once the decision to computerize is made, the organization implements the technology. Business, industry and government can afford the equipment and software for their organizations, as well as invest in research and development.

In theatre, however, there is no industry-wide (organization-wide) implementation of computer technology. Use of computers and software is user motivated, not part of an overall organizational commitment. The individual

creative nature of many aspects of theatre preclude a blanket acceptance of any technology. In theatre, no one is required to use a computer if (s)he does not want to do so. Indeed, people in a few areas of theatre such as acting, directing and some design, do not feel the need to use computers in any capacity. Many of the craft aspects of theatre can be done quite effectively manually, and some do not lend themselves to computerization. For example, one time project needs are not efficiently computerized and, as one respondent remarked, computers cannot use hammers to build sets.

Further, computers are fairly new in the theatre because of the lack of appropriate software. Since there are no large organizational commitments, theatre is only a small software market. Creative endeavors may require specialized programs and, as O notes, the software is usually manufactured for generic use. B is among the respondents who have the perception that "existing programs are hard to learn," that most available programs must be modified for theatre use and that the programs developed specifically for theatrical use are too expensive for most organizations. There are very few ready-to-run programs specifically designed for theatre except box office packages and some lighting paperwork packages. Although generic word processing programs can be adopted without difficulty for administrative functions, specialized programs for creative

needs are limited. Programs for CAD are "borrowed" from architecture and modified to fit theatre specific needs.

Unlike other industries, most theatres do not have funds to invest in equipment or research and development. Funds for new technology must be appropriated from elsewhere in the organization, and the majority of theatres cannot decrease their production budget. Theatres cannot sacrifice the means of expressing creativity in order to acquire the latest technology. Most theatres cannot afford the newest developments in technology until the cost decreases, which often means their technology is several years behind what is actually on the market. Business, industry and government do not deal with the issue of creativity when implementing computer systems. Computers are adopted in these industries because they can perform routine tasks faster and more efficiently, and there is little concern for creativity in such circumstances. Because of the great software demand supported by large organizations, these industries can use generic software programs which are produced in large quantities and so are relatively inexpensive.

Individual computer users in theatre have to cope with the relative lack of theatre specific software. Designer and technical directors L, O and BB recognize that, because the theatre is such a small part of any reasonably sized market, it is not profitable for a company to manufacture the specific software. Equipment and materials are expensive

because few people are buying them. "The theatre cannot afford original research and development and so must get the technology from elsewhere and modify it" (L). The theatre is a tiny market without the funds to invest in research and development, and so must borrow any technology that can be modified for its demands.

### **Time and User Resistance Factors**

Time is an important factor in all organizations, but it is uniquely so in the theatre. For many in the theatre, there are no set working hours. Deadlines for designs and productions are very tight and everyone works to accomplish their responsibilities within set periods of time. Due to the nature of the work, proven time-saving technology is always welcomed. In the theatre, anything that makes the work faster, easier, more organized, and saves time will be valuable. Designer F reflects the respondents' sentiments that saving time is critical, especially during technical week and as the deadlines approach. "Anything that saves time is beneficial because theatre, more than any mainstream industry, is constantly under deadlines" (B). With the perceived advantages of saving time, the computer is seen to be a valuable tool.

In the creative aspects of theatre, however, the computer is not always the most efficient way to accomplish the task. The computer's major strengths of efficient repeatability is

very valuable in other aspects of the productions, such as executing cues, handling paperwork and public relations materials, and numerous other tasks. Designers and technical directors D, I, M, W, BB and GG specifically remarked that they use the computer for almost everything now and cannot image how they got along without it before.

Actually learning to use computer systems and software requires a concentrated period of time, which may require practitioners to identify non-creative time as worthy of focused attention. In theatre, time is often in such short supply that people do not have the time to do their jobs in addition to learning new systems and programs. Although computer programs may save time in the future, many theatre practitioners do not have the luxury of spending time to fully understand them. If someone is not convinced that the computer will be useful in his/her creative processes, there is little motivation to learn the software. The excuse of not having enough time is always valid, but may also mask a resistance to learn a new way of expressing creativity.

In business, on the other hand, the value of learning the programs completely is appreciated and arrangements are made to allow a person time off from their regular responsibilities in order for them to learn new programs. In the theatre, there are not enough people to replace someone who wants or needs to learn a new system or program. This person must acquire the knowledge when (s)he has free

time, which makes the learning process longer and potentially more frustrating.

The nature of user resistance in theatre differs from that in business, industry and government. Resistance to computerization by theatre practitioners is more a result of ignorance of the computer's abilities, rather than fear of deskilling or loss of job. One of the major fears of people in business and industry is that they will be replaced by computers or computer operators. This particular fear was not expressed by any of the respondents in Chapter 3. They viewed the computer as another tool, not a potential replacement, because their work is too expressive, creative and/or physical to be taken over by a machine or an operator without creative vision.

### **Similarity Among Industries**

An area of similarity between theatre and other industries is that the perceived advantages of computer use are fairly standard across the industries. The most widespread use is for word processing and spreadsheets. Computers are designed to manipulate information quickly and consistently, reducing the need to manually handle the same information for many different tasks. The computer reliably and efficiently processes information, saving time in the long run and allowing for relatively easy changes. The

ability to easily change documents means cleaner originals and less chance of misinterpretation of information.

Theatre, however, consists of much more than word processing and spreadsheets. The creative process and implementation of the creative concept involves human input and a degree of flexibility the computer cannot duplicate. The computer's strengths lie in completion of routine and repetitive tasks, which make up only part the theatre's total activities.

### **Summary**

The social definition of theatre as an expressive art form consisting of the product of individual creativity shapes how computers are introduced and understood. Initially, computers were most readily accepted in administration, where they were not perceived to threaten the creative elements of theatre. Acceptance in lighting took longer because of a lack of appropriate equipment and software. In addition, computer control of lighting cues was accepted as a time-saving feature which also allowed designers greater possibilities.

Computer use in design, especially scenic and costume, is not as prominent because many designers are not convinced that the software packages are valuable to them. Some theatre personnel worry that creativity will be compromised, while others are enthusiastic about the creative

possibilities made available by the computer. As in all technology in the theatre, when computers and software become accessible and proven effective to everyone, the technology will be more acceptable. Software for design functions is still being developed and tested. With the encouragement of computer advocates, this software will become part of the theatre industry. However, creativity will retain its importance in all design aspects.

Computer users recognize the need to integrate technology with traditional concepts, and the computer does have a place in the theatre. As L remarked, "I think [the computer] is useful. I think that it has tremendous benefits for us if we understand how to use it, if we understand how our creative control must be maintained and if we have the philosophical and conceptual basis to use it as a tool and nothing more." The integration of computer technology into the more creative aspects of theatre is a challenging issue faced by theatre practitioners.

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## **Appendix**

**Table 1**  
**Interview Questions**

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1. What is your background and training in theatre?
2. How did you become interested in computers, and do you have any formal training on computer systems?
3. How do you and/or your organization currently use computers?
4. What do you see as the advantages and disadvantages of computer use?
5. Why do you think some people are resistant to or hesitant about using computers? (What obstacles are confronted?)
6. Have you noticed any particular characteristics, such as age or education, associated with computer use in general?
7. Do you think that computers hinder or stifle creativity?  
Explain.

**Table 2**  
**Interviewees by Job Titles**

Job Title	Number of Respondents
Designers	13
Technical Director	7
Production Manager	4
Shop Supervisor	2
Assistant Technical Director	1
Marketing Coordinator	1
Master Electrician	1
Set Decorator	1
Program Support Manager	1
Assistant Lighting Coordinator	1
Head, Design and Technical Production	1
TOTAL	33

**Table 3  
Designers**

Area of Design*	Number of Respondents
Lighting	12
Scenery	9
Costume	4
Sound	3

\*Most designers are responsible for more than one area of design

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