COLOR ELECTRONIC PREPRESS SYSTEMS:
Developer/User Survey

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Abstract

The purpose of this study was to develop knowledge and experience pertaining to trends, new issues and problems, and to provide systems developers with areas to focus on in addressing user needs. This study examines three surveys administered to 245 scientists, managers, technical experts, and system users of Color Electronic Prepress Systems (CEPS). The study briefly covers the evolution of CEPS from about 1980 to the present, but focuses on the results of the three surveys which span eight years. The surveys, conducted at the 1983 and 1987 Electronic Prepress Workshops, and at the 1991 Electronic Halftone Systems Workshop of the Technical Association of the Graphic Arts (TAGA) annual conferences, explore:

1. Areas of CEPS receiving the most attention
2. Areas of CEPS that should be receiving the most attention
3. The most critical issues and problems associated with CEPS
4. The most successful applications of CEPS

Content analysis was the primary research method used in analyzing the data collected, in making comparisons and observations, and in reaching conclusions. Content analysis is a method used for objectively, systematically and quantitatively describing subjective data. The results show that the main areas of CEPS requiring further development are Connectivity and Standards, CRT Resolution and Proofing, Economics and Time Waste Reduction, Service and Training, Storage, and Quality. The results also show that the areas of CEPS that have been developed to the satisfaction of users are Digital and Phototypesetting, Image Manipulation, Pagination, Equipment and Product Reliability and CEPS/Press Performance and Color.

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Introduction and Purpose of Study

Background

TAGA is an international organization composed of men and women who dedicate their lives to the technical advancement of the printing industry.[1] It is in such printing associations that members can collaborate on new interests and formulate processes for making ideas into realities. In 1983, TAGA developed a new area for research by bringing together users of prepress technology including color separation vendors and prepress divisions of printers, and equipment manufacturers in an Electronic Prepress Workshop to discuss the development direction of Color Electronic Prepress Systems (CEPS).

The Thirty-Fifth Anniversary TAGA Conference held May 4, 1983, in Dallas, Texas, first introduced the topic of CEPS as one for further development. The purpose of the Electronics Prepress Workshop was to bring together individuals who wished to share their interests, expertise, and goals regarding the role of electronics in prepress. Being the first program of this type, Dr. Harvey R. Levenson of California Polytechnic State University, San Luis Obispo, California, and Chairperson of TAGA's Electronic Prepress Workshop, presented a questionnaire to 90 participants. These included scientists, researchers, technical specialists, and industry professionals. The questionnaire served as a fact-finding instrument and posed four questions to gain insights into: (1) What areas of CEPS are receiving the most attention? (2) What areas of CEPS should be receiving the most attention? (3) What are the most critical issues and problems associated with CEPS? and (4) What have been the most successful applications of CEPS?[2] The data was evaluated and grouped into representative categories.

The Electronic Prepress Workshop was repeated in 1987 at the TAGA Conference in San Diego, California. Dr. Levenson discussed Emerging Trends in CEPS and presented the information gained from the 1983 survey. He then re-administered the survey to 80 participants at the 1987 workshop.

The survey was again conducted at the May, 1991 TAGA Conference in Rochester, New York. This time the questionnaire was administered to 75 scientists, researchers, and technical specialists present at the workshop. The Electronic Prepress Workshop was renamed the Electronic Halftone

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[1] Bruehs, Walter A., "TAGA Proceedings," Technical Association of the Graphic Arts, Rochester, NY, 1983, foreward.

2 Ibid., p. 807.

Systems Workshop. It was chaired by Brian Chapman of Eastman Kodak's Electronic Printing Systems Division.

Purpose

The purpose of this study was to compare and contrast the 1983, 1987, and 1991 surveys to discover what had been achieved over the eight year period since the first survey and to determine what areas still need attention, and what some of the new issues are. From this study, researchers and engineers will gain knowledge to help eliminate flaws in present systems and to create or revamp functions and options that are desired by the industry's buyers and users.

This study also investigated the history of CEPS and its development in order to help printers and equipment manufacturers better understand the evolution of systems. Analyzing the developments of CEPS over the years will help manufacturers understand what users need and desire, and what new market opportunities may exist.

Literature Review

It is not clear as to who coined the term "CEPS." Professor Gary Field of California Polytechnic State University, guesses that the term originated in the early 1980's from Dr. Thomas Dunn, an expert in the electronic publishing industry. Presently, the terminology has changed again and the common term for CEPS today is "systems." For clarity and consistency, this study will refer to electronic prepress equipment as CEPS.

Color electronic prepress systems evolved from conventional rotary drum scanners. These drum or electronic color scanners have been in commercial use since the mid-1950's reaching their peak in the 1970's. Presently, with the explosion of color process work now facing printers, scanners have almost taken a back seat awaiting the advent of more extensive color electronic systems. Although, CEPS entered the market in the early 1980's, the rush to install CEPS did not occur until the mid 1980's. As of 1985 CEPS were capable of handling all images and text required to assemble full-color pages.[1]

The operation of CEPS is based on the fundamental operations of the scanner. A scanner has two rotating drums, the first is the input or analyzing section of the scanner, the second is the output or film recording section. Transmission or reflection copy is placed securely on the first

[1] Eldred, Nelson, Edit., "Electronic Prepress: Color and Image Assembly," Techno-Economic Forecast No. 25, Graphic Arts Technical Foundation, Pittsburgh, PA, May 30, 1985.

drum. The copy is digitized and then analyzed by a color computer usually integrated with the scanner. From here the image can be manipulated on CEPS equipment by changing the visual density, removing color casts and achieving gray balance. Adjustments can be made for various printing processes, paper, inks, and any specific aesthetic requirements, to give the best possible reproduction.[2]

High-end, fully integrated digital color prepress systems are dominated by four manufacturers, namely (in alphabetical order) Dainippon Screen, Du Pont/Crosfield (Studio System 830, 870, 880), Hell (Chromacom System), and Scitex (Response). The international market has been dominated for eight years by these full-scale systems. Scitex is probably the best known company in the field of image manipulation since it took the printing industry "by storm" in 1979 when it introduced its Response System before the two scanner manufacturers Crosfield and Hell could. Scitex jumped ahead of the rest. Its name gained worldwide acceptance by Print '80 and the company completely controlled the market for the two years it took Crosfield and Hell to catch up. The three companies then competed closely, rapidly introducing technological advancements and achievements.[3]

- 1969: Crosfield launched the world's first commercial color scanner, the Magnascan, able to produce separations at final print size in one step.[4]

- 1981: Color consoles were developed for color image processing.[5]

- 1984: Scitex again edged ahead, introducing the industry's first transportable color scanner.[6]

- 1985: Flatbed color imagesetters were developed for film output of text, line-art and graphics. Scitex released its HandShake program, which helped to establish industry-wide standards for data transfer and multi-vendor system integration.[7]

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[2] Ibid.

[3] Helen Eckstein, Catalog Age, *Electronic Color Prepress Systems- What are the available options? And which choices are best for your catalog?*, March 1988, p. 112.

4 Du Pont Magnascan Systems, Magnascan Systems: *The Magnascan Pedigree*, p. 1.

5 Scitex Corporation Ltd., Corporate Profile, *Corporate Milestones* of Scitex Backgrounder, provided by Paul Thiel Vice President of Corporate Communications, 1991, p. 9.

6 Ibid., p. 9-14.

[7] Ibid., p. 9.

- 1986: Scitex is the innovator once again, expanding on 1983 Eiconix technology, with its Smart Scanner CCD color input device, creating a more cost-effective input device for color images.[8]

-1988: Desktop links to CEPS became a reality. At present these systems are Visionary by Scitex, SudioLink by Crosfield, and ScriptMaster by Hell. StudioLink and ScriptMaster use the Open Prepress Interface (OPI), a standard proposed by Aldus.[9]

-1990 and beyond: These "superstar" companies, Scitex, Du Pont and Hell, are working in/with Macintosh computer-based software systems to enhance and speed high-quality color production.[10]

Throughout the years of introducing new products to users, each of the companies sought to better their previous equipment. Scitex in particular, has recreated its original Response System for many different applications. The Response 800 interprets and records seismic data for oil exploration on a three-dimensional color monitor. The Response 100 is a full prepress system designed for growing pre-press vendors and printers and Response 500 coordinates design and production. With the introduction of Visionary, Scitex enabled its users to delegate most of its design work to the publisher. This cuts the cost of expensive prepress equipment and operator time, frees the CEPS from time-consuming page layout functions, and increases turnover time.[11]

Recently, there has been divergence from all-encompassing CEPS. Manufacturers have branched out to expand equipment designed for single specific functions. Another growing area are mid-range systems These do not have all of the color quality and high resolution of high-end equipment, but are quite affordable and meet "commercially acceptable" quality printing standards. [12]

Yet with each new development in color prepress, comes new areas of concern falling on the user. The surveys conducted at TAGA focused on the needs defined by the manufacturers, buyers, and users of today's high-

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[8] Ibid., p. 10.

[9] Ibid., p. 10.

[10] Ibid., p. 11-12.

[11] Ibid., p. 13-14.

end CEPS. Careful and thorough analysis of the results will give insight and direction to engineers and manufacturers identifying and addressing user needs.

Research Methods

The research methods for this study include a questionnaire survey, historical/descriptive research, and content analysis. The questionnaire was administered at three different periods and was used to gather information from printers and other users, and equipment manufacturers about issues concerning CEPS. The questionnaire was distributed and completed at the TAGA conferences in 1983, 1987, and 1991.

The questionnaire was intentionally open-ended to prevent directing respondents to any specific concern or issue. The questionnaire asked: What areas of CEPS are receiving the most attention? What areas of CEPS should be receiving the most attention? What are the most critical issues and problems associated with CEPS? What are the most successful applications of CEPS? The respondents recorded their opinions under each question.

Historical/descriptive research and content analysis was used to analyze the data retrieved from the surveys, develop results, and draw conclusions. Historical/desdriptive research systematically and objectively locates, evaluates, and interprets evidence available for understanding the past and present. In this study, the literature search presents the historical background leading up to present concerns of CEPS developers and users, and systems applications. The survey results presents an extension of the past in helping to determine issues, needs, and directions concerning the future of CEPS. Content analysis is a research technique for the objective, systematic, and quantitative description of the "manifest" content of the survey responses. "Objective" and "systematic" means that categories were developed and used that have common meaning to individuals versed in the language of the study. All responses were systematically assigned to appropriate categories by the two authors of this study. The categories developed for this study from the survey responses are:

Advertising, Catalogs, and Magazines
Calibration
CEPS/Press Performance, and Color
Communication between System Manufacturers and Users
Communication with Creative Departments
Connectivity and Standards
CRT Resolution and Proofing
Data Transmission and Satellite Communication
Desktop Publishing
Digital and Phototypesetting

Digital Imaging and Direct-to-Plate Technology/Electronics and Automation
Economics and Time Waste Reduction
Efficiency and Productivity
Equipment and Product Reliability
Image Manipulation
Inplant Systems
Large Companies
Management Controls
Merging Text and Graphics
Monotone
Obsolescence
Pagination
Quality
Raster Imaging
Sales and Marketing Tools
Service
Software
Storage
Training
User Friendly

"Quantitative" means that the results come from counting and adding the same or similar responses to each of the four questions in the survey. In this study, the results are shown as percentages. "Manifest" means that the language used in categorizing all responses is common to manufacturers of CEPS and to segments of the printing industry that uses CEPS. It also means that responses were interpreted literally without assumptions about "what the respondent really meant."

The data collected were arranged into categories reflecting respondent perceptions of the present role and future needs of CEPS in the printing industry. This part of the study aimed at what printing companies desire. The information provided was also meant to inform engineers and manufacturers of CEPS about what the industry needs in addressing issues of quality, productivity, training, and cost.

Results

Areas of CEPS Receiving the Most Attention

In the 1983 survey, 64 percent of the respondents selected six (6) areas of CEPS as receiving the most attention. These areas are: CEPS/Press Performance and Color,** Digital and Phototypesetting, Connectivity and

** CEPS/Press performance and Color refers to being able to match electronically-produced proofs on press with yellow, magenta, cyan, and black inks.

Standards, CRT Resolution and Proofing, Economics and Time Waste Reduction, and Software. Of these, 14 percent noted CEPS/Press Performance and Color as having received the most attention and 14 percent selected Digital and Phototypesetting. The remaining four categories were each selected by 9 percent of those surveyed.

In the 1987 survey, Connectivity and Standards emerged as the area perceived to be receiving the most attention by 20 percent of the respondents. This was followed by CRT Resolution and Proofing, and Image Manipulation which were perceived by 17 percent and 14 percent of the respondents respectively as the areas of CEPS receiving the most attention.

Desktop Publishing emerged for the first time in the 1991 survey and was selected by 29 percent of the respondents as an area of CEPS receiving the most attention. Connectivity and Standards continued to be noted as receiving the most attention on an increasing basis. This area was selected by 9 percent of the respondents in the 1983 survey, by 20 percent of the respondents in the 1987 survey, and by 23 percent in 1991.

Table 1 shows the areas of CEPS that were perceived to be receiving the most attention in the 1983, 1987, and 1991 surveys.

Table 1

AREAS OF CEPS RECEIVING THE MOST ATTENTION

1983 (n = 90)	
CEPS/Press Performance and Color	14.0%
Digital and Phototypesetting	14.0%
Connectivity and Standards	9.0%
CRT Resolution and Proofing	9.0%
Economics and Time Waste Reduction	9.0%
Software	9.0%
	64.0%
No response or other responses	36.0%
1987 (n = 80)	
Connectivity and Standards	20.0%
CRT Resolution and Proofing	17.0%
Image Manipulation	14.0%
	51.0%
No response or other responses	49.0%

1991 (n = 75)

Desktop Publishing	29.0%
Connectivity and Standards	23.0%
	52.0%
No response or other responses	48.0%

Areas of CEPS that Should be Receiving the Most Attention

On the question concerning the areas of CEPS that should be receiving the most attention, three areas in the 1983 survey corresponded to respondents' views about the areas of CEPS receiving the most attention. They are CRT Resolution and Proofing, selected by 21 percent of those surveyed, CEPS/Press Performance and Color, selected by 8.3 percent, and Economics and Time Waste Reduction, also selected by 8.3 percent of the respondents. Other areas that emerged as deserving attention in 1983 were Efficiency and Productivity selected by 12.5 percent, and two new areas, Data Transmission and Satellite Transmission, and Training, were each selected by 8.3 percent of the respondents.

In 1987, Efficiency and Productivity was selected as the main area of CEPS that should be receiving the most attention. This was selected by 14.3 percent of those surveyed. CRT Resolution and Proofing was selected by 12.5 percent of the respondents and 10.7 percent identified Communication with Creative Departments [in printing companies, advertising agencies, design studies, publishing, and packaging companies] as deserving attention. CEPS/Press Performance and Color, and Training were also among those areas that respondents believed should be receiving the most attention with each being selected by 8.9 percent of those surveyed.

In the 1991 survey, three areas emerged as those that the respondents believed should be receiving the most attention with one area dominating. Connectivity and Standards was selected by 31 percent as needing the most attention. CRT Resolution and Proofing was selected by 9.8 percent as was Desktop Publishing.

Table 2 shows the areas of CEPS that were perceived to be needing the most attention in the 1983, 1987, and 1991 surveys.

Table 2

AREAS OF CEPS THAT SHOULD BE RECEIVING THE MOST ATTENTION

1983 (n = 90)	
CRT Resolution and Proofing	21.0%
Efficiency and Productivity	12.5%
CEPS/Press Performance and Color	8.3%
Data Transmission and Satellite Trans.	8.3%
Economics and Time Waste Reduction	8.3%
Service and Training	8.3%
	66.7%
No response or other responses	33.3%
1987 (n = 80)	
Efficiency and Productivity	14.3%
CRT Resolution and Proofing	12.5%
Communication with Creative Departments	10.7%
CEPS/Press performance and Color	8.9%
Service and Training	8.9%
	55.3%
No response or other responses	44.7%
1991 (n = 75)	
Connectivity and Standards	31.0%
CRT Resolutionand Proofing	9.8%
Desktop Publishing	9.8%
	50.6%
No response or other responses	49.4%

The Most Critical Issues and Problems Associated with CEPS

Seven (7) areas were selected by 83.4 percent of the respondents in the 1983 survey as representing the most critical issues and problems associated with CEPS. Service and Training dominated with 25.3 percent of those surveyed selecting this area. Direct Imaging and Direct-to-Plate Technology/Electronics and Automation was perceived by 16.6 percent to be the most critical issue and problem related to CEPS, and five (5) other areas were each selected by 8.3 percent of those surveyed. They are

Connectivity and Standards, CEPS/Press Performance and Color, Communication with Creative Departments, Economics and Time Waste Reduction, and Pagination. It is noteworthy that CEPS/Press Performance and Color, and Economics and Time Waste Reduction were perceived in 1983 as receiving the most attention, as needing the most attention, and representing the most critical issues and problems.

In 1987, Economics and Time Waste Reduction was selected by the largest number of those surveyed (17 percent) as being the most critical issue and problem related to CEPS. This was followed by Service and Training selected by 12.5 percent of the respondents. Merging Text and Graphics was considered to be the most critical issue and problem by 9.8 percent of the respondents.

In 1991, Connectivity and Standards emerged as the main critical issue and problem with 21 percent of those surveyed selecting this area. Storage was suggested to be the most critical issue and problem by 15.4 percent of the respondents, and Economics and Time Waste Reduction, and Quality were each selected as critical issues and problems by 10.3 percent of the respondents. Connectivity and Standards has been receiving attention over the years but continues to be an issue of concern by designers, manufacturers, and users of CEPS. This area has been highlighted in responses to nearly each of the first three questions of the three surveys spanning the eight years of this study.

Table 3 shows the areas of CEPS perceived to represent the most critical issues and problems.

Table 3

THE MOST CRITICAL ISSUES AND PROBLEMS ASSOCIATED WITH CEPS

1983 (n = 90)

Service and Training	25.3%
Direct Imaging and Direct to Plate Tech./ Electronics and Automation	16.6%
Connectivity and Standards	8.3%
CEPS/Press Performance and Color	8.3%
Communication with Creative Departments	8.3%
Economics and Time Waste Reduction	8.3%
Pagination	8.3%
	83.4%
No response or other responses	16.6%

1987 (n = 80)

Economics and Time Waste Reduction	17.0%
Service and Training	12.5%
Connectivity and Standards	12.2%
Merging Text and Graphics	9.8%
	51.5%
No response or other responses	48.5%

1991 (n = 75)

Connectivity and Standards	21.0%
Storage	15.4%
Economics and Time Waste Reduction	10.3%
Quality	10.3%
	57.0%
No response or other responses	43.0%

The Most Successful Applications of CEPS

The most successful applications of CEPS falls within the most common prepress tasks of printing. Like personal computers which have a wide range of applications but are used primarily for word processing, CEPS is perceived to be most successful in a limited number of frequently used areas. They include Digital and Phototypesetting, Image Manipulation, Pagination, Equipment and Product Reliability, and only recently there have been documented successes in CEPS/Press Performance and Color. These are the main areas of successful application noted in the three surveys.

In 1983, 37.5 percent of those surveyed noted that Digital and Phototypesetting represented the most successful application of CEPS. In 1987, Image Manipulation was selected as the most successful application by 26 percent of the respondents and 9.7 percent selected Pagination. In the 1991 survey, 23.3 percent of the respondents chose Image Manipulation as the most successful application of CEPS, whereas 20 percent selected Equipment and Product Reliability, and 13.3 percent noted CEPS/Press Performance and Color as the most successful application.

Table 4 shows the areas of CEPS perceived to represent the most successful applications.

Table 4

THE MOST SUCCESSFUL APPLICATIONS OF CEPS

1983 (n = 90)	
Digital and Phototypesetting	37.5%
	37.5%
No response or other responses	62.5%
1987 (n = 80)	
Image Manipulation	26.0%
Pagination	9.7%
	35.7%
No response or other responses	64.3%
1991 (n = 75)	
Image Manipulation	23.3%
Equipment and Product Reliability	20.0%
CEPS/Press Performance and Color	13.3%
	56.6%
No response or other responses	43.4%

Conclusions

Many diverse and varied areas related to CEPS were included in the three studies conducted over an eight year period. While the results address these areas in relation to the four survey questions asked, a useful conclusion should focus on the implications on CEPS use and development now and in the future. Therefore, the following conclusions are meant to provide direction to designers, manufacturers, and users of CEPS on areas requiring further development and to present areas that are now serving the printing industry in a satisfactory manner.

Areas Needing Further Development

The study uncovered six crucial areas requiring further development. They are Connectivity and Standards, CRT Resolution and Proofing, Economics and Time Waste Reduction, Service and Training, Storage, and Quality.

Connectivity and Standards: While work has been ongoing and accelerated in developing Digital Data Exchange Standards (DDES) since 1986 and the issuance of DDES 00 by the American National Standards Institute (ANSI), the industry wants more. Since 1986, two ANSI standards have been published: IT8.1-1988 "User Exchange Format (UEF00) for Color Picture Data" and IT8.2-1989 "User Exchange Format (UEF01) for Line Art."[1] Other standards are under development by the IT8 Committee and several groups are working to enhance interconnectivity of products from different manufacturers and suppliers. The industry demands interconnectivity and communication between hardware and software form different vendors in individual cost centers such as scanning and proofing, and between and among cost centers such as from prepress to press to post press. This study shows that Connectivity and Standards was expressed as a critical issue and problem in the 1983, 1987, and 1991 surveys but was not once expressed as a successful application of CEPS. Some organizations working in these areas are ANSI, the International Standards Organization (ISO), Initial Graphics Exchange Specification (IGES), Computer Graphics Metafile (CGM), Graphics Kernel System (GKS), Programmer's Hierarchical Interactive Graphics Standard (PHIGS), Committee for Graphic Arts Technologies Standards (CGATS).[2]

CRT Resolution and Proofing: Developments in off-press proofs via electrophotographic, ink jet, laser, and digital systems have been enhanced in recent years, particularly in the area of Direct Digital Color Proofing (DDCP). Off-press proofs have improved in quality and are producing closer process color matches to press sheets than ever before. However, proofing seems to be an area where print buyers are looking for, and in some cases demanding, "perfection" in color match, resolution, and pigment/substrate relationships that resemble ink/paper relationships. The present off-press proofs, whether digitally produced or not, have not yet reached this point but are improving. Additionally, some printers and prepress vendors are desirous of not having to produce "hard" proofs and are looking for improvements in "soft" proof CRT resolution that will enable a closer approximation on the monitor of what the press will produce. However, a hard proof will still be required as a "contract." Developments in High Definition Television (HDTV) may bring the industry closer to achieving "soft" proof acceptability, but much work is yet to be done in this area. This study shows that CRT Resolution and Proofing is an area that was emphasized in the three surveys as needing the most attention and in no case was it identified as a successful application.

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[1] Bruno, Michael H., "Status of Printing: 1989-90--A State ofthe Art Report," GAMA, Salem, NH, 1990, pp. 43, 179.

[2] Orr, Joel N., "Electronic Data Interchange," Computer Graphics World, 10/89, pp. 109-110, 112.

Economics and Time Waste Reduction: While the capital intensiveness of CEPS has been reduced over the years with lower cost and mid-range systems entering the market, the hourly costs required of some systems along with long training and operating time have hampered more rapid acceptance of CEPS across industry segments. Complex operations often advertised as system benefits are often tedious, time-consuming, and occupies major portions of storage capacity of the mid-range and smaller systems. Data compression improvements are needed to speed processing and simplified procedures for achieving complex imaging. This study shows that Economics and Time Waste Reduction was expressed as a major critical issue or problem in each of the three surveys and in no case was this area expressed as a successful application.

Service and Training: Sophisticated electronics have made it virtually impossible for most CEPS users to service their own equipment or to even find qualified technicians to serve as full-time technical support staff. Most CEPS users have resorted to expensive service contracts with equipment vendors and still face the inconvenience of not having a service representative available to them in a timely fashion when problems occur. When companies do hire their own technicians, training periods are often long and expensive and rarely guarantees that a "trained" technician or operator will be able to solve all problems that occur. Some companies claim that large investments in training an individual is also a large risk at best because "pirating" becomes an issue. Once trained, technicians or operators find new opportunities with greater personal rewards than available from the company that provided the training. The study shows that while the area of Service and Training was noted to be a key concern in the 1983 and 1987 survey, there is no indication in the 1991 survey results that this concern has been adequately dealt with.

Storage: The area of Storage is an interesting one because it was not expressed as a key issue in either the 1983 or 1987 surveys. The area first appeared in the 1991 survey responses with a significant percentage of respondents noting that it is the most critical issue or problem related to CEPS. One can speculate that the issue revolves around the proliferation of mid-range and low-end systems that do not have the storage capacity of larger systems but, in concept, can perform the same tasks as larger systems in a much longer period of time. For example, full graphic systems often have 300MB disk drives to accommodate a sufficient number of pictures for most printing jobs. However, a "desktop" system with 20MB and significantly less internal working memory is greatly limited in application and speed.[3] CEPS users of smaller systems are depending on system engineers and developers to produce systems in the future that will provide the storage and speed in smaller systems that are today reserved for larger systems.

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[3] Mortimer, Tony, "An Introduction to Graphics in Desktop Publishing," PIRA DTP Commentary, Vol. 1, No. 9, Leatherhead, Surrey, England, 1990, pp. 17-23.

Quality: Like storage, the area of Quality was not expressed as a serious issue of CEPS until the 1991 survey. Quality refers to color and resolution and is becoming a greater issue as print buyers become more sophisticated and knowledgeable about the printing processes, and as they become more demanding even for "lower budget" work previously produced in one or two colors and now being produced in full color. Many print buyers want their work at the lowest possible price, in the shortest period of time and at the highest quality. It is incumbent upon the printer to provide such service in order to retain clients and to keep clients in print media. Properly trained operators have demonstrated that high fidelity and high resolution color printing can be done and it will be increasingly demanded across the various printing industry segments; including the "on-demand" or "quick copy" segment. Industry engineers and developers must move to provide such capabilities. One example of strides in this direction is the Heidelberg/Presstek digital imaging direct-to-press technology. While the present capability of this technology does not compete with high quality lithographic or gravure full-color printing, it has established a niche in the "on-demand" or "quick copy" market and has prospects of vast improvements that will place it in the general commercial color printing market in the years ahead.

Satisfactory Areas

From the results of the study it is concluded that there are five areas of CEPS presently serving the printing industry in a satisfactory manner. They are: Digital and Phototypesetting, Image Manipulation, Pagination, Equipment and Products, and CEPS/Press Performance and Color.

Digital and Phototypesetting: Dating back to the early 1950s, typesetting has been the focus of prepress automation. The first phototypesetting system (Harris Corp.) became commercially available at that time, and as long ago as the early 1970s the first truly electronic phototypesetter having no more than four moving parts (Mergenthaler Co.) was available to the industry. Therefore, the industry has a lot of experience in the area of typesetting and has successfully provided products and services to meet user demands in all printing industry segments.

Image Manipulation: The attraction of CEPS has been what some refer to as "magic": the ability to achieve in one operation manipulations that previously took a high degree of craft skill, hours or days to do, or was impossible to do. Examples include image rotation, image distortion, "cloning," airbrushing, color shifts, tone adjustments, highlighting, silhouetting, and so on. These were some of the first unique capabilities of CEPS that have streamlined prepress operations for users requiring these features.

Pagination: This is an area that was given early attention by CEPS manufacturers because it became apparent that this was the main application that the industry wanted once integrated electronic prepress technology was available. Electronic pagination has all but eliminated the need for the labor-intensive, craft-oriented, and expensive stripping cost centers of many printing and publishing companies.

Equipment and Product Reliability: While all CEPS users require service at some point, the equipment and products of CEPS are for the most part reliable. The "handful" of major corporations that manufacture CEPS have the resources for research and development, testing, and successfully implementing their technology. An analogy would be the automobile industry. Basically, with the rare exception of a part or assembly defect, their products do what they are supposed to do.

CEPS/Press Performance and Color: The "fruits" of the industry's labor around technology and standards for matching artwork to proofs to press sheets are paying off after many years of research, development, and operator training. There is a better understanding of RGB and YMCK relationships today than in the past, and the technology of prepress proof pigment matches to printing inks has been vastly improved in only the last few years. While work is still needed in this area, the study shows that CEPS users are beginning to express satisfaction with the progress being made.

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Appendix

Survey Questions

1. What areas of CEPS are receiving the most attention?
2. What areas of CEPS should be receiving the most attention?
3. What are the most critical issues and problems associated with CEPS?
4. What are the most successful applications of CEPS?

Survey Responses

1983	Question (%)			
	1	2	3	4
Advertising, Catalogs, and Magazines	0.0	0.0	0.0	0.0
Calibration	0.0	0.0	0.0	0.0
CEPS/Press Performance, and Color	14.0	8.3	8.3	0.0
Communication bet. Syst. Mfg. & Users	0.0	0.0	0.0	0.0
Communication with Creative Depts.	0.0	0.0	8.3	0.0
Connectivity and Standards	9.0	12.5	8.3	12.5
CRT Resolution and Proofing	9.0	21.0	1.7	0.0
Data Transmission and Satellite Comm.	4.5	8.3	0.0	0.0
Desktop Publishing	0.0	0.0	0.0	0.0
Digital and Phototypesetting	14.0	0.0	0.0	37.5
Digital Imaging and Dir.-to-Plate Tech./ Electronics and Automation	4.5	4.1	16.6	12.5
Economics and Time Waste Reduction	9.0	8.3	8.3	12.5
Efficiency and Productivity	4.5	12.5	0.0	12.5
Equipment and Product Reliability	0.0	0.0	0.0	0.0
Image Manipulation	0.0	4.1	0.0	0.0
Inplant Systems	0.0	0.0	0.0	0.0
Large Companies	0.0	0.0	0.0	0.0
Management Controls	0.0	0.0	0.0	0.0
Merging Text and Graphics	0.0	4.1	0.0	0.0
Monotone	4.5	0.0	0.0	0.0
Obsolescence	0.0	0.0	0.0	0.0
Pagination	0.0	0.0	0.0	0.0
Quality	4.5	0.0	8.3	12.5
Raster Imaging	4.5	0.0	0.0	0.0
Sales and Marketing Tools	0.0	0.0	0.0	0.0
Service	0.0	0.0	8.3	0.0
Software	9.0	0.0	0.0	0.0
Storage	4.5	4.1	0.0	0.0
Training	4.5	8.3	17.0	0.0
User Friendly	0.0	4.1	0.0	0.0

Survey Responses

1987	Question (%)			
	1	2	3	4
Advertising, Catalogs, and Magazines	0.0	0.0	0.0	6.5
Calibration	0.0	0.0	0.0	0.0
CEPS/Press Performance, and Color	5.7	8.9	2.4	3.2
Communication bet. Syst. Mfg. & Users	0.0	0.0	2.4	0.0
Communication with Creative Depts.	0.0	10.7	7.3	3.2
Connectivity and Standards	20.0	7.1	12.2	3.2
CRT Resolution and Proofing	17.0	12.5	7.3	3.2
Data Transmission and Satellite Comm.	3.0	1.8	2.4	3.2
Desktop Publishing	0.0	0.0	2.4	6.5
Digital and Phototypesetting	3.0	1.8	0.0	3.2
Digital Imaging and Dir.-to-Plate Tech./ Electronics and Automation	3.0	8.9	2.4	13.0
Economics and Time Waste Reduction	3.0	7.1	17.0	0.0
Efficiency and Productivity	5.7	14.3	7.3	6.5
Equipment and Product Reliability	0.0	0.0	2.4	0.0
Image Manipulation	14.0	1.8	0.0	26.0
Inplant Systems	0.0	0.0	0.0	3.2
Large Companies	0.0	0.0	0.0	3.2
Management Controls	0.0	3.6	2.4	0.0
Merging Text and Graphics	5.7	3.6	9.8	0.0
Monotone	0.0	0.0	0.0	0.0
Obsolescence	0.0	0.0	0.0	0.0
Pagination	5.7	1.8	2.4	9.7
Quality	3.0	0.0	2.4	3.2
Raster Imaging	0.0	0.0	0.0	0.0
Sales and Marketing Tools	0.0	0.0	0.0	3.2
Service	0.0	0.0	0.0	0.0
Software	5.7	0.0	0.0	0.0
Storage	3.0	5.4	4.9	0.0
Training	3.0	8.9	12.5	0.0
User Friendly	0.0	1.8	0.0	0.0

Survey Responses

1991	Question (%)			
	1	2	3	4
Advertising,Catalogs, and Magazines	0.0	0.0	0.0	0.0
Calibration	2.0	0.0	2.6	0.0
CEPS/Press Performance, and Color	4.2	7.1	7.7	13.3
Communication bet. Syst. Mfg. & Users	0.0	0.0	0.0	0.0
Communication with Creative Depts.	0.0	0.0	0.0	0.0
Connectivity and Standards	23.0	31.0	21.0	0.0
CRT Resolution and Proofing	4.2	9.8	2.6	0.0
Data Transmission and Satellite Comm.	6.3	4.9	0.0	0.0
Desktop Publishing	29.0	9.8	7.7	3.3
Digital and Phototypesetting	0.0	0.0	0.0	10.0
Digital Imaging and Dir.-to-Plate Tech./ Electronics and Automation	0.0	0.0	0.0	0.0
Economics and Time Waste Reduction	8.3	7.1	10.3	3.3
Efficiency and Productivity	6.3	4.9	7.7	10.0
Equipment and Product Reliability	4.2	2.4	2.6	20.0
Image Manipulation	0.0	0.0	0.0	23.3
Inplant Systems	0.0	0.0	0.0	0.0
Large Companies	0.0	0.0	0.0	0.0
Management Controls	0.0	4.9	2.6	0.0
Merging Text and Graphics	0.0	7.1	2.6	0.0
Monotone	0.0	0.0	0.0	0.0
Obsolescence	2.0	0.0	0.0	0.0
Pagination	0.0	0.0	0.0	6.7
Quality	6.3	0.0	10.3	6.7
Raster Imaging	0.0	0.0	0.0	0.0
Sales and Marketing Tools	0.0	0.0	0.0	0.0
Service	0.0	0.0	0.0	0.0
Software	0.0	4.9	0.0	0.0
Storage	4.2	0.0	15.4	0.0
Training	0.0	7.1	7.7	3.3
User Friendly	0.0	0.0	0.0	0.0