The Issue of Standards for Electronic Prepress

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Abstract

This paper will deal with current standards and developing standards for text and line art, their impact on electronic prepress systems, and their current state of adoption. The paper will then discuss the issues of standards for monotone and color pictures. Reference will be made to experiences from CAD/CAM and the medical industries.

As the proliferation of electronic systems within the graphic arts industry continues, the need for a standardized information exchange format between different systems is going to become imperative to maintain a cohesive production flow through this industry's segmented work cycle. Further, in order for the design and manufacturing of images to continue with any degree of freedom and flexibility the electronic tools which are employed in this process must begin to provide a degree of system compatibility. If this does not begin to transpire the progress currently being made in the area of electronic prepress will falter, leaving current electronic prepress installations trapped within the industry's existing framework as isolated and expensive islands of automation.

Before beginning our discussion on standards for the printing and publishing industry we feel that it is important to clarify a variety of terms.

As used in this report, Graphic Arts refers to a variety of art elements from business graphics, to presentation graphics, engineering drawings and commercially printed products inclusive. Printing and Publishing describes the mainstream of volume printed images.

A term that is becoming increasingly vague is Graphics. The computer graphics industry generally means line art (or colored line art and geometric art) when referring to graphics. The printing and publishing industry usually includes pictures, (e.g., continuous tone and halftone) in the term Graphics. For purposes of this standards discussion we will use the term Images to include graphics, (e.g., line art) and pictures.

Within the context of this discussion it is important to stress that we are talking about the need to develop technical standards that will allow for the transfer of data between electronic prepress systems. We are not intending to address issues related to standards of visual quality.

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There are several key elements that should be standardized in order to facilitate data exchanges between electronic prepress systems. These include: Typefonts; Graphic Primatives, which are basic image elements that can be described by a simple mathematical equation (e.g., circles, lines, boxes, tints, etc.). These primatives are used in the construction of complex shapes. Page Document Descriptors; Vectors, which are defined line segments; Line Art, which is artwork that can be defined as one bit deep; Geometric Art, which is a higher order of graphic primitives; Pictures, both continuous tone and halftone; View Files which arees created for the purpose of displaying an image on a monitor; Fine Files which are filequired for printing resolution; and Color Space, e.g., YMCB, RGBS and HSL.

The inherent structure of the printing and publishing industry requires that multi-vendor system standardization evolves. Not only to facilitate the existing industry segmentation, (Figure 1), but also to facilitate various functions that must be performed throughoututhe prepress process, (Figures 2 and 3).

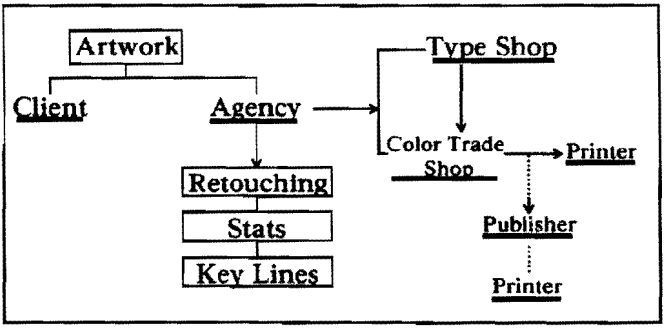

Figure 1: Segmented Production Process

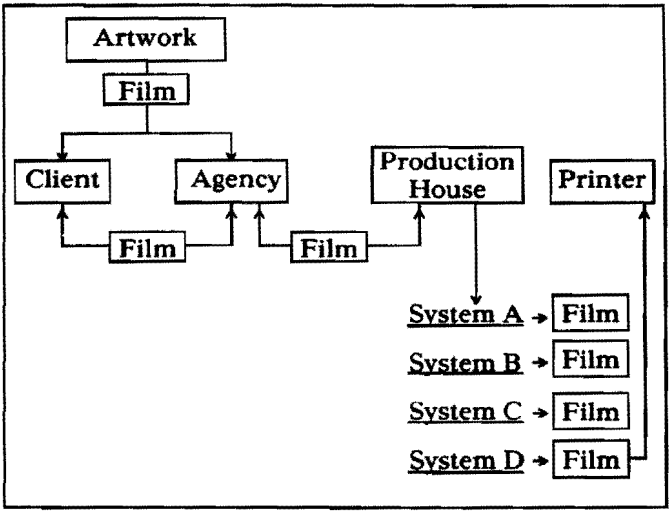

Figure 2: Multi-Vendor Systems

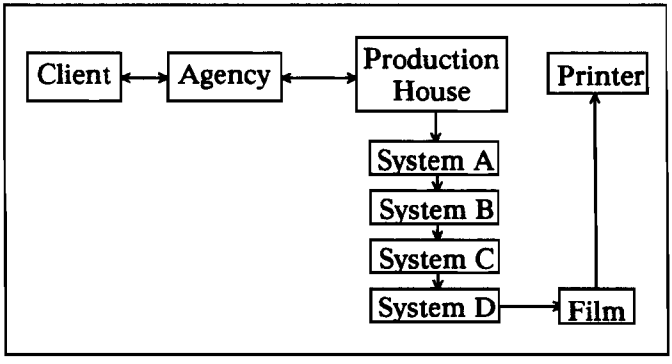

Figure 3: Multi-Vendor Systems - Standardized

Something of a precedent was established for this when paper tape was first used to drive hot metal typesetters. Later it was used to drive second and third generation typesetters. This has been followed in today's world by magnetic tape, and on-line interfaces.

Film as a Standard

Film has long served as a standard exchange format within the graphic arts industry. It is easily transportable, it allows for multi- company production to be undertaken on one job; archiving and storage of film are now mature procedures; continuous tone or halftone formats are readily available; it's changeable, and it's physical. In order to be ultimately successful, digital standards for the graphic arts industry must emulate the attributes of film.

In order to accomplish this, data must be formatted in such a way that it can be transported between CAD stripping and Electronic Printing Systems, (EPS); between paint systems and EPS; between EPS issued by different vendors; between EPS and direct digital color proofing, (DDCP) systems; between typesetters and EPS; and across transmission lines to and from remote EPS and any peripheral device.

In addition to the aforementioned interfaces which must be developed in order to have a successful electronic data transfer standard implementation; it is also highly desireable to develop interfaces that will accomodate true electronic multimedia systems. These interfaces would allow digital information to pass from television to EPS to final presentation in print, or from print to television. The ability to input pictorial information using a CCD, or digital still camera, is likely to find many useful applications in short run printing for real estate directories, yellow pages, etc., as well as for image capture of high quality product pictures for catalogs, brochures, and advertising.

In the corporate world, standards must evolve that will allow us to integrate facsimile, word processors, electronic data processors, CAD/CAM, electronic graphic art

systems, in-plant printing and publishing systems, and hard art into one system. This must occur in order for true corporate publishing to become a reality.

Existing and Developing Computer Graphic Standards

Although it's true that there has been, and continues to be, a significant amount of activity in the computer, computer graphic, and medical imaging fields in the area of developing graphic standards; and it's also true that some of this work may provide a useful foundation for the work of developing standards for the printing industry; it would be folly to assume that these activities will provide a useful solution to the printing and publishing industry. This is due chiefly to the fact that many important considerations generic to the printing industry are not taken into account in the existing standards development work. For example, computer graphic standards do not address YMCB color space, concerns with accurate color, halftones, printing resolution, the very large data bases required by printing, or the need for adequate type fonts.

This is not to be critical of these emerging graphic standards. Most of them do a fairly good job of responding to the needs of the industry that spawned them -- e.g., mechanical and electrical engineering, and broadcast arts.

Nonetheless, there are some attributes of several of the graphic standards that may relate to the graphic arts. Figure 4 illustrates the three broad categories that the

Standard	Graphics Application Interface	Graphics Device Interface	Graphics Transmission and/or Storage
CGI		✓	
CGM			✓
GKS	✓		
Group 1,2,3,4			✓
IGES			✓
NAPLPS		✓	
NEMA		✓	✓
PHIGS	✓		

Figure 4: Catagories for Evolving Graphic Standards

current computer graphic standards fall into. The Graphical Kernal System (GKS), and Programmer's Hierarchical Interactive Graphics Standard (PHIGS), are principally application interfaces. These standardized interfaces are intended to sit between any vendor's workstation and any graphics application program allowing any graphics software to function on any workstation. The Computer Graphics Interface (CGI), North American Presentation Level Protocol Syntax (NAPLPS), and

Digital Imaging and Communications Standard (NEMA), are graphics device interface standards. (Though the NEMA standard also has several attributes related to picture transmission standardization.) A graphics device interface allows any graphics device, (e.g., workstation, input device, output device, communication link, font, etc.) to function with any other graphics device. Graphics transmission and/or storage standards allow graphics information to be transmitted, stored, retrieved, and received while maintaining the integrity of the information. The NEMA standard fits in this category, along with the Computer Graphics Metafile, (CGM), the CCITT Groups 1, 2, 3, and 4 facsmile standards, and the Initial Graphics Exchange Specification (IGES).

All three of these areas, applications interface, device interface, and storage and/or transmission interface, must be standardized in order to assure that digital information can be passed around within the existing segmentation in the printing industry as well as back and forth to the other area's of graphic applications.

Figure 5 examines some of the specific functionality provided by these standards. Note that none of the existing or developing standards address the graphic arts industry's need for halftones.

Proposed Standard	Application	Text	Typography	Line Art	Color
GKS	-Hardware Independent applications interface ($2-_2$3-D) -Graphics primatives (2 levels) (6 forms)	height align size	font expansion spacing style color	polyline polymarker fill area	✓
PHIGS	-Hardware Independent applications interface ($2-_2$3-D) -Graphic Primatives (14 forms)	height align size	font expansion spacing	width color	edge model table filter
CGI	-Defines a hardware independent interface between graphics packages and I/O drivers	expansion spacing height align		width color	fill perimeter marker
CCITT Group 1,2,3,4	1-2 Obsolete	✓		✓	grey scale
	3- Facsimile	✓		✓	grey scale
	4- Facsimile	✓		✓	grey scale
CGM	-Hardware independent data structure for graphics transmission and storage	✓		width color	✓
IGES	-Defines standard file and language formats for storing and transmitting product definition data	✓		88 primatives spline arc cylinder etc.	✓
NAPLPS	-Text and Graphics transmission interface with display and/or recording devices. -Not interactive -Code extension	✓		✓	✓ 8-bits
NEMA	-Hardware interface and data formats for communication	✓		✓	✓

Figure 5: Graphics Standards Functionality

Figures 6, 7, and 8 illustrate where, in a system configuration, these standard interfaces would fit.

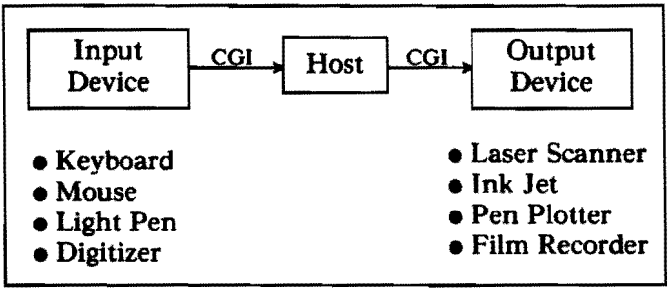

Figure 6: CGI as à Device Interface

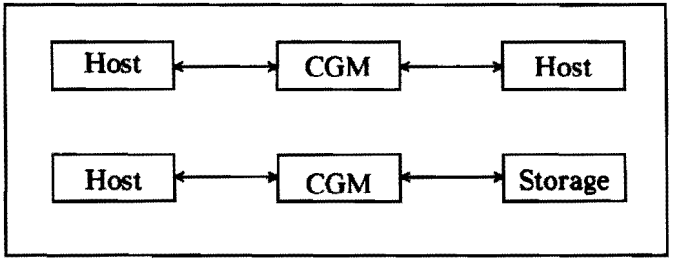

Figure 7: CGM as a Transmission and Storage Interface

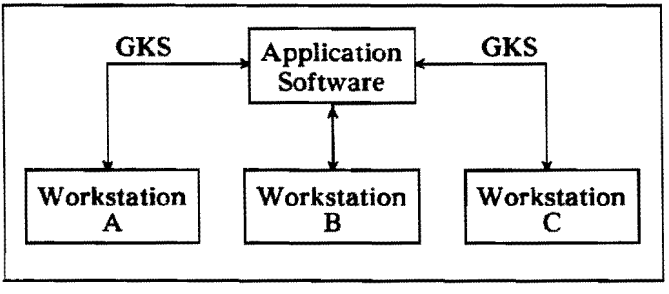

Figure 8: GKS as an Applications Interface

The Standards Making Process

There are several different ways in which standards evolve, though generally it begins with a perceived need for some form of standardization. Often a peer group such as a special interest group, technical, or trade association will formulate procedures that evolve into standard working practice or a working standard (for instance SWOP). Another approach is when an equipment manufacturer issues a

standardized product line that becomes something of a standard due either to a large existing installed base or popular acceptance of the product.

The danger inherent to these forms of standardization is that, in the case of working standards, one oftimes sees an unnecessary duplication of effort usually accompanied by the development of incompatible working standards. The current activity surrounding SWOP and EuroSWOP is an example of this.

In the case of vendor supplied standards, it's reasonably safe to say that every major vendor has one; and it's usually incompatible with every other vendor's standard. It is important to keep in perspective the fact that there is a perceived economic disincentive on the part of the vendors to pursue standards development. Unfortunately this somewhat short-sighted perspective could result in stymying the growth of electronic prepress.

There is another more formal avenue to the establishment of standards. This process exists under the auspice of the American National Standards Institute (ANSI).

ANSI does not make standards per se; rather it controls the process through which standards are set. The organizations' over riding concern is that an industry-wide concensus is achieved in the setting of any standard. This is done to maximize the likelihold that the standard will maintain both wide and long term acceptance. Thus, any professional or industry association can become a standards setting body by meeting ANSI's standards for concensus and approval.

It is interesting to note that the printing industry's representation to ANSI for 1983 was limited to the National Association of Printing Ink Manufacturers, National Printing Equipment and Supply Association, PIA, and the Technical Association of the Pulp and Paper Industry. From the user world only Moore and Standard Register (both forms printers) were members.

In addition, ANSI is a member organization of the International Standards Organization (ISO). As such, much of the developmental work undertaken by ANSI committees receives attention at, and is oftimes adopted by, ISO. This helps assure international compliance.

Conclusion

In order to continue in its automation progression the printing arts industry must begin now the developmental work to formalize data standards. There is a clear requirement to have international cooperation while doing so, due to the number of important overseas vendors and users.

There is a need to identify and obtain a specific organizational sponsor who will not only serve as a liaison agency with ANSI, but is also of significant stature to assist with identifying and recruiting a group of committed vendors and users to carry out the committee work of specifying a standard.

If this work is not begun shortly, the progress of electronic prepress will likely be choked by its own inability to communicate.

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