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## ***Digitization and Graphic Communication Education: From Print Reproduction to Dynamic Image Generation***

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Production processes are undergoing fundamental changes brought about by the introduction of digital technologies. In fact, the digitization of the workflow is the Industrial Revolution of the twentieth century: Two hundred years ago, the graphic arts industry adopted the steam press and hot type foundry, eliminating hundreds of jobs. Today, the “digital revolution” is cutting back human resources in favor of automated processes. Innovations adopted as a result of digitization not only include computer-to-plate and direct-to-press processes, but also digital printing. However, the new technologies have not only changed print production, but they have also expanded the realm of graphic communications to a variety of electronic media such as CD-ROM publishing and the Internet, which are capturing growing segments of the print market.

However, far from limiting the job market, the increased use of digital technologies has expanded the employment opportunities of graphic communication technologists. The publishing industry reports a shortage of qualified employees (Pira International, 1999; TrendWatch, 1998; “Turning Gold,” 1997), reflecting a demand for industrial technologists specializing in graphic communications and the graphic arts.

This paper describes the changes faced by the field of graphic communications in light of new digital graphic

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communication media. An analysis of the industry’s needs suggests a redefinition of the graphic arts education to include image generation in addition to image reproduction. Furthermore, this explains that today’s graphic communication includes both print and electronic media, fusing the formerly split fields of still and dynamic image generation. Finally, it is argued that the potential growth of the professional realm of graphic communications will extend only if these changes are embraced by educational institutions. Graphic communication technology curricula need to include electronic publishing and multimedia production technologies in order to fill the job niche created by the development of new media.

## ***Graphic communications and the “digital revolution”***

The digital workflow has all but extinguished most of the traditional “composing room jobs” (Karch, 1970) such as compositor, layout man, proofreader, linotype-intertype operator and monotype operator. The only “survivor” is the “layout man,” known today as a “graphic designer.”

Once exclusively concerned with image generation, graphic designers are now taking over a variety of production responsibilities in addition to the visual conceptualization of information. Working in close relationship with printers and electronic publishers alike, designers are often in charge of preparing artwork for proper ripping, trapping and color separating. Likewise, many of the pressroom positions such as the platemaker, electrotyper, stereotyper, and photoengraver have collapsed into the electronic pre-press

technician who handles all of the pre-printing requisites through a computer. Moreover, it is not uncommon to find the graphic designer’s and the pre-press technician’s duties done by the same person. Hence, today’s graphic communication professionals need to be as proficient in image generation as in graphic reproduction in order to respond to the industry’s needs where automated technology is fading out numerous print positions.

However, while digitization is limiting the job market in traditionally defined graphic arts, employment opportunities in image generation are expanding. In October 1998, “TrendWatch” a monitor of changes in the graphic arts, publishing, and electronic media markets, reported that despite the fact that the pre-press industry lost 29% of the firms and 16% of the production jobs since 1990, employment in the graphic arts did not suffer. On the contrary, finding qualified employees has been one of the top concerns of printing and trade managers. According to “TrendWatch,” graphic communication technologists are joining the creative sector, an area that is growing considerably. In 1998, the number of creative establishments rose by 11.5% and the number of creative employees expanded by 12.5% in comparison to 1997 (TrendWatch, 1998).

The increased production responsibilities at the creative stage of the graphic communication production and the growing demand for professionals skilled to take on such responsibilities are a direct consequence of the growing capabilities of personal workstations. With the advent of the computer, the realms of image generation and

reproduction have overlapped to form one field in which technology literacy is a primary requisite. This kind of expertise, however, is difficult to obtain and to maintain at today's pace of innovations. In the graphics industry, pre-press and electronic publishing have brought a wave of opportunities requiring skills that have not been a part of a graphic communicator's education in the past.

In 1998, the London College of Printing conducted a study analyzing the training needs of the pre-press industry (Pira International, 1999). The study identified a skills gap generated by the convergence of once highly differentiated text, image origination and manipulation areas into one that allows for still and moving images to be treated within a single digital environment. While this convergence has spawned opportunities for companies to expand into new areas of operation providing alternative media services to clients, the study suggested that growth in these areas has been hampered by the need for employees with digital media skills.

### ***Multimedia Electronic Publishing and the Future of Graphic Communications***

Multimedia—the combination of text, images, sound, and motion—has evolved into a powerful information tool. The growth of this medium is directly related to the use of personal computers and their increased media capabilities—most notably, the Internet, which is currently one of the main outlets for multimedia communication. A growing number of businesses are establishing a presence on the Internet by hosting web pages, which oftentimes allow consumers to purchase goods, but are also frequently only used as a means of contact and promotion.

For its multimedia capabilities, electronic publishing has been perceived as a threat to the print publishing market. In fact, at the beginning of the 90s, electronic publishing was predicted to replace print media entirely. Hypothetical scenarios, such as the “paperless office,” described a world of electronic transfer and display

of information with no need for print. However, as far as paper consumption is concerned, time has proven the opposite. While more information is being transmitted digitally, the sheer quantity of information is expanding and more of it is printed on consumers' personal laser printers (Reese, 1997).

Nevertheless, the growth of electronic media has affected the book publishing industry, where such companies as Doubleday, Putnam, and McGraw-Hill have registered major cutbacks (Max, 1994). Although the decline in the book market is strongly related to the increased use of a variety of other media such as radio, television, movies and video, —which have competed with books for several decades, — more recently, the direct competition of the printed book is the CD-ROM.

After two decades on the market, CD-ROM publishing has proven a versatile medium that allows readers to interact and customize their access to information. The advantage of this medium lies in its capability to deliver what today's hyper-stimulated society demands: a high-capacity, dynamic, non-linear and multi-sensory medium. In fact, CD-ROMs are already being replaced by Digital Video Discs (DVDs), whose storage capacity outperforms the former at a rate of 14 to 1 (Beiser, 1996).

In addition, the Internet is influencing the print publishing industry by providing access to catalogs, indexes, books, magazines and other information that used to be available only in print, allowing readers to bypass the need for acquiring a published copy for themselves. An ever-increasing variety of materials has been made available on the Internet, catering to the 129 million English-speaking users estimated to access the Internet in 1999 (Global Reach, 1999).

However, with the exception of the Internet, the adoption of multimedia has been slower than expected. In 1994, interactive media advertising spending totaled \$135 million, primarily for online services and CD-ROMs, which was far lower than anticipated (Rose, Gross & Eechambadi, 1995). In

the book publishing industry, consumers were expected to turn to multimedia in lieu of printed books. However, in 1996, numerous CD-ROM publishers went out of business, cut back their title output, or merged with other companies (Milliot & Kinsella, 1996).

Nonetheless, while the multimedia market has fallen short of its expectations, it should not be dismissed. Recent reports indicate that the demand for interactive and multimedia advertising is slowly increasing (Gren, Fogarty & Ubinas, 1999; Wilson, 1997) and CD-ROM publishers are revising the applications of this medium, focusing on growth markets such as children's education, reference titles, and book/disc packages (Milliot & Kinsella, 1996). Thus, while multimedia electronic publishing has not taken over the print publishing industry, it is certainly evolving into a powerful medium.

In addition, multimedia is making its way to the corporate realm beyond sales and marketing departments. Corporations are exploring the use of multimedia training programs, interactive internal communication via Intranet servers, and CD-ROM publishing. For example, industries such as health care and airlines streamline operations with integrated voice and imaging applications (Smith, 1995). Also, the manufacturing industry uses multimedia programs such as IBM's Paperless Manufacturing Workplace, which provides text, vector and raster-based graphics, video, user written programs, and engineering instructions to workstations on the manufacturing plant floor (Blakeney, 1993). However, the major restraint in the growth of the multimedia industry is the rapid pace of technological changes, an intimidating factor that has prevented many companies from developing mission-critical multimedia systems.

### ***Technology literacy in the workplace***

For a large number of companies the need for training and constant updating is a major deterrent to make large investments in technology-based communication. In 1995, 36% of large

and medium-sized businesses revealed no interest in multimedia and more than half said they were only moderately interested (Smith, 1995). A mere 2.6% of surveyed businesses were enthusiastic about incorporating multimedia technologies into their business strategies, suggesting that the continuous development of digital technologies and the subsequent need to keep up with it has prompted companies not to embrace multimedia (Smith, 1995).

In the field of graphic media production, where multimedia is being developed professionally, technological innovations pose a similar challenge. A 1999 survey (TrendWatch, 1999) reported that 80% of advertising agencies consider keeping up with technological changes their main concern. Over half of the surveyed agencies (55%) were challenged by managing print production, which included both the volume of print produced as well as preflighting files for output, and managing digital pre-press for print. The survey data showed that the graphic arts, publishing and electronic media industries have difficulties in finding and keeping qualified employees, especially those businesses involved in web or multimedia design.

Alternatively, an increasing number of companies are hiring consultants to help them cope with the rapid developments of technology. Through consultants, companies take advantage of professional expertise without engaging in extensive in-house training (Piscopo, 1998).

In short, a great variety of industries and especially the publishing industry, are dependent on technology and respond to it by placing increased importance on the technological literacy of their employees. Therefore, digital media competence, coupled with knowledge of the graphic communication production processes is a highly desirable qualification.

### ***The new face of graphic communications***

The shortage of qualified employees experienced by the publishing industry provides evidence of a shift in

the profile of graphic communication graduates sought by the industry. A new focus places increased importance on image generation and electronic publishing, in addition to print reproduction. Graphic communication specialists with this kind of expertise are in great demand not only by the graphic arts industry, but also by a variety of other companies, such as web design studios.

Businesses are venturing into Internet and other multimedia marketing strategies, and are thus employing graphic communications specialists. In addition, companies that used to outsource their printing needs are adopting desktop publishing technologies to produce business communication pieces in-house. Undoubtedly, in an age where more paper is consumed than ever before, graphic communications employment opportunities are shifting from the press to the computer, from the actual printing process to the formatting of information for electronic access.

### ***Industrial Technology Educational Programs in Graphic Communications***

In recent years, educational programs have started to modify their curricula in accordance with the increasing demands for graphic communication graduates with high command of digital technologies. High schools in the Los Angeles area, for example, are teaching computer animation (Clemons, 1998) and both the Department of Industry and Technology at the University of Pennsylvania (Litowitz & Baylor, 1997), and Colorado State University (Clemons, 1998) have been hosting computer animation workshops for K-12 youth for several summers.

At the college level, graphic communications programs have also commenced to embrace new media technologies. As is usually the case with fundamental changes, the transition is slow and costly. The same factors of rapid technological change and uncertain investment value that inhibit the industry from adopting multimedia fearlessly are halting

educational institutions. At the present rate, computer-related courses need to be redeveloped on a yearly basis with considerable investment not only of hardware and software, but also in terms of time and effort.

One of the top centers of education for graphic arts and printing professionals, the Graphic Communication Department at California Polytechnic State University, has long offered degrees in three major areas: "Printing Management," "Design Reproduction Technology," and "Computers and Printing Technology." In order to better reflect the recent developments in the digitization of the industry, the Computer and Printing Technology area was renamed "Electronic Publishing and Imaging" in 1997 ("Turning Gold," 1997).

At the California Polytechnic, graphic communication instruction includes internet publishing, computer imaging, desktop publishing and multimedia. In addition to state-of-the-art print production facilities, California Polytechnic also features electronic pre-press, design reproduction technology and digital electronic imaging labs. Students of this select program reportedly receive three to five job offers before graduating ("Turning Gold," 1997).

Notably, California Polytechnic not only includes electronic pre-press in its curriculum, but also multimedia, blurring the limits between motionless and dynamic graphic communication. Multimedia is the discipline that has blurred the boundaries of such areas as television, video, and animation with the graphic arts into one field: graphic communication. The transition initiated by California Polytechnic is a model to follow. Not many educational programs have made the leap towards electronic publishing and digital image generation running the risk of ill-preparing their graduates. The existing skills gap in graphic communication technologies is a market niche waiting to be filled by industrial technology programs.

### ***Conclusion***

Through the influence of digital technologies, graphic communication graduates who traditionally joined the

printing industry are facing changing employment opportunities. The digitization of the workflow started with the electronic pre-press, infiltrated the photo-reprographics and plate-burning processes, and is now introducing digital printing. As a result, fewer jobs are available in the pressrooms and more in the area of image generation.

The “digital revolution” is fusing the formerly split fields of print and electronic media demanding graphic communication professionals competent in both still and dynamic imaging technologies. Thus, the graphic arts, publishing and electronic media industries are in need of graphic communication specialists with a high degree of technological literacy to fill positions in the realm of image generation, process management, as well as consulting. In addition, an increasing number of companies outside of the realm of publishing focus on improving their productivity and competitiveness by leveraging the benefits of information management through new media technologies. Industrial technology is an ideal major for graphic communication students facing changing needs in the graphic arts industry. Electronic publishing and interactive multimedia studies have been adopted as a part of engineering, communication, and art programs. However, traditionally, industrial technology has been the field which

combined technological expertise and graphic reproduction. In light of the “digital revolution,” graphic communication programs need to adapt to the age of electronic communication. By emphasizing image generation and interactive multimedia in addition to print reproduction, graphic communication programs will better respond to the changing needs of the industry.

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