

## The future of the printed image

Digital printing is paving the way to a convergence of imaging industries like we've never seen before. Trends in commercial printing and photo imaging are on a collision course. Personalized photo calendars, for example, have technically belonged to the photo industry. However, customers can give digital images to local quick printing firms to print such calendars. Every print and photo business is after the consumers' images.

We do not expect prints to fade completely, but do expect them to lessen in importance as other modes of image usage become more readily available. Of all the digital photos taken, a good portion are being erased and only about 11 percent of all shots are actually used. A mere one-third of those images will be printed, with the balance used electronically. Even at 3.3 percent of all images, digitally printed images will be a greater number than all of the photo prints taken previously. With film, people have to take all 24 or so images printed at retail, good or bad. Digital makes it easy to sort images and delete the rejects.

Digital image printing will remain dispersed between the home, specialty retail, and commercial outlets, but ownership of home printers will increase. Everybody on earth may have their own inkjet printer. Home printing will remain expensive because of consumables compared with retail or commercial outlets. Digital printing will continue to use different consumables, including inkjet, toner, and solid ink. Inkjet printing will dominate.

The consumer market now supports a growing number of image capture devices (cell-phones, PDAs, and digital cameras) that offer new uses for images. Some of these capture devices do not fully support printing—yet. Cameraphones, predicted to capture moving video images with audio within five years, are going to change the world. It will still be possible to freeze a frame and send the image to Grandma. Once, you had to make a decision to have a camera with you; now, you will always have a camera with you.

Cameraphones also will begin incorporating built-in methods for image and video storage and archiving. As these devices continue to grow in use, they will increasingly include portable digital presentation on LCD or OLED display screens. Display screen portability may someday rival printed photos kept

in a wallet. The battle for the consumer's pictures are drawn between two basic forms: print and electronic. The print format uses commercial printers, photofinishers, and other imaging services. The electronic format uses the Web, digital screens, TVs, cellphones, and PDAs. With digital imaging and its various forms, the accessibility of images has also increased. Today, there is no original, as any image can be seen on a computer screen, in print form, or on someone else's computer screen in just moments. We live in an on-demand culture. We want our prints immediately. We're entering the while-you-wait-market on a retail and even on a personal level.

There is a new image market upon us, and in the future people will be able to capture more information *about* images, like temperature and ambient light. Machine intelligence will be incorporated into the cameras and processing systems that make judgments about the image using electronic analysis. This "artificial intelligence" already exists at a high-level in areas like spy intelligence. This functionality will trickle down into other mobile consumer devices, telling users things about their images human eyes can't even see.

When this information is captured within an image, it will greatly aid in color management. Adobe Photoshop and the new JPEG formats have helped in the color management equation already. It's still an imperfect system in the flow from what we see to what we print. Color is "black magic" and everybody has a piece of it. While the imaging market is changing and evolving, often more quickly than anticipated, images will remain an important part of people's lives. With every challenge there's an opportunity, and with every opportunity there's a challenge. A big part of "imagine" includes a lot of "image."

### DID YOU HEAR?

- 71 percent of U.S. households received 5.23 billion credit card offers last year—5.7 per month, or about 68 offers per year per household. The total represented a 22 percent increase from 2003 and exceeded the previous mail volume record of 5.01 billion credit card offers in 2001 (Mail Monitor).
- Broadband has surpassed dial-up at home in the United States, reaching 53 percent of residential Web users (Nielsen/NetRatings).
- 28 percent of U.S. adults—60 million—have no wireless phone, while 21 percent—45 million people—have no access to the Internet at home or at work (MRI).
- Can't find a parking space? That's because the number of people on this planet grew from 1 billion in 1820 to 6.4 billion today (CIA World Factbook).
- The Universal Product Code officially goes from 12 to 13 digits this year.
- Without duplication, the human genome, which defines humanity, is 30 million bytes of information—less than MS Word.
- Junk mail is a fantastic offer sent to the wrong person.
- 73 percent of adults who plan to buy a new vehicle responded to direct mail (Vertis).
- "E-commerce will keep growing because 73 percent of teenagers use the Internet regularly, and 81 percent of them made a purchase online, versus 50 percent of adults" (Terry Jones, Travelocity.com).
- 69 percent of consumers prefer direct mail, compared with 28 percent who chose e-mail (InfoTrends/CAP Ventures).
- Direct mail accounted for 15 percent of all U.S. media and marketing expenditures in 2004—about \$36 billion. It is expected to grow 5.6 percent annually between 2004 and 2007 (Kubas Consultants).
- After three consecutive years of contraction, U.S. paper and paperboard capacity held stable in 2004 at about 100 million tons (American Forest & Paper Assn).
- 29 percent of commercial printers produce variable print jobs (TrendWatch GA).

## EDSF BOARD OF DIRECTORS

### EXECUTIVE COMMITTEE

#### Chair

Brian M. Baxendale, Exec. Vice President, Pitney Bowes

#### Executive Vice Chair

Don F. Lowe, CEO, Franchise Services, Inc.

#### Secretary & Treasurer

Wolfgang Pfizenmaier, Senior VP, Heidelberg Americas

#### Vice Chair of Education

Mike Jackson, Sr. Vice President, Pulp & White Paper, Weyerhaeuser Co.

#### Vice Chair of Research

Kenneth M. Morris, Ph.D., CEO, Lightbulb Press, Inc.

#### Members-at-Large

Guy Gecht, CEO, EFI

Nachum "Homi" Shamir, Vice President, Eastman Kodak Company, President & CEO, Kodak Versamark, Inc.

Jeanne Mowlds, EDP, Executive Director, EDSF

### DIRECTORS

Quincy L. Allen, President, Production Systems Group, Xerox

Alfons Buts, President, Nipson Digital Printing Systems PLC

Joel Cartun, Founder & Vice Chair, Vestcom International

Carl Frappaolo, Co-Founder, Delphi Group

Jeffrey Hayzlett, President & CEO, Hayzlett & Assoc.

Harold "Skip" Henk, EDP, President, Xplor International

P. Tom Jenkins, Chair & CEO, Open Text, Inc.

John Lombard, President, Böwe Bell & Howell

John A. Lopiano, President, Spinet Associates

John Mancini, President, ALLM International

Ed Marino, President & CEO, Presstek

Keenie McDonald, General Manager, IBM Printing Systems

William P. McGlynn, Vice President, Enterprise Publishing Solutions, Hewlett-Packard

Barbara C. Pellow, CMO, Graphic Communications Group, Eastman Kodak Company

Tod D. Pike, Senior Vice President, Imaging Systems Group, Canon U.S.A.

Frank Romano, EDP, Professor Emeritus, Rochester Institute of Technology

Sue Tidswell, Senior Vice President, RR Donnelley

James Watson, Jr., Ph.D., President, Doculabs

Joel Wecksell, Group VP, Gartner

## EDSF REPORT

Editor-in-chief: FRANK J. ROMANO, EDP

Editors: Toby Cobrin, EDP, Roberta McKee, EDP,  
Jeanne Mowlds, EDP, Sidney F. Huttner, Univ. of Iowa

Design courtesy of Lightbulb Press, Inc.

Printing courtesy of Sir Speedy, Inc.

Mailing courtesy of IBM Printing Systems Division.

Price: \$50

Copyright ©2005 by The Electronic Document Systems Foundation. All rights reserved. Reproduction in whole or in part by any means without permission is prohibited. When reproduced, the credit line should read "Reprinted courtesy of EDSF." EDSF is funded by individual and corporate contributions. To make your contribution, contact Jeanne Mowlds at [jcmowlds@aol.com](mailto:jcmowlds@aol.com)

This newsletter is based on sources considered reliable. However, EDSF cannot guarantee its accuracy, completeness, or reliability, due to errors in fact or judgment.

**EDSF**  
The Electronic  
Document Systems  
Foundation

24238 Hawthorne Boulevard  
Torrance, CA 90505-6505 USA  
Tel: +1-310-541-1481  
Fax: +1-310-541-4803  
[info@edsf.org](mailto:info@edsf.org)  
[www.edsf.org](http://www.edsf.org)  
[www.EDSFIntern.org](http://www.EDSFIntern.org)

## SHORT SHORTS

**MORE THAN A BILLION PEOPLE** A day read a daily newspaper in print. Not bad for a 400-year old medium. The World Association of Newspapers says that 2005 marks the 400th anniversary of the birth of the first newspaper in print. The publisher of 'Relation' was Johann Carolus, who earned his living at the turn of the 17th century by producing hand-written newsletters, sold to rich subscribers at high prices, reproducing news from a network of paid correspondents. In 1604, he bought a printing shop from the widow of a printer and in 1605 he switched to printing his newspapers, because it took him too long to have them copied by hand. He calculated that he could make more money by printing more newsletters for a lower price. Carolus petitioned the Strasbourg city council asking for "protection against reprints by other printers."

**PIONEER CORP. HAS DEVELOPED** A recording disc made of corn that lets you dispose of data by planting it in the ground. The Japanese electronics maker said the Blu-ray optical disc, which can be written once and stores 25 gigabytes of data, is 87 percent natural polymer derived from corn and biodegradables. If the starch polymer is incinerated, it will not emit dioxins or other harmful chemicals. The disc is edible, but it is coated with a 0.004-inch thick layer of resin and too hard for even the strongest teeth. Pioneer has yet to decide whether to market the disc. Sony Corp. and Toppan Printing say they developed a paper disc that can be cut with scissors for data security.

**67 PERCENT OF PEOPLE SURVEYED** agreed that mail is more personal than the Internet; 56 percent say receiving mail is a real pleasure, and 55 percent look forward to opening the mail they receive. The Mail Moment study, conducted for the USPS, showed that mail offers marketers a rare chance to capture a consumer's undivided attention. Messages are noticed and the offer is considered for longer than the often-assumed 30 seconds. 98 percent of consumers bring in their mail the day it's delivered, and of these, 72 percent bring it in as soon as possible. 77 percent of consumers sort through their mail immediately. Consumers spend an average of 30 minutes reading their mail, 45 minutes with magazines, 30 minutes with catalogs; and 25 minutes with direct mail. Consumers who receive a company's catalog account for 22 percent of a company's Web site traffic and 37 percent of their e-commerce dollars.

**SURVEYS FROM THE PEW INTERNET** and American Life Project discovered that 69 percent of broadband users go online on a typical day, compared with 51 percent for dial-up. Broadband users average 107 minutes surfing the Web, 21 minutes longer than dial-up users. Web use hasn't changed as much as frequency and duration, and some people are making telephone calls on the Internet or using webcams for video chats. Users are now more apt to look something up online than to check a printed volume. The U.S. trailed 12 of the 15 top economies in broadband penetration.

## Making knowledge mobile

Scientists have developed document imaging technology that can turn mobile phones into portable document scanners and even allow users to acquire, store, read, print, and share documents at will. Mobile phone technology had to catch up so that the cameras integrated on them were of a high enough resolution. The new technology would enable them to capture information from handwritten notes, documents, screens, whiteboards, or other surfaces, then immediately transmit it. Patented mobile document imaging software uses a four-step process:

1. Capture the image photographically.
2. Apply software to correct blurring.
3. Convert image to black and white and eliminate shadows and reflections. For handwritten text or writing in color, as might be found on a whiteboard, apply color saturation and white balance contrast techniques.
4. Compress the image to send and print. G4 fax compression produces images one-tenth the size of JPEG. A 250Kb JPEG image becomes a 25Kb G4 fax image.

The file can be sent by Bluetooth wireless technology, multimedia messaging, or facsimile. Once the image reaches a server or desktop PC where optical character recognition can be applied, various types of services can be offered based upon user needs. In the future, we will be able to apply other document technologies such as indexing, retrieval, or summarization. Ultimately we will be applying business-to-business document functions to the basic consumer snapshot technology and, in doing so, will have changed the way in which people communicate. Information becomes knowledge when it is organized and accessible.

# GEEZERS AND GEEKS

Younger age groups were the first to embrace the Internet, but most of today's growth is being driven by older age groups, starting at age 55 (The Media Audit). In a population of more than 130 million adults, 61.2 percent of all adults visit the Internet regularly, up from 54.9 percent in 2000, and most of the new growth is coming from those over 55 years of age. The 55 to 64 age classification has increased from 9.5 to 11.3 percent of the total Internet audience in the past four years. The percentage of those in that same age group who access the Internet regularly increased from 45.8 percent in 2000 to 56.7 percent in 2003. 55.6 percent of married, childless, age 35 plus, households use the computer regularly. 65.1 percent of U.S. households with children access the Internet regularly.

But, young people are now the savviest of the tech-savvy and demand high-speed connections to download music onto an iPod or upload digital photos to their Web blogs. The Internet has shaped the way they work, relax, and even develop relationships. The Internet has created a different concept of community for them and new avenues for communication and expression. Students are continuously connected to other students, friends, and family in ways that older generations never would have imagined. More than any previous generation, today's young people are connected all the time to a world of communication and information.

Students, not necessarily their schools, are the ones who often drive the use of technology on campus. Students are much more likely to do research online than visit the library. Tests are online and even the class handout has gone the way of the Web, posted for downloading. Assignments are delivered electronically and new excuses must be developed, like "The dog ate my modem."

When the computer server goes down, it is almost as though the world has come to an end for young and old alike. People of all ages see the Internet becoming vital. For them, accessing information is easy.

We are all curious about using new technologies. Young workers continue to push technological advances in the corporate world, partly because they are able to handle multiple conversations and juggle tasks better than the previous generations. The Internet—and other forms of communication—play very much into every generation's wish for flexibility at home, work, and even while on the road. All age groups are multi-tasking—using multiple media simultaneously.

A study from the Cabletelevision Adver-

tising Bureau says teens are just where we left them—in front of the TV. But they're not just sitting there. They are also e-mailing and Instant Messaging friends, surfing the Web, and—as an example of a surviving tradition—they're on the phone. Nielsen Galaxy says more 12-to-24-year-olds are watching TV on a nightly basis, more than ever before. Total day TV ratings for the segment are also on the rise compared with last season, which was also a growth period. TV is seeing compound growth from this important, and young, audience. The next generation of media con-

sumers—multi-tasking, multi-screen, on-the-move multiple media manipulators—are expected to change industry paradigms.

The Internet is bringing us all together. Generations are colliding in cyberspace. Old and young are applying technology in different ways. When the browser was introduced in 1994, older people saw text and books—information; younger people saw graphics and interactivity—games and entertainment. The Internet attracted all generations for different reasons and the world has not been the same since then.

## Where prints are printed

The Photo Marketing Association (PMA) does a great job tracking all aspects of the photographic market. During their Orlando 2005 event they presented significant data on the imaging market. The most interesting fact was that the use of silver-based products is declining overall.

Household penetration of new cameraphones continues to increase:

2003	2004
2.5%	11.0%

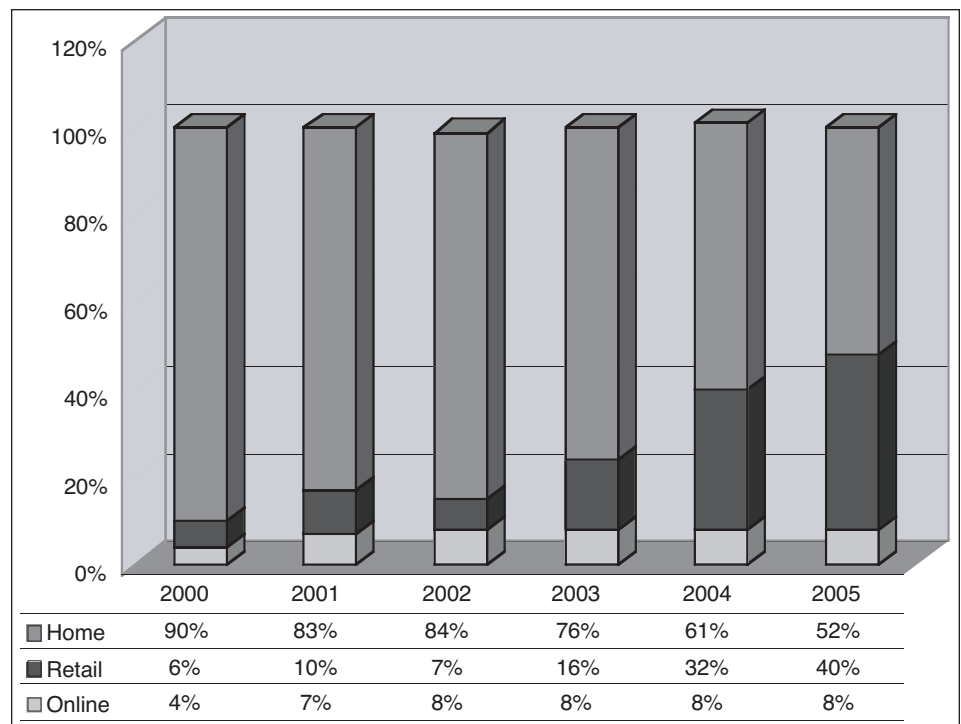
Total prints made also grows:

Billions of prints	2004	2005
Online	0.4	0.7
Retail	1.6	3.1
Home	3.1	4.0

The world of digital photography is growing rapidly as the film-based world diminishes. As cameraphones increase in resolution, virtually everyone will be carrying a digital camera with them.

At the New York Thanksgiving Day parade, about one-third of the watchers held up cameraphones as they were talking to someone on the line.

In the chart below, one can see that the retail printout of photographic prints is growing at the expense of home printing, according to PMA. Home printing could rebound if consumable costs can be reduced. No one seems to be bullish on online printout services, even though there is a synergistic relationship between digital technologies and the Internet. What is a retail service? In the past it was a photo finisher. Today, it could be a quick printer, or other imaging service.



## Electrochemical print

David Nilsson's dissertation from Sweden's Linköping University describes a sensor that can be printed—the result is an electrochemical transistor made of plastic. Since both electrons and ions are active, they can function as a bridge between traditional electronics and biological systems. Electrically conducting plastic is used today in field effect transistors, light-emitting diodes, electrochemical components, and batteries. Organic semiconductors are better than silicon because they can be applied to soft surfaces, even paper, using printing technology. The components can be recycled in the same way as regular paper and plastic.

In an electrochemical transistor, both electrons and ions serve as charge bearers. They can then be used in sensors, analytical tools, logical circuits, and smart display screens. The current is controlled by a reduction/oxidation process, which means that they use low-voltage current, about one volt, and are not dependent on small dimensions. Most important, they have a memory function. The dissertation describes an electrochemical humidity sensor, produced using only organic materials. Depending on the humidity of the air, the conducting capacity of the electrolyte changes, as does the response from the transistor.

The sensor, the battery, and the display can be printed on paper or other flexible surfaces to produce cheap electronic "litmus paper" or reaction strips for blood and glucose testing. Varying the current alters the color of the display and thereby the content of the image or text for smart labels and advertising signs.

## Skin and bones print

Scientists at UK's University of Manchester have developed a breakthrough technology which will allow custom-made tissues and bones to be printed, simply by inputting their dimensions into a computer. Professor Brian Derby, Professor of Materials Science in the School of Materials, and head of the Ink-Jet Printing of Human Cells Project research team, said: "With this technology we are able to place cells in any designed position in order to grow tissue or bone." This breakthrough allows more than one type of cell to be printed at once, which opens up the possibility of being able to create skin tissue and bone grafts.

Using the printers, researchers create 3-dimensional structures, known as 'tissue scaffolds.' The scaffold determines the shape of the tissue as it grows. The structures are created by printing very thin layers of a deposited material repeatedly on top of each other until the structure is built. Each layer is 10 microns thick (1,000 layers equals a thickness of 1 cm). The process is known as "continuous deposition," or "direct write," or "additive fabrication" to distinguish it from etch-based methods.

The cells are suspended in a nutrient-rich liquid that can be compared to ink, which ensures the survival of the cells, and the substance is then fed into the printer and seeded directly into the structure as it is built. By using inkjet printing they are able to deposit the cells onto the construction as it is being built. We can envision later developments that use process color inks to print tattoos at the same time the skin is being created.

## Peas in our time—the future of veggie power

Scientists at the Massachusetts Institute of Technology, the University of Tennessee, the United States Naval Research Laboratory, and the Defense Advanced Research Projects Agency have found a way to harness the energy that plants use during photosynthesis to convert light to energy. They are using the process to extend the life of batteries in cellphones, laptop computers, and other portable electronic devices. While the research is still at an early stage and scientists say commercial applications are years away, they add that this discovery challenges barriers between nature and technology.

Research shows that there is a way of using biologically produced molecules and coupling them directly into applied electronic circuitry. This opens up a gateway for applied application, whether you make DNA wires or enzymatically-based reactor cells. This is the first time scientists have been able to extract electrical current from photosynthesis. While previous efforts have produced currents that lasted for a few hours, this group of

scientists produced an electrical current that lasted for a few weeks.

Earlier efforts to extract a current from photosynthesis failed because the proteins that capture energy from sunlight died without water. Researchers liquefied spinach. They ex-

tracted the protein and placed it, heads up and with spaces between each protein, on a chip. The mixture was wedged between layers of plastic, gold and indium-tin oxide, a transparent semiconducting material.

The chips have been built with only one layer of the spinach "soup" and thus can produce a negligible amount of electricity. Scientists are planning to add more layers to generate more power.

The technology won't be able to power electronics on its own. It will wrap around a battery, using light energy to prolong the life of the battery. Scientists chose spinach for its high chlorophyll content, which makes it dark green.

Peas would also have served, but spinach is cheap and readily available. Scientists also think they may be able to use the chips for transistors and memory units. Devices based on the discovery will not be available commercially for about a decade. But vegetables could possibly power electronic devices.

Popeye may have been onto something.

### Flying without a Net or a Cell

49 percent of cellphone-less adults are age 18 to 44, and 20 percent of Net-less adults have household income of at least \$50,000, according to Roper Reports. Cellphones, introduced in 1983, and the Internet, where the browser appeared in 1994, quickly became mainstream technologies. Stereotypes of digital Luddites that are old and poor are not true. Almost 4 million young adults age 18-to-24 manage to live without cellphones; 8 million homes with teenagers have no cell—this is inconceivable.

MRI research shows 60 percent of adults with household income below \$20,000 do without cellphone service. 66 percent of the cell-less make more than that. Roper found two-thirds of cell-less adults are below age 60. The assumption that the cell-less are poor and/or old only goes so far. Adults age 60-plus account for less than 30 percent of the Net-less, and the percentage of people in their early 60s with Internet access is about the same as it is for 20-somethings. In the non-Internet population, there are more adults below age 40 than there are age 60 and above.

The digital divide on the Net has more to do with education than age. 48 percent of adults lacking a high-school diploma have access to the Net, according to MRI; 97 percent of people with post-graduate degrees have Internet access.