

Paper as a disruptive technology

IN 17th century Britain, wood was used to extract iron from ores, heat homes, and build ships. Overuse resulted in a “timber famine,” which forced an increase in the use of coal as a replacement fuel. But coal deposits were deep underground, where mines flooded. This led to the invention of steam engines to pump water from the mines. Higher efficiency steam engines then provided the power for the Industrial Revolution.

The steam engine’s productivity made goods more plentiful, and these goods had to be transported for sale. By the 19th century, this need drove the development of railroads, which ushered in a transportation revolution, which in turn led to the development of suburban communities and mass transit systems.

This was stimulated by wood shortage. Such dramatic changes are unpredictable.

The Internet was made possible by silicon and glass. In 1958, Texas Instruments built an integrated electronic circuit including transistors, resistors, and capacitors on the same silicon chip which became the basis for today’s personal computers. In 1970, Corning produced the first high-purity glass fibers that allowed transmission of light over long distances. Fiber-optic communication replaced copper telephone lines and now carry a vast amount of information over the Internet. Four ounces of optical fiber can carry more information than 33 tons of copper wire. By the late 1990s, 40 million kilometers of optical fiber were laid across the world annually. A copper shortage is driving replacement by fiber optics. Copper cables are now recycled because the metal’s price has gone from under \$1 per pound to over \$4 since 2004, and theft is a problem.

Every technological change is a two-edged sword. On one hand, it disrupts existing markets, but on the other, it often creates new markets. The biggest impediment to change is the inertia of existing markets; once in motion, markets seem to remain in motion and virtually timeless in nature. But change happens, and if we do not control change, change will control us.

Now the world’s use of paper is diminishing as a result of electronic replacement. Bits (electronics) are considered cheaper than atoms (physical items) as we replace paper

images with screen images. There are new markets for paper—we just have not imagined them yet.

1. Make paper smarter. Print with infrared or other inks that can be read by special pens/readers so that the printed page can talk, sing, or link to a website.

2. Make paper radiate. Print antennas, batteries, and circuitry with conductive inks so that paper broadcasts what it is and where it is. Every piece of mail could be trackable.

3. Make paper re-usable. Allow the printed sheet to be erased and re-used.

4. Make paper print efficiently. Link the paper to the printer/process for more efficient reproduction.

5. Make paper on steroids. Create a new generation of paper with plastic-like attributes for rigid packaging.

6. Make paper digital. Integrate electronics and coatings that make paper into display screens.

7. Make paper more packagable. Flexible film and plastics dominate in packaging. Create lightweight paper hybrids that are also biodegradable.

The reduction in paper volume has been sufficient to close down papermaking machines, mills, and companies. As a result, the industry is leaner and meaner and may be in a better position to research and apply new approaches which will lead to new paper applications and markets. We have not seen the level of innovation applied to paper that we have seen applied to printout technology. We seem to take the substrate for granted.

In a TV commercial, a woman shows an architect a beautifully designed faucet and says “Build a house around this.” Why not create new kinds of paper and say “Build a printer and an industry around this.”

DID YOU HEAR?

- At the dinner meeting of the Young Printing Executive Club, Gilbert P. Farrar, Typographic Counselor, predicted that newspapers one day would be turned out without typesetting, electrotyping, stereotyping, that newspapers and magazines would be produced by radio, and that speeds of production and use of color would be increased tremendously. (INPRINT Magazine, 1938)
- The OLED lighting market will hit almost \$4.5 billion by 2013 (NanoMarkets).
- Photo print volumes via photo kiosks were up 14 percent (to 227 million prints) and minilab print volumes grew 23 percent (to 416 million) (PMA).
- Overall color spending, the printing industry’s growth driver, is up 13 percent (Gartner).
- There are more than 84,000 Centenarians in the United States, and that number is projected to increase seven-fold, to 580,000, by 2040 (U.S. Census Bureau).
- Forty-six percent of email users said they’re hooked on email (up from just 15 percent last year) and 51 percent check their email four or more times a day. One in five said they check their email more than 10 times a day (AOL Mail’s fourth annual Email Addiction Survey).
- Households with Internet access receive more advertising mail than those without access. Households with broadband access average 18.6 pieces of direct mail a week while homes without Internet access average 12.6 pieces of direct mail per week (NuStats on behalf of the United States Postal Service).
- Internet advertising revenue will reach \$51.1 billion in 2012 (U.S. Internet Advertising Forecast and Analysis).

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SHORT TAKES

Mintel Comperemedia reports that the estimated mail volume for credit card offers fell eight percent from Q1 2008 to Q2 2008, from 1.67 billion to 1.54 billion. This is the third consecutive quarter that credit card direct mail offerings have dropped—a 17 percent decline from the high point of 1.86 billion pieces. Credit card companies are increasingly offering deposit accounts in lieu of credit accounts because of the credit crunch and declining response rates to acquisition offers. They are looking for alternative ways to reach the consumer. In the past year Discover and Citibank cut credit card mail by 18 percent and 31 percent, respectively. Bank of America held steady on credit card mailings and boosted its mortgage and loan promotions by 26 percent. Capital One and Chase have also maintained credit card mail volume, but each cut lending offers while increasing banking direct mail by 80 percent and 60 percent, respectively. HSBC has reduced its credit card, banking, and loan mail volume across the board, sending 52 percent fewer offers overall.

According to a PEW Internet study, the percentage of Internet users who use search engines on a typical day has been steadily rising from about one-third of all users in 2002 to 49 percent today. The number of those using a search engine on a typical day is reaching 60 percent of internet users who use email on a typical day. Underscoring the dramatic increase, the percentage of Internet users who search on a typical day grew 69 percent from 2002 to May 2008. During the same six-year time period, the use of email on a typical day rose from 52 percent to 60 percent—a growth rate of 15 percent.

Are Yellow Pages telephone directories a threat to the environment? Phone books published annually in the U.S. outnumber the population by 2 to 1. Lawmakers in many states have tried to place limits on distribution, and recent legislation focuses on establishing an opt-out process. Environmentalists complain phone books comprise a major part of many landfills. The \$17 billion-a-year industry compares favorably with other advertising-driven businesses. Moves against phone books threaten not only giant directory printers but other printers who have entered the field to produce geographically targeted phonebooks. A usage study conducted by Knowledge Networks/SRI estimates that Americans referred to print Yellow Pages advertisements 13.4 billion times last year, compared with 3.8 billion online listings.

InfoTrends reports that the traditional print manufacturing business has become increasingly price-driven, and print service providers need new ways to drive profitability. Print service providers (PSP), in today's market, must change their mindset and begin thinking of themselves as Marketing service providers (MSP) to compete effectively. Today's printers must extend their services beyond print manufacturing and into the communications business to help their customers facilitate the process of sharing information. Customized communications solutions can have a major impact on marketing effectiveness. Today's marketing professionals face the conflicting challenges of new distribution channels, a 24/7 global economy, pressure to deliver identifiable ROI (return on investment), and the need to deal with rapidly changing technologies.

*EDSF Excellence in Education Awards nominations
accepted through December 10, 2008.*

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EDSF RESEARCH IN COLOR PREFERENCES FOR WEB DESIGN

The EDSF study “Color Preferences in Web Design” by Professor Carl Nelson Blue with students Christopher McGee and Ty Welu, University of Northern Iowa, Department of Industrial Technology, Graphic Communications Program, was made possible through a research grant provided by EDSF and is available at www.edsf.org.

The overall objective of this EDSF research project was to investigate color preferences in web design. Through the use of an online survey, the primary goal in Phase One was to collect and identify color preferences from the sample’s responses to a computer-screen’s colorimetric space by characteristics based on age and gender. In the Phase One investigation, over two hundred observations were documented on a sample population’s descriptive and quantifiable information with specifics on age, gender, academic level, areas of study or profession, along with each participant’s color preferences for webpage backgrounds, text, and links. The goal in Phase One was to compare color preferences for the group and between related subgroups.

The next step (Phase Two) was to present these color preference findings and data on an accessible website to a sample population of industry and academic professionals in order to document their responses to the Phase One findings. The results were provided to a secondary group of nearly 50 participants from both industry and academic professionals to gather their responses and perceptions on the Phase One research. This group provided additional analysis on the overall color preferences in web design.

When comparing the Phase Two findings and those observed in Phase One, the favorite choice in color combinations for background and text color preferences was a white background with black text. In looking at 100 percent of the Phase Two observations, the favorite choices in background text colors preferences found that 33 percent preferred white background with black text, and when looking at link color preferences, 18 percent of the total group preferred white background with black text and blue links.

Results from this research found that in the sample of over 200 participants, one third of the group preferred a white background with black text. In addition to the preferences for the white background, black text, 18 percent of the total group preferred that combination with blue hyper-links. These findings show that a greater proportion of those surveyed preferred high contrasting page layout with blue hyperlinks. These preferences may reflect or symbolize conventionality in conservative web design, but it may also offer the designer or web content manager with more predictability of interface with website contents and greater usability.

In looking at gender color preferences, females were nearly half of the entire sample yet only 27 percent preferred white background, black text, with 12 percent blue hyperlinks, whereas 40 percent of the males preferred white background, black text, with 26 percent blue hyperlinks. There were nearly twice as many males with this preference over females. Statistical testing reflected these preferences in text and link colors to be significant to what the males were choosing in this group whereas the opposite was found significant for the females in their choices for background colors. Popular color preferences for females’ background colors are more significant than their choices for text and links. Male choices for color preferences for text and link colors are more significant, than

their choices for backgrounds. In other words, the overall color of the webpage background colors and choices for women was more important than their preferences for text and link colors; whereas for men, the colors used for content associated with the text and hyperlinks was more important. For women it may be more about the aesthetics and look of a website, and with males its may have more to do with the details of the content.

In looking at age as a variable, this research found that there are preferences in color combinations based on age groups. These results could reflect the difference in “digital immigrants,” those born prior to the computer/Internet era and “digital natives,” those born within the era of digital technologies. People more accustomed to conventional print might prefer the conventional interface that mimics white paper pages with contrasting dark printed text, whereas a younger viewer is more comfortable with a differing electronic interface. It may also reflect a difference in age as it relates to the eyes and the ability to see clearly and how that might influence color/contrast preferences. All these issues with age and color preferences should be taken into account for web designers and intended audiences.

An overwhelming majority of academic and industry expert respondents found this color research beneficial in terms of designing their marketing communications and bolster the ongoing argument that there are certain expectations of the user’s experience on a website. There are significant reasons to use certain common elements like conventional colors on a website. It is helpful to be able to use color to more accurately capture the attention of the primary audience, many of whom are defined by age. The results reinforce the opinion that most Internet users prefer clean, clear visuals vs. unusual color combinations and lower contrast. Research into color preferences and how those choices affect usability are as important as the content that goes into a website. Addressing these issues should be an important aspect to web design and web design interface research about the human user and the colorimetric color space.

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3RD GENERATION RFID

IDTechEx Chairman Dr. Peter Harrop reports that first generation RFID used a battery in the tag to permit it to initiate a signal, give longer range, manage a sensor, or otherwise improve on the capability of a passive RFID tag. Active RFID locks and unlocks a car at a distance of thirty meters or so. About two billion dollars has been spent on car clicker systems to date and they are still going strong. Other forms of first generation active RFID include over one million tags put in a random sample of letters to monitor the performance of postal services. There are military versions for supplies and assets.

Second generation active RFID is the Real Time Locating System (RTLS) where people or things are located almost continuously from 30-300 meters away, generally by using many emitters. Overlapping the growth of this second generation active RFID is the third generation where a number of remarkable new systems have just become available. It is the Ubiquitous Sensor Network (USN) sometimes known as the Wireless Sensor Network (WSN), characterized by the tag doubling as a reader and a so-called mesh network being used with a choice of sensors on each tag. It may be limited to 30 meters range and the tag may be rather like active RFID tags from ten years ago, even using AAA batteries, but this capability is still notable because it can make systems scalable, self-healing, affordable, and extraordinarily capable. RTLS and USN systems arise from the latest version of the seminal IEEE 802.15.4.

BRIGHT FUTURE FOR OLED

OLED (Organic Light Emitting Diode) lighting is a recent phenomenon. Its brightness, efficiency, and lifetime have reached the consumer stage, and OLED-based lighting products are in the works. The costs of OLED lights are higher than older general lighting technologies. Manufacturing processes for OLEDs have progressed significantly. GE and the Fraunhofer Institute have both demonstrated roll-to-roll manufacturing of OLED lighting, which will ultimately lead to significant cost improvements in OLED fabrication. Low-cost printing approaches and new, small molecule inks will propel OLEDs into the backlighting market. Factories in Asia have scaled up to build large OLED displays. By 2015 sales of OLED architectural and specialist industrial lighting is expected to reach \$1.9 billion.

The challenge for OLED and printed lighting is general-purpose lighting. Will consumers pay for relatively expensive OLED lights when incandescent and fluorescent lights are inexpensive? LEDs, incandescent bulbs, and fluorescent lights present competition for OLEDs. There are other technologies (including some printable technologies) that will compete for certain lighting applications. Thick-film electroluminescent (EL) lamps dominate the market in backlights for keypads and instrument panels. Carbon nanotubes (CNTs) for lighting or displays provide a damage-resistant structure. CNT lighting may also prove printable and thus promise a low cost manufacturing regimen. CNT lighting is also transparent.

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