

# Images and the Information Superhighway

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## Introduction

This paper discusses the impact that the *information superhighway* and *commercial image distribution* will have on each other.

### Scope

There are many seers today who prophesy the eventual demise of paper. Whatever that time period may be, this paper does not pretend to reach that far out into the future. To the contrary, it focuses on:

- how *commercial image distribution* works today
- what are the hurdles preventing widespread use of the *information superhighway* in *commercial image distribution*
- what form of *information superhighway* would most be suited to *commercial image distribution*
- what can change now
- the economic issues

Today a significant portion of *commercial image distribution* is television or radio (sound is one form of image). Because this is already distributed electronically I have excluded it from this discussion.

## Definition

I have not found a good definition of the *information superhighway* so I'll give you my own. For the purposes of this paper these definitions apply:

### *Information Superhighway*

"A global, low cost, high bandwidth electronic system to transport information."

### *Commercial Image Distribution*

"Distribution of third party images for profit."

### Most of Today's Net Traffic Excluded

Third party implies that the ownership of the image content lies neither with the distributor nor the user of the distribution system. Specifically this excludes the majority of business and private mail, telephone calls, faxes, E-mail and most of today's Internet traffic. What then remains?

### Vast Quantities of Data

The world's largest printer, RR Donnelley & Sons Company, enjoys about 6% of the market share of U.S. *commercial image distribution*. Most, but by no means all, of these images are on paper. A back of the envelope estimate indicates that we at RR Donnelley image and distribute about one hundred petabytes ( $10^{17}$  bytes) of information per year. Because we account for probably about 1% – 2%

of global *commercial image distribution*, this puts global *commercial image distribution* at about 10 exabytes ( $10^{19}$  bytes) of information—and most of this is on paper! This amount of information dwarfs the nets of today!

### How *Commercial Image Distribution* Works Today

We are surrounded by printed images, most of them in color. Many of these images are printed on the packaging of the products we buy. Marketing managers are constantly on the lookout for more image real estate to print on. Not much white space remains on products at the supermarket. Advertising pays for most of *commercial image distribution*, and therefore most of the commercial printed product we receive today.

### Major Products

Typical *commercial image distribution* products:

- telephone directories, yellow and white
- newspapers
- magazines and journals
- packaging
- catalogs and advertising mail
- books
- software and manuals
- posters and billboards

### Complex Industry

The wide variety of imaged products speaks to the complexity of the industry. There is no single player with dominance in all product types and no equipment vendors or system suppliers broad enough to cover all the bases. RR Donnelley is the dominant supplier in five of the above product markets in the U.S. and therefore we are deeply concerned about how changes will take place and where we should lead the charge.

### Traditional Work Flow

Publishers—the customers for the *commercial image distribution* industry, traditionally prepare the images for printing. In the world of color, most of the preparation is film based and color proofs are prepared from the film, using predominantly analog imaging methods, sometimes on a lithographic press. Once this image is approved it is used as a reference for the final product quality. This process takes many days and in the case of large documents it can take months. In its heyday the Sears catalog took more than three months.

### Recent Trends

There are some recent trends and technological developments which are changing the rules:

- computer to plate—automated digital imaging of off set lithography plates

- computer to press—automated digital imaging of off set cylinders on press
- desk top publishing—most images will be available in digital form
- electronic photography—the role of film is diminishing
- low cost electronic storage—digital color images consume vast amounts of storage capacity
- direct digital color printing—new low cost digital color printing for commercial printers
- ever increasing net bandwidth—cost and speed of transporting image data are coming into line
- improved screening technology—faster turnaround with greater process latitude
- digital imaging of gravure cylinders—automated digital engraving of gravure printing cylinders
- ongoing cost/performance improvements in processing—color images are process intensive

### Common Factor

All these trends make it easier to maintain the image in digital form until late into the image production process. In other words—the technology is making it possible for the industry to go digital, right up to the point of final commitment of the image to paper!

### Print and Distribute

Transport is a key cost component of most commercial printed products. The economics of the traditional methods of printing—gravure, flexographic and offset—require run lengths of many thousands of copies. Most large scale printing is done at centralized printing plants and the finished product is distributed from there.

### Distribute and Print

The advent of color direct digital printing technology introduces the capability of printing very small quantities economically, even one off. Revolutionary changes in the distribution model are now possible. A network of small printing modules will be built to cater to a particular geographical area. Products will be produced when and where they are needed. This just in time/ just in place approach brings some major savings and advantages to the industry:

- transport cost reduction
- elimination of warehouse storage costs
- up-to-date content
- greatly reduced waste from overruns
- prompt delivery
- personalized products

## The Role of the Information Superhighway

### Electronic Images in your Home

Because most of today's *commercial image distribution* is on paper, what role can the *information superhighway* play? There remain quite substantial hurdles to the electronic transportation of such images to the end user—for example, the home:

- insufficient bandwidth
- lack of suitable imaging equipment—both soft and hard copy
- end user resistance
- concerns regarding the effectiveness of advertising

- images on packaging—you can't carry your detergent home in an electronic package!

### Some Products Will Overcome Difficulties

Clearly the advantages of direct image distribution will overcome certain of these hurdles for some products. Clearly too, human ingenuity will find new commercial products that are not sensitive to the above limitations.

### Going Digital in Commercial Image Distribution

The question outstanding is "what is the role of the information superhighway in today's *commercial image distribution*." Very little will happen while *commercial image distribution* remains primarily an analog, film based process. The new technologies available will change that. Most of our imaging within RR Donnelley today is digital and we anticipate close to 100% digital imaging in the 1997 time frame. We are probably ahead of the industry by a significant margin, but this nevertheless heralds a significant change. We are on the edge of a digital revolution in *commercial image distribution*.

### Transmission and Storage of Large Amounts of Data

Within RR Donnelley we expect this century to be transmitting about one petabyte ( $10^{15}$  bytes) of information per year and storing about one hundred terabytes ( $10^{14}$  bytes) on-line, producing about one hundred petabytes ( $10^{17}$  bytes) of information imaged on paper. This quantity of data would make RR Donnelley one of the largest—perhaps the largest single commercial network user in terms of data volume. This would put the global *commercial image distribution* data volume in the region of one hundred petabytes ( $10^{17}$  bytes) and global on-line storage requirements in the region of ten petabytes ( $10^{16}$  bytes).

There is no experience base with data quantities this large and clearly the numbers themselves are nothing more than an attempt to size the ball park. Nevertheless they do allow some conclusions:

- at least one industry leader in this field is trying to build a network capability for global *commercial image distribution*
- the data volume is large enough to be a significant portion of the *information superhighway*
- the economics of on line storage requirements provide a significant challenge

If these data volume and storage estimates are even close to reality then the impact of global *commercial image distribution* on the worldwide network will be dramatic.

## How Commercial Image Distribution Will Affect the Information Superhighway

### Networked Commercial Image Distribution Model

Within RR Donnelley we anticipate direct network connections to our customers, the publishers. These connections will enable transmission of their image content to an image processing center. The processing center will audit the data to verify that all pages, fonts and instructions are present and correct and then will store the data on-line in at least two geographical locations for security. In accordance with the customer's requirements the data will

then be output as required in various geographical locations around the world.

### **A Hypothetical Example: a Scientific or Medical Journal**

As articles are submitted they are placed onto the network and transmitted to the RR Donnelley image processing center. An audit check is performed on each submission and the articles are placed on-line for restricted access by the peer review board for that journal. Once all the articles have been reviewed, those approved are formatted by the editorial staff and a new edition of the journal is assembled, approved and sent back to our image processing center.

Images are processed according to each output requirement. In our hypothetical example, a run is printed using offset lithography in New England, and copies are printed and distributed from various color digital printing modules around the world. A CD ROM is produced and circulated. An electronic copy is processed and made available to on-line subscribers. Individual articles are available on-line for ad hoc 'pay as you use'. Electronic subscribers can obtain a color hard copy of particular articles on a rapid service basis from the nearest color print module or by fax or E-mail.

The data is archived for long time storage.

### **Network Requirements**

The example highlights a number of network requirements

- global access
- high bandwidth nodes (probably >30 megabytes)
- image transmission tracing and audit—when and where did each image go?
- subscriber and 'dial in' on-line access
- data security and confidentiality including restricted access
- support to enable billing of subscribers and casual on-line users
- audit function for incoming data checking
- archive support

Some of these requirements may be better served by the image processing center itself rather than by the network. While the allocation of functions between the image processing center and the network is not the issue here, the *information superhighway* must support, or at least enable the implementation of these basic functions for the system to be successful.

What form the network should take is far from clear at this stage. Options for RR Donnelley include:

- a privately operated network
- a private leased facility from a network provider
- adaptation of a future, more advanced public network

As we further develop our vision and focus and examine what is available, this decision will become clearer.

### **Conclusion**

The *information superhighway* offers substantial benefits for *commercial image distribution*.

There are substantial benefits to be obtained by "going digital" in today's printing markets.

Advances in imaging technology, data storage and data transmission now make "going digital" achievable—the industry is ready!

The very large volume of information to be transmitted and stored and the functional requirements of the *commercial image distribution* industry will significantly impact the nature of the *information superhighway*.

At least one industry leader is committed to finding solutions to these problems and to implementing a global *commercial image distribution* system.

The wheel is still in spin as to whether an existing net protocol can be adapted to serve the needs of the *commercial image distribution* industry or whether a privately operated network is required.

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