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Printing and Paper Industry in Digital Era

Sang Hyun Moon

ABSTRACT

The objective of this article is to review the impact of emerging information technology on printing and paper industry. Today' s developing information technology affects every corner of one' s daily life and will bring dramatic changes in printing and paper industry, which should be regarded as definite trend that every participant in the industry must follow in any manner.

Reviewing relevant technologies and quoting recent survey conducted by Boston Consulting Group will hopefully lead to a basic understanding of the impact of the transition of information distributing methods on printing and paper industry.

1. Changes in Printing Industry

There have been many changes especially in prepress stage of printing workflow in recent years. Postscript, a complex set of PDL (Page Description Language), introduced by Adobe in 1985, aimed at device-independent standard format for regenerating graphic components of documents has made a great advance reaching level 3 and become standard format in graphic arts industry. Recently PDF (Portable Document Format), created also by Adobe, became standard tool for distributing document

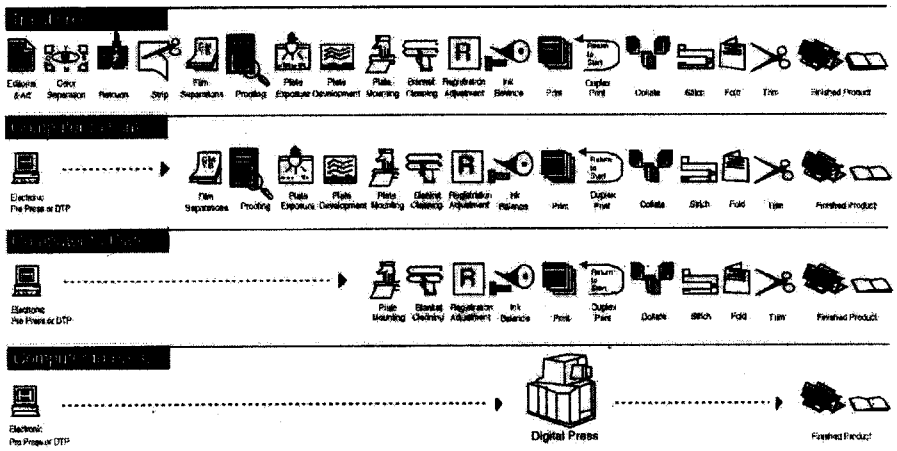

Fig. 1. Changes in Printing Process.

•DaiYon Co., Ltd., 118-6, 3ka, Eulchiro, Chungku, Seoul, Korea.

online for viewing electronically and eventually printing. Under the increasing use of online methods of the distribution and owing to its slimness and independence, PDF based workflow will be dominant in printing industry.

Other than the aforementioned formats, putting information into digital format in general will increasingly affect printing workflow and the shape of the industry.

1.1 Changes in workflow

As Fig. 1 shows, many stages of workflow in printing are being and will be skipped as technologiy evolves. Major role played here is the standardization of PDL as Postscript used by every manufacturer of equipment and software. Owing to the standardization, users have been able to select and configure his or her own system based on open system.

At early stage of desktop publishing system, images were input by a high-end drum scanner and jobs were composed mainly by Apple's Macintosh personal computers and output to film to the postscript imagesetters. Manual imposition and plate make-up should be done before final printing. By the introduction of CTP (Computer To Plate) the manual imposition and plate-making can be eliminated, thus creating much higher quality of plates and better registration at shorter turnaround time.

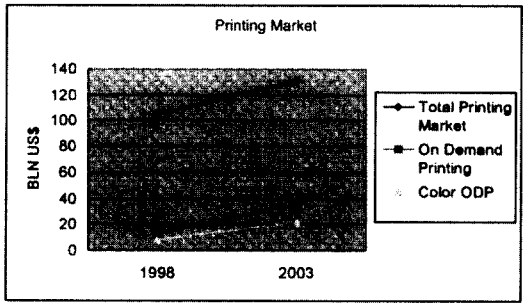

Fig. 2. Growth Paths of Printing Market.

Digital presses introduced since 1993 even skip the process of making plates by accepting digital files directly from computers via network. The whole printing process becomes as simple as sending a file to a printer on the network. Digital printing technology is developing so rapidly that there are some models even using up to seven colors for spot colors as well as hi-fi colors. Even though the application of digital presses are somewhat limited to short run-length of printing, however, as the level of digital information becomes ubiquitous, there will be increasing demand for digital presses as a method to print digital information at exact number of copies necessary, on demand and wherever needed.

Fig. 2 shows growth paths in printing market in U.S.A. As the total printing market grows, so does digital printing market especially color on demand market with average growth rate of 31% per year.

Network printers for in-house application are also gaining much faster printing speeds and better quality absorbing much of office printing and home printing demands.

Additionally digital cameras as image capturing devices are developing so rapidly with better quality and less cost and consequently there are increasing usage in graphic arts industry as well.

Major trend in printing workflow is toward full digital way, which will eventually eliminate human intervention to the end.

1.2 Internet and network

Fast development of the internet and information technology affect not only workflow but also ordering and controlling practice. There were estimated 160 million

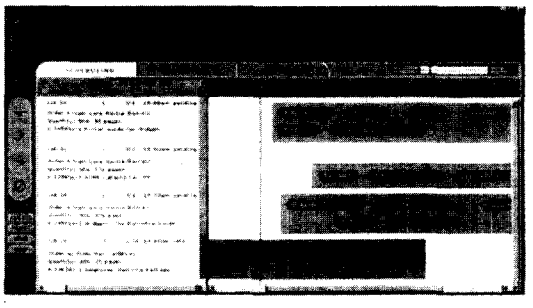

Fig. 3. Pressware Module from Impresse.

users globally connected on line in May 1999 and among them were 88 million in North America, 37 million in Europe and 30 million in Asia. It is known that there are 4 million internet users and 42,000 servers in Korea in April this year already and there will be around estimated 10 million users by the end of the millenium.

According to the statistics of IDC, 59% of American companies and 38% of European companies are already using intranet. By 2001 there will be 133 million intranet users. The primary purpose of intranet is document and information management. Additionally 56% of American companies will use e-commerce, which is 24% higher than in 1998.

There are already internet web sites aiming at e-commerce based ordering and tracking printing jobs and controlling printing process via internet is gaining popularity for better and easier gathering up the reins.

Fig. 3 shows a web browser for controlling printing process based on Pressware from Impresse. As a separate module Impresse provides print buyers with fully automated ordering and trackaing software solution based on the internet and intranet.

The Internet is not only a simple method to distribute information but also a revolutionary method to enhance customer interactiveness through e-commerce. Searching for product information on the internet and buying it directly on the internet is becoming more popular, as customization and personalization of specifically asked information on the net is much easier than through mass-produced paper media.

Remote printing or distribute-then-printing is possible through online networking. Postscript will be popularly used in long term, however, PDF based distribution of document over the net will be more or less standard. PDF files do not need application software originally created documents and do embed all the elements in the document such as fonts, graphics, and original design, thus eliminates all possible miscommunication that might occur while using other format. As the file size is also extremely compact compared to Postscript, distribution of files are able to be done even through the low band-width network.

Companies such as Vio and Wamnet are already providing global graphic network where you can send and receive digital files for printing over the internet or proprietary networking system.

1.3 Digital Printing

One-to-One marketing based on digital printing technology has become a significant development in business communication. Transferring personalized message and customized information based on one's need through digital printing technology made it a strong tool for printing industry to contribute to real sales revenue of their customers.

The role of printing as distribution of mass-print information is changing its face as similar role of electronic media through the revolution of digital printing technology.

Application software are now more complex and synthetic, as it does not deal with only design aspect of job, but the whole con-

Table 1. Volume changes due to substitution in 2003 (million tons)

Grade/Region	Newsprint	Uncoated mechanical	Coated mechanical	Coated woodfree	Uncoated woodfree	Total
U.S.	-1.40	-0.37	-0.38	-0.42	-0.17	-2.70
Western Europe	-0.58	-0.35	-0.39	0.32	0.02	-1.60
Japan	-0.31	-0.11	-0.11	-0.12	-0.02	-0.70
Row	-0.16	-0.01	-0.02	-0.02	0.00	-0.20
Total	-2.45	-0.84	-0.91	-0.88	-0.17	-5.20

Table 2. Impact of substitution on growth rates

Grade	Forecast annual volume growth 1996-2003 without substitution (CAGR)	Impact of substitution in 2003 (million tons)	Impact of substitution in % (substitution losses in 2003)	Forecast annual volume growth 1996-2003 including substitution effects (CAGR)
Newsprint	-0.50%	-2.45	19.90%	-1.60%
Uncoated mechanical	2.00%	-0.84	6.00%	1.00%
Coated mechanical	2.00%	-0.91	2.30%	1.00%
Coated woodfree	3.60%	-0.88	0.70%	2.90%
Uncoated woodfree	3.30%	-0.17	0.90%	3.30%

tent of jobs such as text, images, graphics and especially database oriented jobs.

As all the information will go digital, use of common data for various types of viewing will be increasingly requested. Common database of text, images and other elements are to be used for both internet and printed hard copy. E-commerce/CALS requires having all the information in digital format and this factor will bring a status of parsing structured form of data from common database for printed manuals and electronic media.

2. Impact of electronic media on paper industry

Recently Boston Consulting Group conducted a survey called "Paper and the Electronic Media: Creating value from Uncertainty" predicting the impact of electronic media replacing paper-based distribution of information.

The study concludes that overall paper use in the key regions studied, which account for a majority of global printing and writing paper demand, will continue to increase in the next five years despite some losses to electronic media that are projected to occur. The losses will be greatest for newsprinting, and a considerable amount of the displacement will occur in the United States, the world's most advanced economy and thus the area most susceptible to the impact of electronic media substitution.

The effect of substitution was evaluated by application rather than by grade because a shift in behavior or use by consumers or users is focused at the application level. Once the impacts by application were projected, projected paper use by application in 2003 was converted back to consumption by grade.

The substitution for paper-based medium was measure by two factors: direct substitution in terms of availability of the new medium; and switching probability, and indirect substitution such as a reduction in print advertising revenues caused by increasing rate of online advertisement.

Table 1 shows that overall consumption of these grades will continue to rise, but substitution by electronic media will reduce demand by 5.2 million tons in 2003 vs. growth without the effect of substitution.

Table 3. Model analysis of substitution impact on paper demand by product and by reo

Region	1996 Demand	CAGR w/o Sub. (%)	Projected 2003 Demand		Electronic Impact
			w/o Sub.	w/Sub.	
Newspapers					
Rest of World	8.6	2.0%	8.9	8.8	-0.1
Japan	3.2	-0.2%	3.2	2.9	-0.3
W. Europe	6.9	1.2%	7.1	6.6	-0.5
U. S.	9.8	1.9%	8.6	7.4	-1.2
Total	28.5		27.8	25.7	-2.1
Magazines					
Rest of World	1.4	2.4%	1.5	1.5	0.0
Japan	2.8	2.8%	3.0	2.8	-0.2
W. Europe	7.2	2.8%	8.7	8.1	-0.6
U. S.	2.4	0.0%	2.4	2.2	-0.2
Total	13.8		15.6	14.6	-1.0
Directories					
Rest of World	0.4	n.a.	0.5	0.4	-0.1
Japan	0.3	n.a.	0.3	0.3	0.0
W. Europe	0.4	n.a.	0.5	0.3	-0.2
U. S.	1.1	n.a.	1.2	0.9	-0.3
Total	2.2		2.5	2.0	-0.5
Catalogs					
Rest of World	0.7	2.0%	0.8	0.8	0.0
Japan	1.1	3.0%	1.3	1.2	-0.1
W. Europe	2.0	4.0%	2.6	2.4	-0.2
U. S.	1.9	4.0%	2.6	2.2	-0.4
Total	5.7		7.3	6.6	-0.7
Books					
Rest of World	1.0	2.0%	1.0	1.0	0.0
Japan	0.3	0.0%	0.3	0.3	0.0
W. Europe	1.2	3.0%	1.5	1.4	-0.1
U. S.	1.7	3.0%	2.1	1.8	-0.3
Total	4.2		4.9	4.5	-0.4
Cut-size Paper					
Rest of World	2.0	10.0%	3.9	3.9	0.0
Japan	1.1	5.0%	1.6	1.6	0.0
W. Europe	3.7	10.0%	6.1	6.3	0.2
U. S.	3.8	5.0%	5.4	5.7	0.3
Total	10.6		17.0	17.5	0.5

*w/o Sub = projected growth without considering subtitution effect.
*w/Sub = BCG projections using model to assess substitution impact of electrinic media.

Table 2 shows that the impact on projected average annual growth rates for the most part will be modest in coated woodfree and uncoated woodfree. In newsprint and uncoated mechanical grades, however, the impact of substitution in percent will be more substantial, projected at 19.9% and 6.0%, respectively.

The impact of electronic substitution on each of the key products is summarized (Table 3). Interesting figure shown here would be increasing demand of cut-size paper regardless of substitution impact. There are two driving factors of cut-size paper: the growth through further transition of copying to printing and transition of mass printing to printing on demand (home).

3. Summary

Electronic media, an alternative method of distributing information will affect printing and paper industry for sure, regardless of how much it can be measured quantitatively. As using the internet in U.S.A. has been already popular accounting for 40% of the total users, the impact will be likely more severe in emerging countries such as Asia with rapidly increasing population of the internet users.

This is not a trend that any individual or company can ignore. Printing and paper industry should observe those changes in the already set direction and prepare for establishing profound solution to them.

Commercial printers should digress from the passiveness of simple printing service and provide customers with more contribution to their expanding markets by helping them as business communication partners. In order to achieve this goal, they should have very close tracking of recent development in printing and other relevant technology to implement diversified services such as personalization, segmentation based on database mining.

Paper industry should watch the changes in printing technology and meet the demand in advance by exploring emerging technology such as digital printing and office printing. In this way meeting the various requirement of paper media for many different types of printing technology would be achieved.

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