

Digital Printing and Packaging

Packaging Management Council

2015 Fall Meeting

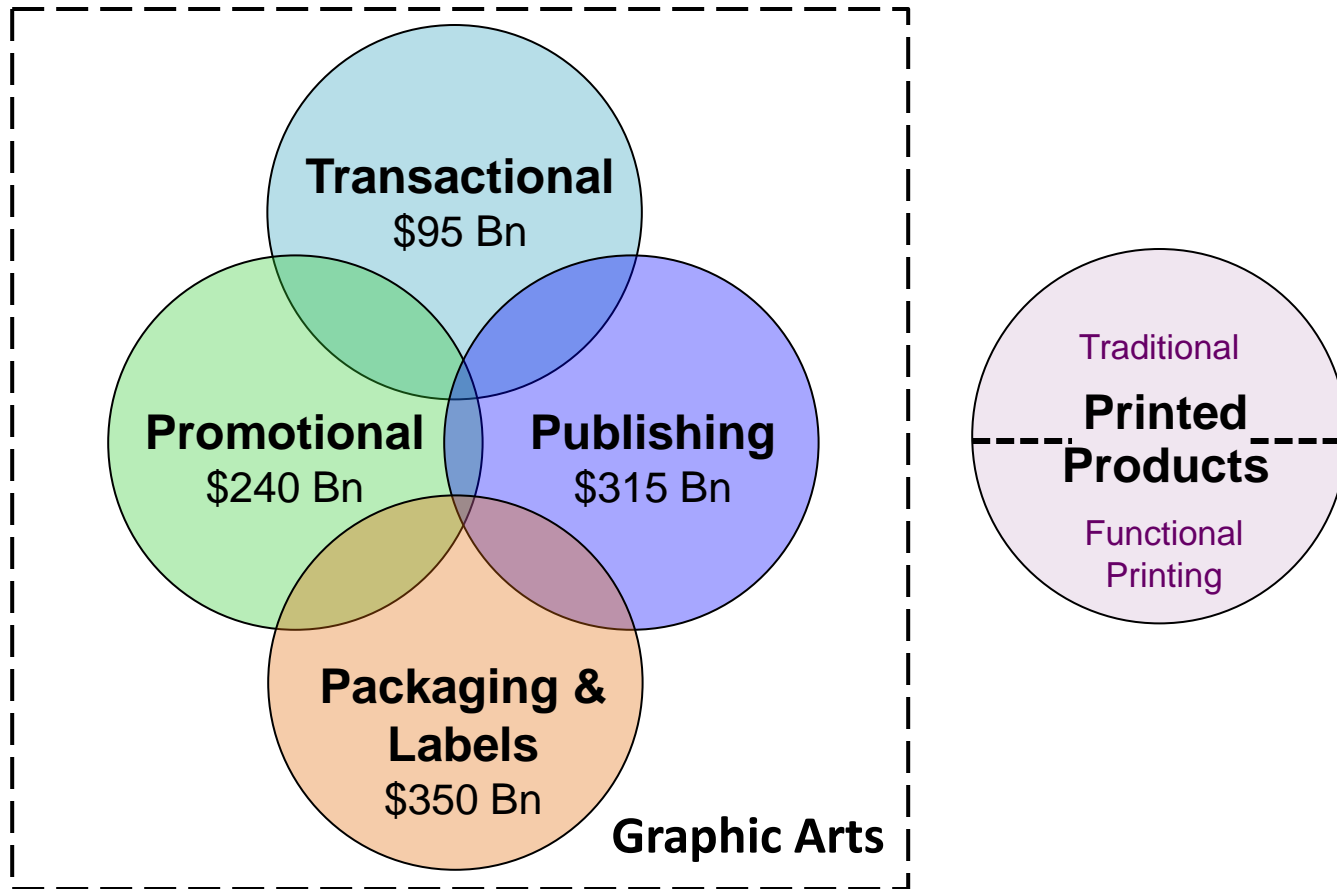
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Graphic Arts - A Trillion Dollar Industry



The Scope of this course is limited to Graphic Arts Printing.



Packaging - The Case for Digital

Packaging		
Digital Capability	High Value	Application in Publication
• Short to Very Short Run Length	✓	Low Volume Products
• Short Leadtime (hours instead of days)	✓	Supply Chain Efficiency
• Electronic Collation of Pages		
• In-line Finishing		
• Variable Data Printing (segmentation)	✓	Targeted Promotions
• On-demand Printing	✓	Supply Chain Efficiency
• Shorten Time to Market	✓	Drug Packaging
• Very Large Format		
• Compatible with a Wide Range of Substrates	✓	Plastic Film, Paper, Board, Metal, Glass & Plastic Containers



Digital Printing In Packaging

- Until very recently, digital package printing was limited to mock-ups, samples, and production of Pressure Sensitive (PS) Labels.

Package Market Segments			
Package Format	Common Example	Market Size	Digital Applications
Screen Printed Bottles	Retro Coke Bottle	\$5 Bn	None
Metal Cans	Coke Can	\$45 Bn	None
Flexible Packaging	Doritos Bag	\$70 Bn	Mock Ups/Samples
Labels	Campbell's Soup Can	PS Labels - \$30 Bn	Full Scale Production
		Other Labels - \$40 Bn	Mock Ups/Samples
Folding Cartons	Kellogg's Corn Flake Box	\$55 Bn	Mock Ups/Samples
Corrugated Boxes	HP Printer Box	\$100 Bn	Mock Ups/Samples

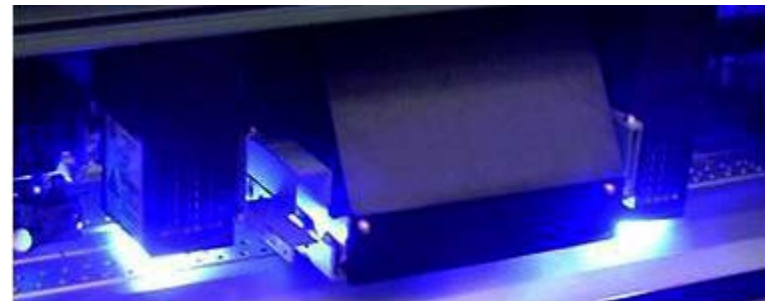


Mock-Ups

- Mock-ups look like production packages, but compromise functionality for ease of production.
- The Roland VersaUV is optimized for mock-up printing. It combines three functions:
 - Printing (6 piezo inkjet heads: CMYK + White + Clearcoat)
 - Curing (UV inkjet inks)
 - Cutting (with a knife cutter)



UV Inkjet Inks



Print/Cutting Head with UV Curing Lights



Samples



Xerox iGen 150 Automated Packaging Solution



iGen Belt with Multiple Developers

- Samples are fully functional packages produced in small batches to conduct market testing and to support scale-up activities.
- The Xerox iGen 150 Automated Packaging Solution is optimized to produce folding cartons in batches of a few hundred cartons.
 - Sheetfed offset presses can produce small batches, but at a ~1000% price premium.
 - The iGen produces cartons at a ~300% price premium: cost advantaged for small batches (e.g. samples) but uncompetitive for full scale production runs.



Pressure Sensitive Labels

Q: Why was Digital Printing successful in the PS Labels segment?

A: It solved a big problem at a cost the user could accept.



- The problem:

- On a flexo press, cost per label skyrockets as run length decreases:
 - From 1¢/label* for 150K labels to 2.5¢/label for 25K labels (and 10¢/label for 5K labels)
- Short runs are commonplace in the PS Label market
 - Between 35% and 40% of all orders are for 25,000 or fewer labels

* 3"x5" label (for comparison, a Softsoap label is 3"x3")



The Solution – HP Indigo ws4000 Press



HP Indigo ws4050

HP's Solution

Cost	Solution	Comments
Economics	1.7¢/label at 25K; 1.9¢ at 10K	2.5¢/label at 25K; 5.2¢ at 10K (Flexo)
Acquisition Cost	HP Indigo 4050 (~\$500K)	2-Year Payback
Technical Readiness	Speed, Width, & Quality OK	50 fpm, 12" wide, 4c + Spot
Substrate Compatibility	Substrate Qualification Pgm	Major Suppliers Enrolled
User Support	Training & User Network	Training Centers; DSCOOP



PS Labels Today



HP Indigo ws6600

- HP Indigo ws6600 web fed, liquid toner EP, 7-color press.
 - Speed: 2x ws4050 - 98 fpm (4-color) or 130 fpm in enhanced productivity mode.
 - Image quality: Expanded gamut (7c printing) nearly doubles gamut size
 - Image format: 12.5" x 38.5" maximum
 - Cost: ~\$800K (i.e. 2x increase in output for a 1.6x increase in price)
- Most popular choice for digitally printed pressure sensitive labels.



PS Labels Today (Con't)



Xeikon Label Suite (Press, Coater, Laminator, and Slitter)





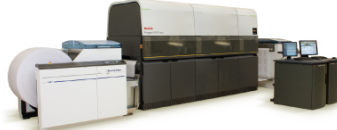

Xeikon 3500 Cut Away

- Web fed, dry toner electrophotography, 5-color press
 - Xeikon technology - multiple complete imaging systems.
 - Up to 63 fpm (Xeikon 3500).
 - Prints a 20.5" wide web – no cutoff restriction.
- No. 2 technology for digitally printed pressure sensitive labels.



Next Generation Digital Printing Presses

	HP Indigo 30000	Landa S10
Sheetfed Presses		
Sheet Size	B2 - 29.5" x 20.9"	B1 - 41" x 29.5"
Max. Speed	2,300 B2 sheets per hour (6 colors)	6,500 B1 sheets per hour (8 colors)

	Kodak Prosper 6000	Landa W10
Web Presses		
Max. Width	24.45"	40.1"
Max. Speed	1,000 feet per minute	328 feet per minute



Research Question

- Which package market segments are best suited to adopt next generation digital printing technologies in the near future?
- My graduate student, Yujue (Allen) Wang, chose this topic for his Master's Thesis.
- To answer this question, Allen and I screened eight major packaging market segments (22 application areas) to identify the most promising areas for further research.
- In each segment we evaluated:
 - The prevalence of short run orders and the need to improve their economics.
 - The use of on-package promotions and the opportunity for digital printing to enable new promotional concepts.



Flexible Packaging Results

Market Opportunity

- Large numbers of short run orders, especially for regional brands.
- Short runs are runs $\leq 14,000$ m².

Technology Readiness

- No digital technology is fully ready to penetrate flexible packaging.
- Kodak Stream shows the way (right speed, too narrow, paper only).
- A hypothetical inkjet press was used for the cost models.

Result

- Breakeven run length for a hypothetical inkjet press $\approx 8,500$ m².
- Breakeven run length constrained by ink cost.
- Research suspended in favor of the folding carton market.



Folding Carton Results

Market Opportunity

- Large numbers of short run orders (short run defined as $\leq 12,000$ B1 sheets).
 - Runs $< 2,000$ B1 sheets: typically do not cover variable costs.
 - Runs between 2,000 and 5,000 B1 sheets: typically do not cover fully accounted costs.
 - Runs between 5,000 and 12,000 B1 sheets: typically do not make enough money to justify reinvestment.
- On-package promotion is extensively used in the folding carton market segment.

Technology Readiness

- Digital technology is fully ready to penetrate flexible packaging.
- HP Indigo 30000: commercial today, capable for runs $< 2,000$ B1 sheets.
- Landa S10: in beta testing today, capable for runs $< 6,000$ B1 sheets as introduced, with potential to expand to runs $< 12,000$ B1 sheets.

Folding Carton Results (Con't)

- To assess the use of on-package promotions, Allen surveyed a total of 4,562 SKUs on store shelves.

Walmart		
Application	Number of SKUs	Promotional SKUs Shelf Occupancy
Cereal	245	10.2%
Dental Care	240	10.1%
Crackers	215	11.4%
Soft Drink	94	14.9%

Wegmans		
Application	Number of SKUs	Promotional SKUs Shelf Occupancy
Cereal	206	4.0%
Dental Care	134	5.0%
Crackers	101	3.2%
Soft Drink	102	11.9%





Promotional Opportunity

- Because on-package promotion is widely used in folding cartons, there may be an opportunity to introduce new types of on-carton advertising (e.g. localized promotions).
- Some folding carton suppliers stated that there are significant obstacles to implementing localized promotions (e.g. distribution chain limitations and difficulty in selling value).
- Other folding carton suppliers stated that localized promotions have real potential based on brand owner interest.



Resources

- Wang, A., 2015, The Adoption of Digital Printing Technology in Package Printing
- HP Indigo website, <http://www.hpindigo.com/>
- Landa website, <http://www.landanano.com/>
- Xeikon website, <https://xeikon.com/>
- Eldred, N., 2007, Package Printing Second Edition