

Retail Printing, Industry Trend and Technical Challenges

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Abstract

An increasing number of consumers are printing digital photos at retail locations. Both net-to-retail printing and photo kiosk printing have the most potential to grow. This paper presents the latest technical advances in retail printing and remaining challenges to meet both customer and consumer needs.

Introduction

An increasing number of consumers are printing digital photos at retail locations. Both net-to-retail printing and photo kiosk printing have the most potential to grow, according to InfoTrends marketing firm [1][2]. This paper presents an overview of how Hewlett-Packard combined its latest print-head, ink and Writing System technology to improve print quality standard at retail stores, offering prints at a low cost.

The second part of the paper focuses on challenges and solutions that were provided to meet the consumer need for increasing printing options at retail stores. To address this market segment, industries present solutions that are based on multiple printing systems. Some of the print quality challenges such as tighter color consistency requirement between different printing platforms are discussed in this paper.

Retail Photo Industry Transformation

The transformation from traditional analog to digital printing started accelerating in 2000 ([1] Figure 1). Retailers are trying to attract more consumers by expanding their breadth of photo outputs from 4x6 to albums and posters. At the same time the market is seeing that the mass consumer is adapting to the change and demanding more choices, control and convenience for the experience.

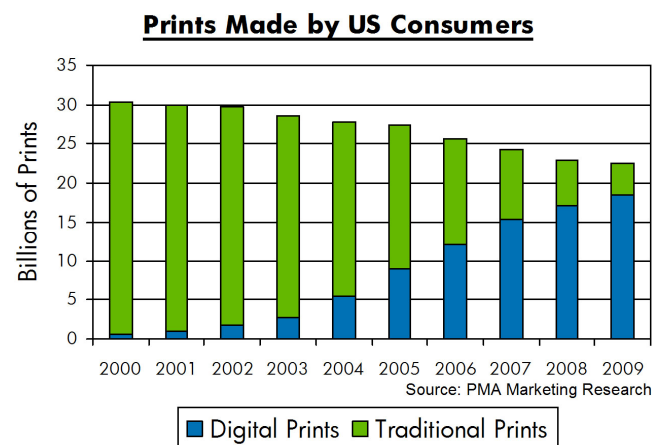


Figure 1: Transformation trend in US market from Analog to Digital prints

What retailers are seeking at this time is a new profit opportunities where most of the transaction can be done instantly using fully or semi self-serve options.

Recently Hewlett-Packard combined its own scalable printhead technology with Writing System, Ink and Media to introduce the first ink jet based retail photo solution that had image quality to the level that could compete with existing wet lab solutions. Fuji and Noritsu, similarly introduced their own ink jet technology in this market where retailers are excited to move away from chemical based, labor intense wet lab solutions to more dry-lab self-serve technologies.

Hewlett-Packard Solution to Retailers

In 2006, Hewlett-Packard introduced the first stand-alone printer, pm1000, based on its own scalable thermal ink jet technology to achieve a professional looking image quality. (Figure 2). Using this new printhead and new pigmented ink, Hewlett-Packard was able to offer a solution to retailers that exceeded inkjet standard in lightfastness and waterfastness ([3]).



Figure 2: Hewlett-Packard Scalable Printhead Technology based on stitching 5 smaller printheads

By integrating HP Online Photo Solution (Snapfish) with its stand alone printers (pm-1000) and existing printing solutions, HP enabled retailers to offer an affordable solution to the consumers to create and print solutions that were more attractive than traditional 4x6 prints.

Market Driven and Technical Driven Challenges

When Hewlett-Packard introduced its Dry-lab solution based on thermal inkjet using pigmented ink, retailers needed to be educated to accept this new solution in the market that had been relatively calm for a long period of time.

HP was able to achieve a fast printing speed by taking advantage of its scalable printing technology. However, inherently achieving a uniform, consistent output from a scalable multi-printhead technology is quite challenging. Bastani et. al. [4] have

explanation on challenges and solutions for achieving color uniformity from scalable technologies.

Being able to automatically detect and correct for any of variation in the printhead, ink or media is another challenge for stand-alone printers. Pm1000 printer is able to automatically detect and correct for most of print quality attributes such as color uniformity, color accuracy and drop placement error using its built in vision system. Service technician can also monitor performance of the printer and troubleshoot any problem remotely from a central location.

Challenge I: Image Quality from Dry-Lab Printers

Silver halide based printers have been widely used as the chemical based wet-lab solution in retail photo market. Going towards more environmentally friendly systems (Dry-lab) at lower costs, the industry was challenged to introduce Dry-lab systems that can have similar image quality and print speed output to the Silver halide printers.

Currently industry is proposing solutions based on laser, dye sub and thermal inkjet technology to be used in the Dry-lab printers. To introduce thermal ink jet based solutions in this market, the industry had to rethink the interaction of the printhead with the system. A new printhead design (scalable printhead), media path, new ink and media and new drying solution are all outcome of enabling thermal inkjet for retail printing at high printing speed and low cost.

Challenge II: Retail Solution Hybrid and Color Consistency

Retail photo solutions are more than regular 4x6 or 5x7 prints. Today consumers can order different print sizes to as large as posters. Typically the prints jobs are distributed to more than on printer in order to optimize the output speed or enable different print sizes. In addition, there are cases that a print solution provider is forced to have its solution co-exists with the previous printer solutions that a Retailer had contract with.

One of the challenges in having a mix of different printer systems beside each other is achieving a consistent color output from all these system. Consumers may order a photo album, a poster and a 4x6 print that has the same image in it. Different systems may use different ink, media and Writing System solution and thus may have different color output.

Hewlett-Packard initiated an effort under name of Dream Color [5] in 2007 to improve the current industry specification in color consistency and accuracy across different output devices, including printers.

Initially Hewlett-Packard and later followed by Epson Inc are addressing this challenge in their fine art products using a built in spectrophotometer. All of the ink jet systems provided by Hewlett-Packard are enabled with its internal vision system to monitor and adjust color performance of the print output. ICC based profiling are becoming common to unify different output devices and also take into consideration consumers color preferences.

Challenge III: Self-Serve Systems and Different Environments

Retailers demand systems that have minimum down time and require minimum intervention to get them back up and running. To meet this demand most of the mini-lab or micro lab photo printers are equipped with internal self-diagnostic systems and some have remote control features.

For instance, Pm1000 systems automatically evaluate any drift in the overall color or drop placement error over life and run correction if necessary. Also there are automatic system-checks built in these printers to keep track of any wasted media, servicing material, ink or even possible dust or other environmental contamination that may enter the printer.

Similarly, some of the Noritsu's mini lab printers guide the store technicians through a number of steps in order to qualify and correct any color drift that the printer may have.

The main challenge in all these solution is being able to either depend on the store technician to follow the instructions correctly or assume the built in algorithms are robust and fast enough to take care of most of the diagnosis automatically.

Conclusion

Retail Photo printing is going through a transition from analog to digital printing while the total number of prints is declining. During this transition Retailers are looking to non-traditional printing markets and depending on Dry-lab solutions during this transition. Dry-lab systems are facing challenges to meet the acceptable print quality while addressing new challenges as the systems are used in a more hybrid environments.

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Author Biography

Behnam Bastani joined Hewlett-Packard Company in 2004 where his research focus has been on designing auto-calibration models for stand-alone high-end ink-jet printers with focus in Retail Printing market. He has been involved in Retail Photo market analysis and collaborated on protecting HP Intellectual Property in this market. He is also a PhD candidate at Simon Fraser University where his research focus is in Spectral Printing and automatic Ink Separation. He has 18 publications and 8 patents in the field of color science and computer vision.

Anton Tabar joined Hewlett-Packard Company in 1982 as a Firmware Development Engineer in the R&D Lab. He graduated from UC Irvine with BSEE and BSCS degrees. His initial work was on pen based plotters and then with the advent of inkjet technologies, moved to

development of desktop printers. He has held management positions in both Manufacturing as well as R&D. He has spent the last 15 years in startup businesses within HP ranging from photo quality printers to appliance printers to retail photo printing devices. He is currently the Director of R&D for the Retail Publishing Solutions.