

BookNet: Innovation in Book Publishing and Distribution

*Uri Adler
Aprion Digital
Herzlia, Israel*

Introduction

The last 2 years have seen a frenzy of technologically driven innovation in book publishing & distribution. With internet book sales now an everyday part of life, there now is strong movement on the very short run printing front (as evidenced by services like Lightning Print's, Libris' and others) and on the "digital library" front: Barnes & Noble, RR Donnelley (along with Microsoft), Netlibrary and others are digitizing massive amounts of titles to enable their resale in whatever new means arise and improve their availability. With Internet as the ultimate distribution medium, the downloadable book has become a commercial reality and is further fuelling the establishment of these digital book repositories.

Whether they are dedicated book lovers, information-hungry professionals, or casual readers, their ability to find the books they want right when they want them is about to change dramatically. Introducing BookNet, a revolutionary point-of-sale book-printing machine. BookNet is capable of producing high-quality perfect-bound books within minutes and saves the frustration of waiting for days of delivery or paying expensive shipping charges. BookNet will be located at familiar shopping venues and will be connected to any of the digital book repositories in creation today by leading booksellers, book printers and Internet publishers; that hard-to-find title will now be printed as they drink their coffee. Or, order the book from their favorite Internet retailer to have it immediately waiting for them at the store 15 minutes away from home; Or maybe even delivered to their doorstep within the hour! BookNet will also allow unique publishing services previously too expensive- like instant publishing, distribution & printing of the shortest editions at a modest fee. eBooks, eRetail and electronic publishing are all marvelous- but paper books will not go away so soon.

Aprion Digital - Background

Aprion Digital Ltd. is a new technology company, a Scitex spinoff incorporated in September 1999 in order to attract the investment capital necessary for accelerated growth. The company has developed novel, patented MAGIC (Multiple Array graphic Inkjet Color)

technology for digital liquid delivery and associated water based, environment-friendly inks, for use in its digital inkjet presses. Development of the Aprion Digital drop-on-demand (DOD) head began in 1992, as part of the Scitex in-house technology incubator. The first 1" prototype head was demonstrated in 1996. A 6" prototype head was demonstrated in June 1998.

Aprion is owned by a group of investors that include top Israeli and US-based firms such as Scitex, Clal, Discount Investment, Israel Infinity, Hapoalim Bank, TDA (Templeton) and CDI (ODD) and is managed by a seasoned executive team with a remarkable track record and employs over 140 people in a broad range of disciplines.

Strategy – From Niche Markets to Mainstream

As a new player in an industry dominated by large multinational companies, Aprion Digital has decided to focus on vertical markets where its technologies have significant advantages. These technologies are uniquely suited to addressing industrial niches where there is a clear need for modernized production tools with no available solution like: Home Furnishings, Packaging and Graphic Arts. Aprion's initial focus is to provide digital printing solutions for these industrial niches with the intention of entering other markets like textile. Aprion Digital has always felt that its products will soon evolve into industry pacesetters.

Over the next two or three years focus will extend to other print markets such as book printing, thus cornering a larger slice of the printing market. This will fuel revenue growth and establish Aprion technologies and products as an ongoing, viable replacement for all printing applications.

In the long term, Aprion intends its technology to completely replace other commercial printing technologies, proving itself competitive in both quality and total cost/page printed.

Technology

Aprion has developed digital printing technologies based on two components:

1. Digital liquid delivery of small, highly repeatable droplets of liquid simultaneously delivered from thousands of nozzles at extremely high speed (currently 25,000 droplets/nozzle/sec with a demonstrated capacity of 100,000 droplets/nozzle/sec under lab conditions). Aprion Digital drop-on-demand heads are extremely flexible: a variety of head designs are easily and quickly accomplished. Testing has proven that these heads have higher operating speeds, enjoy longer life and have a greater tolerance for a much wider range of inks than do other inkjet technologies. This, among other things, makes them well suited to industrial applications, but not necessarily limited to them.
2. A family of water-based, environment-friendly inks that are highly abrasion resistant and are water and UV fast.

There are over 45 patents and patent applications protecting Aprion Digital's products, inks and print head technology, with more on the way.

The technology is the fastest, most flexible, most robust and cost effective available today. Today's digital press based on the above technology is a viable alternative to a conventional offset sheet-fed press in terms of speed and cost/page. As the technology continues to develop, print quality and printing speed will reach even higher performance. Aprion is currently working on the next generation, while implementing the existing one.

Aprion Digital's strong chemical research and engineering team continues to expand the ink portfolio towards a wider range of print applications, including paper, plastics, metal and textiles.

The Aprion Digital drop-on-demand technology has several outstanding advantages over other inkjet technologies:

1. Compared with continuous inkjet, the head is less expensive, of higher quality, reliable and compact.
2. Compared with thermal inkjet, the head tolerates a wider range of ink formulations; has better control over drop volume and velocity (which affects image quality); lasts longer and will work with high-viscosity inks.
3. Compared with other piezo-type technologies, the heads' drop rate is higher (25Khz in the current generation, with up to 100KHz proven in the lab as compared with 10-20Khz); can be configured in very large arrays; is highly reliable and can be manufactured using standard industrial processes (and is therefore less expensive).

4. In addition, the heads' unique characteristics make this technology potentially competitive with electrophotography thanks to its higher performance-to-cost ratio. The table below shows the drop-on-demand inkjet head's basic specifications:

Resolution	True 600dpi
Ejection frequency	25khz
Ink viscosity	5 to 20 centipoise
Drop volumes	20 picoliters
Head dimensions	6" x 0.8"
Structure	Rooftop piezo drop-on-demand; multi-layer structure enables high rate, reduced cross talk and easy manufacture
Ink types	Pigment, water-based

In conclusion, the fact that Aprion Digital owns both a print head technology as well as industrial digital 'speed' inks capable of running at very high frequencies is considered a major industry breakthrough.

The Book Publishing Market: Background

The American book publishing industry is alive and kicking; consumer spending on books since 1991 has been growing at 5% annually, global mergers are taking off and new technologies are enabling new service offerings. However, the industry is also burdened by a rigid structure and by resistance to change. Demand is unpredictable and economics of scale limit manufacturing. Huge amounts of cash are tied up in inventories, book returns often exceed 30% and the majority of would-be authors are turned away by publishers. At the same time, publishers must stop printing older books, leaving many customers' needs unfilled and retailers with lost sales. There is much truth to the assumption that overall value can be created if old publishing traditions are updated and the value chain restructured. This is the reason for the excitement over eBooks, ePublishing, books-on-demand and similar

novelties: each has the potential to unlock previously untapped value and change the publishing value chain.

The relatively new on-demand book printing market is one in which books are actually made to order. Traditionally, books are printed in thousand-copy batches on large, dedicated presses. This has been a cross the publishers have had to bear; because demand was impossible to forecast accurately, publishers almost always ended up with unsold stock.

Digital printing allows the cost-effective printing of some books (single units or several dozen), which could change the way the book industry works. Several print operations of this type already exist and cater to different segments of the book market. One segment is education, where small class size and changing course material creates a demand for customized, small quantities of course books printed prior to the beginning of the academic year. Other segments are the markets for out-of-print reading and textbooks.

Present On-Demand Methods

Printing books on demand currently requires large, fast and expensive industrial machines, a fact that, to us, is contradictory. In order to be cost effective, these machines must be run at high capacity with backlogged production schedules, limiting the effect of 'on-demand' and 'distribute-then-print' slogans. Demand must be accrued over time and geography or the high fixed costs of the machines will make the entire process uneconomical. It may not be feasible to maintain the capacity to print incoming jobs within the hour (or minutes). In addition, these machines have succeeded in the statement and financial print markets precisely because they were designed with an industrial setting in mind. Their high capacities, speed and flexibility are made possible only by allowing for the resources (manpower, floor space etc.) available in a production environment. Prime location retail settings cannot compete. By definition, industrial areas are located far from consumers. However, if the entire process is revamped and a highly focused manufacturing platform is designed solely and specifically for books, this need not to be the case.

The Aprion Digital 'BookNet' Concept

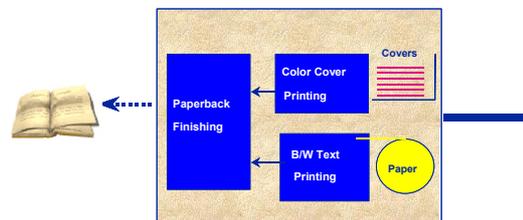
The available digital print solutions present a tradeoff: since the solutions are targeted at wider markets, there is either the low productivity, automated 'office' variety or the high productivity, automated 'industrial' variety. Neither offers the performance and reliability required for true on-demand books; in addition, the machine won't fit in a retail store (which again negates the 'on-demand'

title). This can be overcome by custom tailoring a solution for a single application. A book can be produced in a matter of minutes, right in the store.

Aprion Digital has designed a compact, automated and



inexpensive machine. It is small enough to be located in a store's back room, and will produce complete paperbacks within minutes of an order being placed. The pages are printed in black with the Aprion drop-on-demand inkjet engine on both sides of the page while the cover is printed in color. A new, patented mechanism binds and finishes the printed book. The entire operation will take 3-5 minutes. The following drawing shows the principle of operation of the BookNet:



The fixed array web press is a modular roll-to-roll machine, which is based on Aprion Digital inkjet head and maintenance systems, with paper loading and unloading units (which include the paper handling, print heads and ink system) and a control unit. A digital print engine based on this technology has been tested at a linear print speed of 1m/sec (200 ft/m).

The basic characteristics of the BookNet are:

1. Fully unattended books production
2. Office environment (bookstore, hotel lobbies, supermarkets etc.)
3. Operated by shop personal (no skilled person needed)
4. Up to 10 books per hour ability
5. Enough consumables for a full day's operation

Due to its structure, the machine produces only books with a fixed format of 6"x9" (15.24 cm x 22.86 cm). This size, called trade size holds a great share of all books in soft-cover (not pocketbooks). The traditional value chain in the book industry is very long and complicated. In a typical scenario of the traditional publishing we see that the relations between all parties involved are very strong. The Author, the publisher, the distributor, the warehousing, the retailers, etc. are all depended the volume of sold books at the retailers. That causes a lot of returns of books from the retailers to the publishers, sometimes up to 50% (typically between 25% to 35%). The situation is not much better when the .com companies are involved. It does not change the value chain; it just brings more noise to the system. It of course creates more traffic of books and generates some short runs, but it is still the traditional way. Another big problem of the traditional publishing system is the warehousing and stocking of books. The following diagram demonstrates the problem.



There are just a few titles in the bestsellers section, but many copies each, there are more, which are stocked at the retailers and publishers, but the biggest quantity is not available for purchasing. Aprion targets the BookNet to fulfill the need for these books. In other words, there is no more answer for a customer, "sorry, the book is no more in stock" or "the book is no more in print".

Another problem that the BookNet can provide a partial solution is to the fact that every week there are between 1,000 (the USA) and 2,000 (the UK) of new titles published. No store can have them all on stock. With the BookNet, there is no such problem.

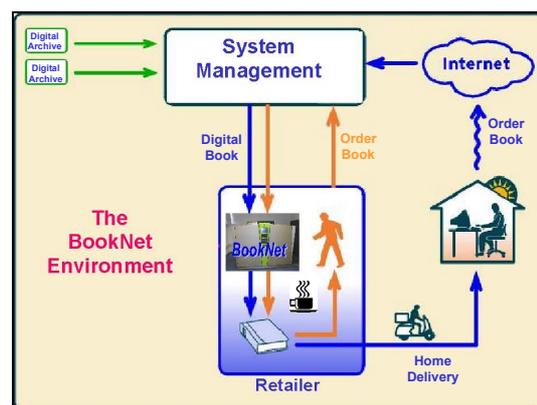
Not like other vendors of solutions, that provide a complicated system, which demands at least one professional operator, the BookNet is a fully unattended system. The competitor's solution is mostly based on several units that are not in a compact system and that are incorporated to a production line. Therefore they are not suitable for Point-of-Sales applications, but only in printing houses. This actually the main difference between quick printing and a true on-demand printing.

The system consists of Digital Archives that can be the proprietary of the publisher or any one else who has the rights for digital publication of the book, a server with System management Software that controls the workflow, Internet connection to end-user, secure line from the Digital Archive.

There will be two types of users for the BookNet. The first one is the walk by traffic. People that will walk around the machine will use terminals that will be around to search for books, order them and pay by a credit card. The books will be delivered within up to 10 minutes (typically 5 to 7 minutes). The other type of users will be the people at home. Here all the search and ordering procedure will be done over the Internet. Then the user will get two options how of which he can chose how to get the book. While ordering the book he will be asked either he wants to get it delivered or to pick it up. If the answer will be "pick up", then he will be asked for his zip code and he will get a list of locations in here immediate neighborhood where the BookNet machine is available. This is a good incentive for the retailer to install the BookNet in his store, since this creates more traffic in the store and the customer who comes to pick up a book might also buy few other items at the store.

The other option that the user will have is home delivery. Again, upon having the user's zip code, the system will address the request to the locations near by. The one who is the closest or, if this site is too busy, it will be diverted to a less busy machine at the neighborhood and after the book is printed it can be home-delivered with the local courier service such as the pizza delivery system, which is cheap and fast.

The following diagram shows the two options in a schematic way.



The installation of the BookNet in a store transforms a small store into a superstore.

A typical shelf space in a bookstore creates yearly revenue for a square foot of about \$ 300 (\$ 3,000 per year for 1 square meter). The BookNet has a footprint of

about 50 square foot (5 square meters). This space on shelf at a store will bring yearly revenue of \$ 15,000. If only 50 books will be produced on the BookNet every day, the revenue will be close to \$ 250,000. No retailer can ignore this fact.

The only true Books-On-Demand equipment that is fully unattended is the BookNet. The impact that it will create in the publishing industry will position it at the top of the Digital Technology Revolution.

Biography

Uri Adler – Director, Business Development

Uri Adler a qualified printing engineer, is world renowned as an expert in the Digital Printing Industry and Ink Jet Technology.

Mr. Adler graduated in printing engineering from the Fachhochschule in Munich, Germany. Further studies include computer programming, information system analysis and MBA.

In 1994 Mr. Adler and 2 other entrepreneurs established, Idanit Technologies Ltd. Under their leadership Idanit

Technologies developed into a leading company in wide-format digital printing. Scitex Corporation Ltd., a world leader in the pre-press and digital printing systems, acquired Idanit in February 1998. The company is now known as Scitex Vision (former Scitex Wide Format). Until the end of 1998, Mr. Adler served as VP of Business Development at Idanit. Presently Mr. Adler is Director of Business Development at Aprion Digital Ltd., a new subsidiary of Scitex Corporation.

Mr. Adler is responsible for new market development, development of new business opportunities, and initiation of joint ventures with international companies.

Mr. Adler holds several patents in the field of Digital printing and Ink-Jet Technology.

From 1975 to 1995, Mr. Adler held senior managing positions in the Israeli Small Business Association (voluntarily). He has served as Chairman of the Tel Aviv County, Chairman of the Printers Association in the Tel Aviv County and Chairman of the Printers Association in Israel. In 1998, Mr. Adler was awarded first prize for "Entrepreneurship in Israel" for the founding of Idanit. He is a senior speaker at international conferences on Digital Printing and Ink Jet Technology.