PUBLISHING ON DEMAND
technical possibilities and limitations

Sjef J.F.M van der Steen
ITC, The Netherlands
steen@itc.nl

1. INTRODUCTION

Publication on demand is a (digital) publication process that gives you exactly the printed material you want, when you want it. Publication on demand is a process, which uses the latest digital technology to deliver, printed materials faster, cheaper.
The digital era enables new prospects for the publication and dissemination of information. Other than the analogue production of cartographic information digital ready to go information is always available and just a fairly simple small process displays the information on paper in quantities the customer requires. Whether just one small quantity, a large quantity or a split quantity is ordered, the printing industry can produce it.
Due to the new opportunities the effect is that we do not need map stock production anymore. This is a large advantage. Mapping agencies don't require any stock facilities and do not need to sell outdated maps anymore.

Regarding selling our products in cartography we have great uncertainty with respect to how many maps of one area are sold. Further the market segments which is covered by cartography is pretty small. For instance , apart from well-known cities, if we require large scale extended towns plans we need number in figures of 1000's, sometimes less.
If we deal with cartographic publications we wish to print not too many , because it might take years for selling the publications. For fundamental science this is not a big problem. Technology, however, changes by increased speed and that is why Web publications are also printed in fairly low quantities. Publications seem to be out of date soon.

2. PRECONDITIONS FOR POD

Printing on demand just includes time factors, as well as quantities. When you want to have something published and numbers of each one wishes to have available for dissemination.
The latter might mean that clients wish to receive only one output copy. More realistic figures are quantity numbers of 5, 10, 25 or 100. If we consider for example planning maps we deal with 10 or 20 sheets rather than hundreds of maps, sometimes.
But regarding town plans to be applied for various purposes and to be produced for an attractive town like Barcelona numbers of quantities are sometimes counted in hundreds of thousands. In this case we insurmountably have to work on stock production. In most of those cases we do not really mean to deal with printing on demand.
POD usually deals with relatively small quantities of output production. This also includes careful study with respect to equipment depreciation and writing off. Like in any production cost price calculation is anyhow the determining factor. Outdoor production is often a good option.

Applying POD, therefore, implies answering some important questions:
- does the client want to have large stock production or just enough copies according to request
- does the technology be the latest state of art or can we deal with analogue production, as well.
- is format size exceeding the maximum size of digital printing technology, 30x42cm
- does the price per unit production not exceed the client's target price
- is the available production state of technology not a hinder for outdoor production

The original information container for the print is in principle a digital document on file, whether a completely digitally produced file or just a scan of an analogue map or document.

3. POSSIBILITIES/LIMITATIONS. SMALL SIZES UP TO A3FORMAT

For publications we can execute entire digital production lines. Till the trimming, folding and binding digital production is possible. Illustrations, scanned maps and other publication contents such as text and figures do not technically meet resistance anymore. Books and atlases of 200 pages can simply be printed by the POD technology.
In any case prices do not exceed pre-calculated prices, while quality is often good. The only limitation the restriction might be the kinds of paper to be printed on. Digital printing requires special paper that usually is a kind of matte. In case of glossy paper print request the client must go to analogue printing technology such as offset printing.

To successfully use POD for the publication of your work, the complete document must be in an digital format. These days, this is normally the case. However, if your book has illustrations or photographs that are not presently electronic, these must then be scanned and imported..
The concept of printing on demand is that you **only print a document when it is ordered**. While this concept is certainly the epitome of POD, it is not usually practical for the small, independent publisher. POD equipment is extremely expensive. At the very least a publisher may expect to invest upward of $50,000 for a basic POD system (that will involve considerable hand labour). A Xerox Docutech costs from $250,000 and up depending on options. Océ and IBM have fully automated POD systems--the file goes in one end and books "fall out" the other with (at most) minimal human contact along the way. These POD systems cost upwards of $1 million. Clearly most of these systems are outside the budget of a small, independent publisher.

The Traditional Publishing Model

In the traditional scenario, the publisher decides to print an "economic order quantity" of a particular atlas. For small publishers, this may be 1000, 3000, 5000 or more copies. The more products you order, the lower the unit cost.
Using an example of a 208 page soft cover book, the cost per unit might be: 1000 qty=$2.66 each; 3000 qty=$1.95 each; and 5000 qty=$1.46 each. (This reflects "typical" printing costs prices vary (that's why you get estimates) and the prices do not include some "fixed" costs for design and production of the work, cover, or film, plates, or proofs. Since book/cover design and production costs (of the master file) are the same for either traditional or POD, we'll ignore those costs. A printer might charge set up fees (on our 208-page example) of about $300 for plates, films, etc. Some POD shops may charge a 'RIP' fee for the electronic preparation of the file.
This requires the publisher to invest at least $2960 for 1000, $6150 for 3000, and $7600 for 5000 atlases. A 200 page (approximately) book might retail for $18.00--20.00 per copy, or perhaps more depending on the topic. Using the typical publisher's overhead, mark-up, royalties, and other costs, we would probably want to print at least 3000, if not 5000 copies to keep the book cost in line with our retail price. (Publisher's rule of thumb: retail price should be eight to ten times the production cost.) Assuming a $20

retail price and a net average sale of $10 (50% off list) to the publisher (from all sources), it will require sales of 615 to 760 books to pay for the printing. Throwing in some other costs (review copies, publicity and marketing costs, production costs, overhead), our break-even point will require sales of more than 1000 books.

The risk: A publisher never knows how many new atlases will sell for any given title. With the "right" program and good timing, the publisher may sell thousands of copies. Most small publishers will never face these challenges! More likely, the book will make some initial sales a few hundred copies or perhaps a couple of thousand. If sales are to continue, the publisher and the author must keep up marketing and publicity efforts. If the book does well, it could be reprinted and sell several thousand copies. If the book is poorly received in the market, it may not sell more than a couple of hundred copies. (This is how small publishers end up with a "garage" full of atlases)

The POD Model

Situation 1: The publisher sells out the first (normal) printing. (That's good news.) The book took about thirty months to sell out. Initial sales reached 300 per month, but during the last six months, sales have averaged 25 copies per month. Now what? Do a second printing of 1000 atlases? That would give you inventory for 3+ years, if the sales don't slow down any more. And, it would take nearly a year to recover your printing costs on the second printing (if sales stay constant at 25 copies per month).
Converting the book to POD might increase the unit cost to $4.00 (initial production costs have been recovered at this point, so you don't need to consider them further). If you run 25 or 50 copies per order, you only need to sell 10 or 20 copies to pay the printing costs. With 25 copies per month sales (probably declining over time) you can continue to make a profit on the title without making a risky investment in a large inventory. Eventually, you may only want to order reprints 5 or 10 copies at a time as the demand trails off. In the end, you will probably only have "excess inventory" of 2 or 3 atlases.
Many "general interest" atlases fit **situation 1** very well and can be profitably produced using this scenario.

Situation 2: Plan the book as POD from the beginning. Since you won't tie up your cash in inventory for an extended time, you really *can afford* to pay more for the unit cost of production. This is called the "opportunity cost of capital." If I invest in book inventory, then I can't invest (that same money) in something else (that might give a higher return).
I estimate that my book will interest a fairly limited market. I don't want to invest thousands of dollars in inventory (that I may never sell). Therefore, I produce the book (to full trade-book standards) then print using POD technology. Since I need to "prime" the market with review, publicity, and distribution copies; my first "printing" may be about 100 copies. As initial orders are received, I may print another 100 copies. When that sells (almost) out, I'll print 50 copies; then 25 copies, etc. until demand is satisfied. Perhaps I'll sell a total of 500 atlases. My (net) revenues (same assumptions as situation 1) on the book will be $5000, my printing costs $2000. The $3000 gross profit will easily pay the design and production costs associated with the manuscript and the remaining profit can be applied to my overhead.
Had I printed (using the traditional model) 1000 or 3000 atlases, my sales of only 500 would leave me with a loss and a garage full of atlases (i.e. a liability where I need to find a way to dispose of the excess inventory). If the demand for the book proves to be more than expected, the book can always be sent to a "traditional" printer for a modest number of copies, then revert to the POD model.

Situation 3: Use the POD model to work the "kinks" out of a book. Many small publishers combine book sales with "expert" consulting or speaker's fees. By selling your book through a (low to moderate cost) seminar, you can leverage book sales revenues with your speakers fees. Using POD, you can print only

the number of atlases you're likely to sell at the seminar and you can use the feedback that comes with such close contact with the consumers. After a period of "beta" testing and improvements to the book, then you can move to a general distribution, marketing and publicity plan that will support a traditional initial printing of your book or you can continue with the Situation 2 approach.

Using Adobe Acrobat PDF for print production

Adobe Acrobat was originally created to enable electronic distribution of documents. It was aimed at large corporations as a means to create 'paperless offices.' For this purpose, Acrobat was just one of several competing products and had no remarkable benefits as compared to the competition.
However, Adobe 'got smart' and began giving away Acrobat Reader for free and soon after, the World Wide Web was established on the Internet.
Finally, electronic distribution of documents had a real reason for being and Adobe Acrobat was well positioned to take advantage of the new situation.
Still, Acrobat was developed for electronic documents. It was not designed for efficient handling of printed documents until the release of Acrobat version 3.0. None the less, you will find that many printers are not yet ready to deal with Acrobat files but the future of the digital work flow is based on Acrobat so, eventually, any printer working with digital files will be able to work with (and probably prefer) Acrobat PDF files.

Advantages of Acrobat PDF

Most book printing is based on files output through a PostScript driver. These PostScript files can be quite large. PostScript, developed by Adobe approximately ten years ago, was never intended as a means to exchange files, but was a 'page descriptions programming language' intended to drive a printer. (Indeed, the combination of Apple Macintosh computers, Adobe PostScript, Adobe PageMaker, and (relatively) inexpensive laser printers set off the "desk top publishing" revolution that is still reverberating through the graphic arts, printing, and publishing industries.)
Acrobat PDF has clear advantages over PostScript. Distiller, the PDF file creation program, processes the base PostScript file and simplifies it to specifically describe the pages. PostScript has commands that 'flow through' the whole document that eliminates the possibility of interrupting a job and 'fixing' an individual page the whole PostScript document must be resubmitted. PDF is 'page independent.' No page depends on commands that may have been made globally or were on another page. PDF allows font embedding. PostScript files must have the font installed on the computer. PDF files are quite compact as compared to PostScript files.

The process

First the document is prepared in a professional page layout program (Quark XPress, Adobe PageMaker, Adobe FrameMaker, or Corel Ventura) then the file is 'printed' to disk or saved as a PostScript file. Next, the PostScript is 'distilled' with Acrobat Distiller to create the PDF file. To include any changes made to the original document in the 'parent' program, you must repeat the steps of creating the intermediate PS and distilling the PDF file.
Acrobat consists of various parts: Reader (available for free) that allows you to view and print a PDF document. Exchange, that allows editing of PDF documents. And Distiller that creates PDF documents from PostScript files. Another PDF creation utility is also available, called PDF-Writer. Writer was developed to create PDF files from 'simple' word processors and was often bundled with such products. It will not create usable PDF files from professional page layout programs and it will not create PDF files that print with the highest possible quality in other words, avoid PDF-Writer for professional work.
Adobe PageMaker has a 'create PDF' selection on its file menu.
This is a trap for the unwary--it's intended for Internet-low resolution files. To create high quality files for print reproduction, you must use the 'print' command and select the 'Acrobat' PPD (Printer Personality

Description) then "print to disk" to save the document as a PostScript file. You will need follow a similar procedure with Xpress ®, FrameMaker ®, and Ventura ®.
A PostScript printer driver must be installed (use LaserWriter driver 8.5.1 on the Macintosh and the latest available PostScript driver for Windows computers) even if you do not have a PostScript printer.
To print out a PDF file, you use Acrobat Reader or Acrobat Exchange. If the file was distilled with the appropriate settings, Acrobat Reader will print the file at the highest resolution that the output device is capable. If you are using a computer with a non-PostScript printer, you need to install Adobe Type Manager to get accurate PDF output.

Font Embedding

Font embedding is used to specify which fonts are included in the PDF file to prevent font substitution at print time. Distiller never embeds the 'standard 13' fonts (Helvetica, Times, Courier, and Symbol font families) because they are available on all PostScript devices.
Select *embed all fonts* so that Distiller includes all the fonts used in your document in the PDF file. With this option Distiller includes only the characters used in the document for each typeface and renames the subset fonts in the PDF file to prevent an available font with the same name from being used at print time. This ensures that any customisation to your font (such as kerning tables) will be used and reduces the chance of other unexpected results caused by an unintended font substitution. This option, however, does prevent last minute editing (by the print service) using the Acrobat Exchange 'touch-up' tool. (There are work around to allow 'touch-up' tool edits, but then the font embedding information is lost requiring the original font(s) used to be installed on the computer(s) processing the document.)

4. Possibilities/limitations (for maps, large size production)

If compared with the previous story POD for large size production is a different discussion.
Digital printing technology is not available for sizes larger than 30x42 cm yet.
This results in a more limited number of technological opportunities.

We face the main large size production streams:
1. Output printing on the inkjet printer
2. B/W Output printing on the Image Setter, the photographic film laser writer followed by copying on request
3. Output printing on the Image Setter followed by plate making and offset printing.

1. Output printing on the inkjet printer

The quality of inkjet printer has tremendously been improved the last years. Sizes of posters can technically be output without real problems. The only bottleneck can be the absence of a Raster Image Processor (RIP). If not available the computer has to reserve capacity on processing and storage of huge amounts of data. This leads to lower efficiency in the production environment.
Connected to the computer one can print out quantities of maps in the range from single maps to numbers of 50 maximum. POD is a real hot item for this technology. On request the production companies can deliver such quantities easily without hesitation.
Without preparation for file making the price of one sheet is the same as 50 sheet divide by 50. Production time for one is the same like for fifty (multiplied by 50). This counts also for the materials costs for paper and ink.

Without preparation the cost price includes:

-	materials: A0 paper according to quantity:	sq.m. =	$ 10.-
-	ink: A0 ink from cartridges according to quantity		$ 1.-

- equipment: A0 inkjetprinter price ($20,000.-)	hr.price =	$ 5.-
- Labour: $ 30/hr		$15.-
	Subtotal	$31.-
	Overhead	$10.-
	Final total	*$41.- per sheet*

2. B/W Output printing on the Image Setter, the photographic film laser writer followed by copying on request
This choice delivers one film output on high resolution. Settings can be adjusted from 300 –3600 DPI and decisions on the output resolution depend highly on the follow-up.
In the majority of the cases the film output forms the original for diazo (blue print) or photo paper production. Quantities of reproduction vary approximately from 1 to 50.
Although inkjet produces fairly good quality images the Image Setter output quality of this equipment is higher. High resolution leading to the sharp and black image dot quality allows for better and sharper dot building.
However costs are consequently higher, but dependent on the process to be followed after the film output.

Preparation for file making is not included.

Original Film output production of an A0 size 1 film (incl. labour)		$ 100.-
One sheet of photocopy $ 40.- (excl. labour) production 2/hr		
10 copies: 5 x $40 =		$ 200.-
labour $30.-/hr 5 hrs =		$ 150.-
	Subtotal	$ 450.-
	Overhead	$ 165.-
	Fin. Total	$ 615.-

Preparation for file making is not included.

Original Film output production of an A0 size 1 film (incl. labour)		$ 100.-
One sheet of diazo paper $ 20.- (excl. labour) production 10/hr		
10 copies: 10 x $20.-		$ 200.-
labour $ 30.- hr 1 hr		$ 30.-
	Subtotal	$ 330.-
	Overhead	$ 66.-
	Final total	$ 396.-

3. For large quantities one must consider traditional offset printing technology as the most advisable.
In order to keep prices as low as possible, without quality limitation considerations, for larger quantities we are more or less bound to have printing executed by sheet fed offset printing presses.

If quantities do not exceed 200,000 – 300,000 sheets we can consider the sheet fed press as the best, cheapest and the most rapid solution. Larger quantities are more cheaply offered if printing is executed on roller rotation printing presses, like used for magazines and newspapers.

(example 25,000 sheets)
Preparation for file making is not included.
Further costs:

Film making: 4 separation films A0 size:	$ 400.-

Printing plate making (incl. labour)	4 separation plates	$ 300.-
Printing equipment: 4 colours press hr. price $ 100.- (3 hrs)		$ 300.-
Labour: $ 30/hr/person 2 staff		$ 180.-
Paper 25,300 x $ 0.20		$5060.-
Ink		$ 100.-
	Subtotal	$6340.-
Folding/trimming		$ 500.-
	Overhead	$2000.-
	Fin Total	*$8840.- per 25,000 sheets*
	Fin Total	*$ 0.3536 per sheet*

(example 500 sheets)
Preparation for file making is not included.
Further costs:

Film making:	4 separation films:	$ 400.-
Printing plate making	4 separation plates	$ 300.-
Printing equipment: 4 colours press hr price $ 100.- (1hrs)		$ 100.-
Labour: $ 30/hr/person 1 staff		$ 60.-
Paper 800 x $ 0.20		$ 160.-
Ink		$ 10.-
	Subtotal	$1030.-
Folding/trimming		$ 200.-
Overhead $ 400.-		
	Fin Total	*$1630.- per 500 sheets*
	Fin Total	*$ 3.26 per sheet*

paper output		Recommended devices				File formats			Production Recommen-dation	
quantity	size	OffsetPrintPress	DigPrintPress	inkjet	copier	PDF	PS	Native	Inhouse	Outdoor
	A3 max.			X				X	X	
	>A3			X				X	X	
1-10	A3 max.		X	X	X	X		X	X	
	>A3			X	X			X	X	
>10-100	A3 max.		X		X	X		X	X	X
	>A3				X			X	X	
>100-500	A3 max.		X		X	X		X		X
	>A3	X					X			X
>500	A3 max.	X	X			X	X			X
	>A3	X					X			X

5. OUTDOOR PRODUCTION

In many cases we would like to have matter printed in-house. Outdoor production indicates a request for support and an import of production items such as films, plates, paper prints etc.
Cartographic production included map printing for a long time. Until recently we were not used to bag for assistance. We made our work as much as possible by ourselves and assistance was out of question. However, related to equipment, if we realise the number of non-productive hours we neglected economic principles rather than thinking of more beneficial production.

Particularly expensive equipment such as Image Setters, printing presses and sophisticated digital printers cost a fortune due to rapid depreciation and economic writing-off. Devices like those must be written off in 2 –3 years time and despite shift production hour prices remain high.

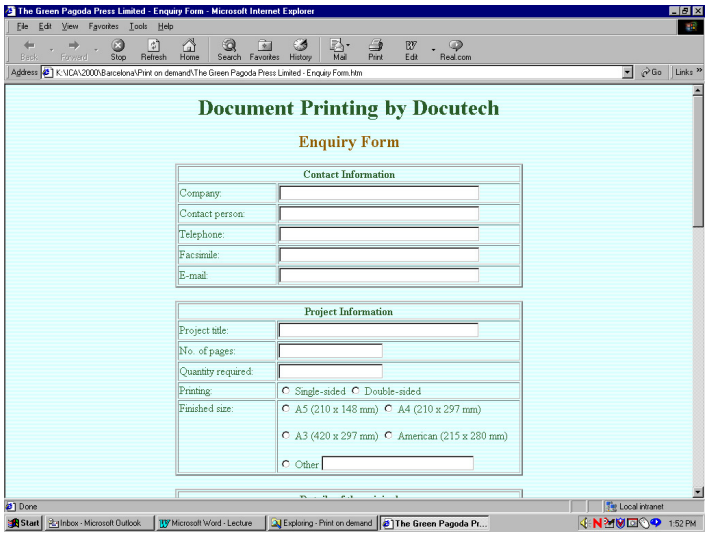
Considering this mapping companies increasingly look for outdoor opportunities. Since competition between graphic printing and printing related industries cost prices are offered to payable prices. It is worth it to have a critical look on this.

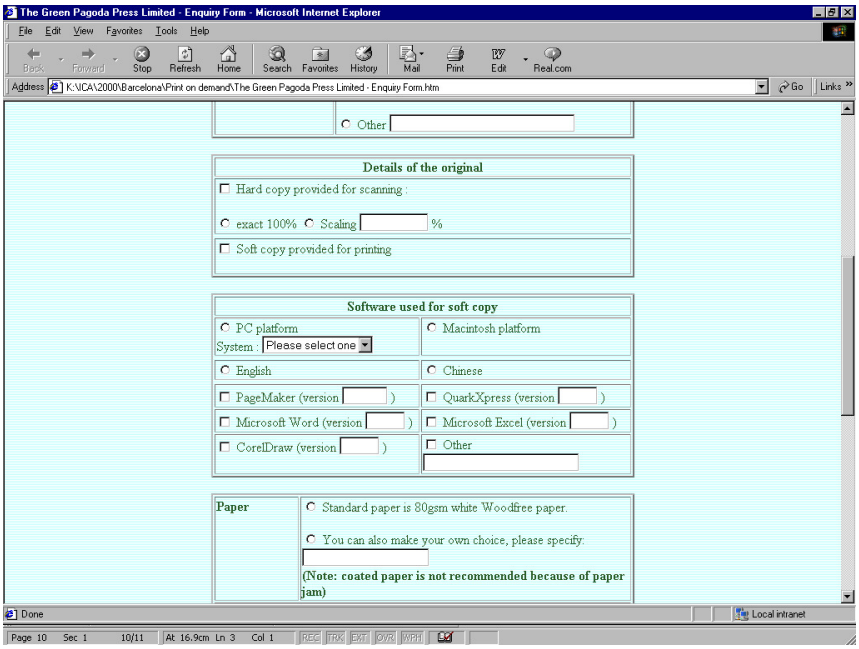
Main advantages of outdoor production are:
- No concern of standing still time of equipment
- No investment on expensive production apparatus
- No investment on building's capacity for large devices
- With respect to quantity a more critical look on what is really required

If one studies POD advantages we can find similarities:
- You save on storage costs.
- You reduce drastically the superfluous and expensive replacement of your obsolete printed matter.
- You save on delivery costs, thanks to more efficient distribution.
- You have unlimited possibilities to personalise your print work.
- The printout is delivered quickly to your business or your customer.

If outdoor production is possible we must give attention to data storage and infrastructure on data transport. Most of us already work with Compression files with Zip characteristics. But nevertheless media for information storage often are reaching limitations to maximum capacity.
In most cases we store data on Zip-drives and CDROM. Maximum capacity increases over the years but data quantity expends with every new computer and software generation.
E-mail has a function in the data transport but only small files can be mailed due to server and network limitations. For large file sizes FTP is mainly used for large data quantity distribution at the moment.
For more information one might consult web sites. An example is found on:
http://www.tph.ca/services/services_outsourcing.htm

In order to meet clients' specifications specially created forms are available for outdoor production. The example hereunder displays a part of one of those forms like developed by just an outsource company.





6. CONCLUSION/SUMMARY

The term printing on demand is a frequent applied term these days. Of course it is not a new term but within its context one meets a new challenge due to many more possibilities these days.
Confronted with digital technology customers can demand much more than earlier times. It is not only the producer who determines the quantity and quality. Clients are definitely more aware of opportunities and

conditions. Due to new governmental rules and in conjunction with economic reasons the mapping society is not the unique organisation that determines what, how and when mapping products are produced.
The influence from the market is growing and clients get increasing awareness of production methods. They often are co-producers and are fully conscious of limits related to economics, as well.
POD becomes more available on small size production. But, since technology evolves rapidly POD is easily introduced in the entire production of mapping products.
The upcoming wider use and importance of PFD formats for pre-printing, printing and even archiving strengthen this process.
Since PDF is a special interest field we have not dealt with it into length during within this lecture. We definitely will experience more of PDF file formats the coming years.

References

PDF Printing and Publishing: Agfa publication
Different Prepress Magazins
http://www.dtpros.com/Print_on_Demand.html
http://www.gpp.com.hk/enquiry.htm
http://www.visitrinics.be/print/index.htm
http://www.starnetdp.com/starnet2.html
http://www.fastcolor.com/postscript.html
http://www.dtpros.com/requirements.html
http://www.tph.ca/services/services_outsourcing.htm