
CARTOGRAPHIC PUBLISHING ON DEMAND

technical possibilities and limitations

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ABSTRACT

The digital era enables new prospects for the publication and dissemination of information. Other than the analogue production of cartographic information digitally prepared ready-to-go geo information is always available. Printing on demand is just a fairly straightforward process, which enables publishing on paper the information in quantities that the customer requires.

In principle, whether just one small quantity, a large quantity or a split quantity is ordered, the printing industry can produce it. But due to the new technological opportunities and their consequent management visions the effect is that we do not wish to keep map stock production anymore.

This is a major advantage. If maintaining printing on-demand mapping agencies don't require any stock facilities. However, and that is the most important progress, organisations do not need to sell outdated maps anymore.

Until today, regarding selling our products in cartography, we have great uncertainty with respect to numbers of maps to be sold by potential customers. Further, the market segment, which is covered by cartography, is pretty small.

For instance, apart from well-known tourist cities, if we require large-scale extended towns plans, we need number in quantities 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 some publications. For fundamental science this is not a big problem. Technology, however, changes by increased speed and that is the reason why cartographic printed matter is also advised to be printed in fairly low quantities.

Further, in this paper comparison is made between small size production and large format printed cartographic products. As a result of the newest techniques, regarding sizes of publication, developments on on-demand printing are different and consequently different managing approaches are apparently available.

Despite the upcoming Web cartography, regarding on-demand publishing, it is expected that on-demand printing will be introduced in our map-making world. Mapmakers, cartographers, publishers and particularly clients will benefit a great deal.

1. INTRODUCTION

Publishing on demand (POD) is a (digital) publication process that gives you exactly the mainly printed material you want, when you want it. On-demand publication is a process, which uses the latest digital technology to deliver particularly 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 segment, 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

Publishing on demand just includes time factors, as well as quantities. When you want to have something published we require numbers of each if one wishes to make these 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 Beijing numbers of quantities are sometimes counted in hundreds of thousands. In this case we have insurmountably 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 alternative 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, 33x46cm. (latest news)
- 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 A3 FORMAT

For publications we can execute entire digital production lines. Digital production is possible till arriving at the trimming, folding and binding processes. 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 fairly simply be printed by the POD technology.

In any case prices do not suppose to exceed pre-calculated prices, while quality is predictably should be good. The only limitation that might be met is the quality 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 atlas 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

Model 1: The publisher sells out the first (normal) printing. The atlas 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. The question is what now? 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 atlas 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 atlases fit **situation 1** very well and can be profitably produced using this scenario.

Model 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 one invests in atlas inventory, then one cannot invest that same money in something else even if that might give a higher return.

Estimating that the atlas or book will interest a fairly limited market one does not want to invest thousands of dollars in inventory that may never sell. Therefore, the client can produce the atlas (to full trade-book standards) then print using POD technology.

Since one needs to 'prime' the market with review, publicity, and distribution copies; the first 'printing' may be about 100 copies. As initial orders are received, another 100 copies may be printed. When that sells (almost) out, 50 copies can be printed; then 25 copies, etc. until demand is satisfied. Perhaps one sells a total of 500 atlases. (Net) revenues (same assumptions as model 1) on the book will be \$5000, the 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 the overhead.

Had the client printed (using the traditional model) 1000 or 3000 atlases, the sales of only 500 would leave him/her with a loss and a garage full of atlases (i.e. a liability where one needs 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.

Model 3: Use the POD model to work the 'kinks' out of a book. Many small publishers combine atlas/book sales with 'expert' consulting or speakers fees. By selling the book through a (low to moderate cost) seminar, one can leverage book sales revenues with speakers fees. Using POD, one can print only the number of atlases one is likely to sell at the seminar and one 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 one can move to a general distribution, marketing and publicity plan that will support a traditional initial printing of the atlas or one can continue with the Model 2 approach.

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

If compared with the previous discussion, POD for large size production is a different discussion.

Although developments tend to extend to larger format, digital printing technology is not available for sizes larger than 33x46 cm yet. However, introducing POD in an organisation the production management approach changes, as well.

Technical restrictions result in a more limited number of technological opportunities.

We face the main large size production models:

1. Output printing on the inkjet technology
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.

Model 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		<u>\$15.-</u>
	Subtotal	\$31.-
	Overhead	<u>\$10.-</u>
	<i>Final total</i>	<i>\$41.- per sheet</i>

Model 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 **photo film \$ 40.-** (excl. labour) production 2/hr

10 copies: 5 x \$40 =	\$ 200.-
labour \$30.-/hr 5 hrs =	<u>\$ 150.-</u>
	Subtotal \$ 450.-
	Overhead <u>\$ 165.-</u>
	<i>Final Total</i> \$ 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	<u>\$ 30.-</u>
	Subtotal \$ 330.-
	Overhead <u>\$ 66.-</u>
	<i>Final total</i> \$ 396.-

Model 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	<u>\$ 100.-</u>
	Subtotal \$6340.-
Folding/trimming	\$ 500.-
	Overhead <u>\$2000.-</u>
	<i>Fin Total \$8840.- per 25,000 sheets</i>
	<i>Fin Total \$ 0.3536 per sheet</i>

(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	<u>\$ 10.-</u>
	Subtotal \$1030.-
Folding/trimming	\$ 200.-
	Overhead\$ 400.-
	<i>Fin Total \$1630.- per 500 sheets</i>
	<i>Fin Total \$ 3.26 per sheet</i>

paper output		Recommended devices				File formats			Production Recommendation	
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

So far we did not discuss web maps. Web map publishing is usually meant for monitor display. For on-demand web map publication we consider this as a one-sheet map to be duplicated through the monitor, only. If the web map must be duplicated through the printing process the producer has to consider this in producing maps with different design and layout specifications. Resolution should then not be a restriction. This implies that the cartographer must not create raster file maps, unless he decides on resolution consideration that is over 600 DPI at least. However, since file size will be too extended for Web publication, the map producer will not apply this possibility. Realising this a consideration should always be on size and quality of map content such as symbolisation.

5. OUTDOOR PRODUCTION

In many cases we would like to have matter printed in-house. 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. Outdoor production indicates a request for support and an import of production items such as films, plates, paper prints etc. 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 expands 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.

6. CONCLUSION/SUMMARY

The term publishing on demand is a term frequently applied these days. Of course, it is not a new name but within its cartographic 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 just the producer who determines the quantity and quality. Clients are surely 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 cartographic publishing on relatively small size production models. But, due to technology evolving rapidly, POD can easily become introduced in the entire production of mapping products. The latter is not just a matter of size, but also due changing production management perspectives. Particularly the economic aspects are a base for frequent discussions. These, sometimes disputes, deal with the fact that cartographic production in general involves a high cost coverage of the total cost price of a mapping product. Cartographic Publishing on Demand reduces costs and leads to receiving the latest published cartographic information. The client gets the answer he/she requires these days: a better product for a lower price.

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