

MATRIX COMPILATIONS

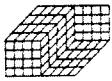
Economic signs this summer were pointing toward a mild recession in the U.S. and Europe. Traffic at U.S. airports was down as worries about jobs at home and higher costs of travel abroad kept vacationers close to home. New car sales were depressed. The number of visitors to Italy for the World Cup in soccer was much lower than projections. Hotels in Stockholm, where the biggest equestrian event in history took place in July, reported that more than one-half of their bookings were cancelled prior to the event's start. Poor weather? High costs? No one knows for sure.

Then, in early August, the situation in the Middle East sent oil prices spiralling upward and stock markets tumbling downward. At this writing, the worldwide economic and political picture looks, in a word, grim. Just when things were beginning to look a little shaky for the tourist and travel business, they have taken a decided turn for the worst.

Hopefully, there will be no loss of life in the Middle East and the situation will right itself. Whatever the outcome, higher oil prices are likely to be with us for some time, and this is not all bad news. Higher prices at the fuel pump will increase the pressure to develop new sources of energy. This will spur investment in GIS and resource exploration systems. Some of the defense projects which have spin-off effects on the computer-aided mapping industry will turn from cold to very hot. Vehicle fuel saving devices, such as computer-assisted routing and scheduling and in-vehicle navigation systems, make much more economic sense when the price of fuel is high than when it is kept artificially low by over production. I expect to see increased interest in intelligent vehicle highway systems (IVHS) in the U.S. and intensified efforts in Europe and Japan where programs are already being aggressively pursued.

Heightened world tensions or not, it was still summer. I figured that if President George Bush could take his family off to Maine for a vacation in the midst of all the problems facing him, my wife and I could take off to an equally tranquil location. We went to Iceland. This was my first visit to Iceland and I was overwhelmed by its natural beauty--volcanos, geysers, hot springs and varied landscape--its friendly and casual atmosphere, and by the quality of its tourist services.

I was also impressed by the quality and sheer quantity of maps that were in evidence everywhere. Free maps were in plentiful supply, but tourists were also encouraged to purchase additional maps. A



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headline in a brochure for Landmaelingar Islands (Iceland's National Land Survey), **Maps of Iceland**, typifies a not-so gentle and persuasive message passed on to the tourist: **Never Travel in Iceland Without Maps!**

"Travelling in Iceland without maps should not be done. Without them the journey would be a series of endless roads and mountains and nameless shapes in the landscape. Using maps for pleasure or work not only helps people get to their destination safely, it is also the key to unlocking geological mysteries along the way. Anyone planning to travel in the countryside, whether by car, bike, or foot, shouldn't even consider departing without maps of all destinations planned. This is the real first step to an enjoyable, fulfilling, and safe trip."

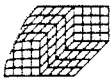
This is the most aggressive piece of advertising for maps I've ever seen. The arguments presented are clear and compelling. How about this: "Never travel in (location) without maps! Travelling in (location) without (your company name here) maps should not be done, etc.

Promote! Advertise! Give people a reason to buy and use your map products. Sell more maps! You'll have good reason to automate.

THE MATRIX PERSPECTIVE

We can learn a lot from the popular press. I've noticed that non-technical periodicals and newspapers have contained more cartographic and geographic references lately. U.S. News and World Report (January 11, '90) in News You Can Use had a clip on the National Geographic Society sponsored Geographic Bee (a "bee" is a contest) held for school children between the ages of 9 and 13. An 11-year old girl won the bee and \$25,000 in college scholarship money when she correctly answered the following question: Mount Erebus is a volcano on which continent? She was "On top of the world" (the title of the article) after she responded with Antarctica. In a sidebar labeled "So Where Is Twin Peaks?" were listed ten of the questions asked in the contest. I wonder how many of us could have answered these questions at the age of eleven. I wonder also how many of my European readers know where, or what, Twin Peaks is.

Forbes Magazine (August 6, '90) contained an article titled "Silicon reapportionment." Ostensibly the article was about how Republicans are fighting Democrats in a redistricting battle in the Los Angeles area by using computers. Stephen Poizner, president of Strategic Mapping Inc., is quoted in the article, but nothing is said about whether his firm's software is used by the Republicans to create voting districts favorable to their party. For Stephen's sake, I hope it is because the



redistricting software cost the Republicans a cool one-half million dollars. What price power?

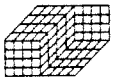
Insight (July 2, '90) and Business Week (August 27, '90) wrote on car navigation systems. Both articles have similar openings: "It's 8 o'clock in the morning (6 o'clock at night); you're heading to work (home); the display on your dashboard tells you there's an accident ahead; the display shows an alternate route and you arrive at work (home) in time for that important meeting (the TV news (the TV news??)). I think both authors pinched their openings from my Computer Graphics World article (September, '89) on the same topic.

One article in Business Week (September 3, '90) that really caught my attention was titled "Travelers is Drawing Itself a Tortuous Road Map." Clever play on the name of the insurance company, but what exactly do the authors mean by a "tortuous" road map? If they are trying to say that Travelers will have trouble following the plan they've laid out to extricate themselves from a difficult financial situation, the road ahead may be treacherous, but the map they've drawn had better be clear and easy to follow. Evidently, the authors believe that reading maps, in itself, can be an unpleasant experience.

The same issue of Business Week reported that Volkswagen had instituted a unique program in the U.S. for buyers of its new cars: Buy the car, try it for thirty days, and if you don't like it, return it for a full refund. The writer of the article thought that this was a great idea--who wouldn't, especially if you've ever been stuck with a "lemon"--but he suggested that automakers take the program one step further. Company executives who receive top-of-the-line models as a perk should be given the returned cars instead. This, he felt, would go a long way toward improving the quality of all cars produced.

How might this concept work for a map return policy? Buy a map, try it for thirty days, and if you find a mistake, return it for a full refund. Company management, not the cartographers or editors, would be given the maps and would research the areas where mistakes have been found in order correct them. Map company executives might find that they were spending more of their time in the field than in their offices. This, I feel, would go a long way toward improving the quality of all maps produced.

I don't know a single commercial map publisher who would claim that his or her company's maps are error-free. I know a fair number of cartographers and editors who complain that they are not afforded the time or the resources to properly research and compile map data. Map producers are compelled to make trade-offs between the cost and time required to achieve close to 100% accuracy and the need to generate as much profit as possible from each map edition. In the U.S., where



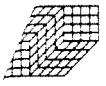
maps and atlases are generally priced lower than those in Europe, and where marginal cost increases can substantially reduce profitability, there is little excess cash available to expand the research activity.

Ken Porter highlighted this issue for me. Ken, as most of you know, was the Director of Cartography for the American Automobile Association (AAA) before AAA moved to Orlando, Florida. He and several former AAA employees have started a business researching cartographic data in the Washington, D.C. area. His business idea is to sell his findings to companies producing maps of the region. He and his team drive the roads, comparing actual conditions to those represented on a collection of map sources, conducting the type of field research that every commercial map producer would like to perform, but can't or won't because of the cost involved.

How much interest has Ken generated so far in his product? Not as much as he had thought he would, at least not yet. It could be a matter of pricing. The breakeven point is relatively high, so one or two purchasers of Ken's research might find the cost prohibitive. If they cannot afford to do the research themselves, they certainly cannot afford to pay someone else to do it just for them. But there are dozens of companies mapping the D.C. area, and if all of them bought from a single source, the cost per company would surely be reduced--and Ken might even make a profit.

Ken's business idea isn't so different from that of companies and public agencies offering digital geographic data. Ken's saying that if all firms creating maps of the D.C. area pooled their limited research funds, they could all afford better quality (i.e. improved accuracy). Companies developing digital street map databases propose that map producers purchase licenses for their digital data. Like detailed field research, building and maintaining map databases is very expensive; lower unit costs are possible if more companies share in these costs. The incentive for map producers, assuming that they have the ability to convert the digital data into publication quality map products, is that they should never again have to worry about researching and compiling corrections.

If you are considering buying digital cartographic data as an alternative to developing your own databases, ask the supplier what type of field research has been done to check the data's accuracy. We are all aware that map features are not compiled by magic. There are some compilation steps which can be automated and we're getting closer to a fully automated process, but for complete accuracy of feature names and classifications, there is no substitute for field research.



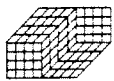
TRANSFORMATIONS

Laser-Scan is twenty-one and counting. In the computer graphics industry, a company deserves at least some kudos for having stayed in business for ten or fifteen years--exhibiting the longevity quotient. Few companies which began life in the late '60's or early '70's are still around, or, if they are, they are in a totally unrecognizable form. Laser-Scan Ltd, Cambridge, U.K., founded in 1969, celebrated its twenty-first anniversary this past summer. (In case you're wondering what happened to the twentieth, companies in Great Britain, like individuals, mark their twenty-first year as a significant milestone.) During celebration festivities held in the company's high-tech/post modernistic headquarters, customers and friends toasted Laser-Scan's achievements of the past and its expectations for the future.

Laser-Scan was started by a group of academics who were working on new technology research at Cambridge University. The technology was lasers and the business idea was to use a computer-directed laser to convert the lines and areas of maps and drawings into digital data. Compared to its original systems, Laser-Scan's current LaserTrak and VTRAK automatic line following devices are doing their work faster, with improved sophistication, and with more inter-system functionality, but twenty-one years after its founding, Laser-Scan is still in the business of using lasers to capture and record graphic data.

Laser-Scan owes its longevity, in part, to having a good idea and being able to manufacture a complex machine that others have had difficulty copying--and understanding. Through constant but controlled tinkering, they have adapted their primary product to changing market conditions, adding new features and functionality. They have managed to keep pace with advances in computer systems architectures while maintaining a consistent relationship with a single vendor, Digital Equipment Corporation. As clients demanded expanded functionality, Laser-Scan responded with new product modules.

So if they've been around for such a long time, and if they have such a good set of products, why don't we know more about them? Why doesn't the name "Laser-Scan" roll off the tongue like "Intergraph" and "ESRI", two companies with similarly long histories? Laser-Scan is very well known in its home market, the U.K., where it has concentrated its sales efforts. International marketing is still relatively new. Its U.S. office is less than two years old, and it has had a full-time director, Wayne Coleman, only since April of this year. Laser-Scan has also been modest (maybe a little too modest) about generating self promotional materials, and, until recently, has used advertising sparingly.



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Laser-Scan will be more visible in the future, promises Robin Waters, Director of Marketing, as the company makes more sales outside of the U.K., like those to Geonex Chicago Aerial Survey, General Dynamics, the U.S.G.S, Canada Centre for Geometrics, Canadian Energy Mining and Resources, VIAK AB. They'll be seen more often at GIS and mapping exhibitions, including the upcoming GIS/LIS'90 in Anaheim this November.

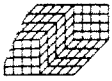
Last year, VTRAK was introduced. This is a workstation version of the original VAX-based LaserTrak automatic line following, raster-to-vector digitizing system. The first platform for VTRAK was Digital's VAXstation, a workstation running under VMS operating system. This port opened the door to the more standard UNIX operating system and RISC-based workstations.

During a recent visit to Laser-Scan's Cambridge offices I viewed a demonstration of VTRAK Greyscale, an enhancement to the already powerful raster-to-vector conversion software. With Greyscale, it's possible to scan a poor quality original document or print, like a utility map or parcel boundary plan, and differentiate features on the document according to lightness or darkness of the feature. By setting a greyscale value, visual background noise, like smudges, stains, or faded copy, can be ignored during the automatic vectorization process. Greyscale settings can also be changed in one degree increments during program operation. This is one of the more interesting software developments I've seen, combining image analysis with raster-to-vector functionality.

In my opinion, Laser-Scan has the best data capture systems for line and area features. Its semi-automatic raster-to-vector conversion system is faster and less tedious than manual digitizing, either over a table or heads-up, and more accurate and reliable than completely automatic (i.e., batch) systems. Anyone involved in map conversion today must consider Laser-Scan as an option.

There's been a changing of the guard at Gousha Map Company. Henry Perez, Vice President of Cartographic Operations for the Comfort, Texas mapping firm, has taken his leave from Gousha effective from mid-July. His duties have been split between Tom Deiley, Director of Custom Cartographic Services, and Cary Wilke. Randy Sands, Manager of Cartographic Information Services, is coordinating Gousha's implementation of automated systems.

Esselte Map Service has been sold. Esselte Map Service, or Esselte Kartor (kartor means "maps" in Swedish) as it is known in Scandinavia, may be undergoing a name change in the near future. In the last issue



of **Compilations** (May 1990) I reported that the company was for sale as part of a group of companies within the Esselte conglomerate that were being sacrificed to raise the company's stock price. After much speculation that the group would be sold to a French or German publishing giant, the entire publishing sector of the group, including Esselte Map Service, was sold this past August to the Liber Concern, a Swedish publisher of educational materials.

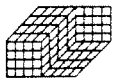
Liber's primary interest appears to be in Esselte's educational book division. It is not at all clear how or where Esselte Map Service fits into Liber's long-term strategy, but concerns about the venerable map company's early demise seem to be greatly exaggerated. I visited Stockholm recently and the firm is alive and well and very busy, especially in the application of its digital techniques.

Liber owned a map company at one time. The company, which is still called Liber Kartor, was sold to the Swedish Land Survey and is under the capable direction of Thomas Mann. The sale of the original Liber occurred prior to Managing Director Birgitta Johansson-Hedberg's arrival. She does not seem to be in any hurry to set Esselte Map Service adrift. On the contrary, she's given every indication that Esselte Map Service (or whatever the firm is called) has a place inside Liber. One sign that may indicate just how important a part the management of Esselte Map Service played in the sale of the group to Liber is the naming of Bo Hermansson, Managing Director of both Esselte Kartor and Focus, to the Board of Directors of a newly formed company within Liber that includes all the former Esselte firms.

Still, there's the matter of a name. New Liber Maps? Old Esselte Maps? It's more likely that both Liber Kartor and Esselte Kartor will be printing up new stationery in the not-so-distant future.

Etak is a map publisher. A few years ago, a sure-fire hit present for my nephews was a toy called a "Transformer." With several nimble twists applied to a plastic car, it would be transformed into a robot warrior with laser guns for arms. Another twist and presto, it was a light speed star fighter. In what must be one of the business transformations of the decade (it's still young), Etak, Inc. president and CEO Stan Honey announced recently that his company has become a "map publisher."

Most of you are familiar with Etak as the developer of an in-vehicle navigation system called the Navigator. After an unsuccessful attempt to market the Navigator in the consumer market, the company concentrated on the commercial sector--fleet management, emergency response, delivery services. Etak found that the costs of supporting a manufacturing operation and a marketing and sales force for such an



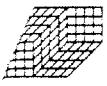
organization required deep pockets, deeper than those of original investor, Nolan Bushnell. In an attempt to unburden themselves from the weight of hardware, they signed licensing agreements with General Motor's DELCO for the U.S. rights to the Navigator, Clarion for Japan, and Bosch Blaupunkt for Europe. Etak then concentrated on system design and production of geographic databases.

Etak next decided to switch gears from hardware to databases. For the past few years, the company has viewed itself as a geographic database integrator. They invented their own computer graphics system for combining available data from governmental sources with their own digitized materials. Their recipe for mixing this home brew remains a closely guarded company secret. Etak actively marketed its MapBase of major U.S. metropolitan areas to map publishers, desktop mapping vendors, and anyone else who needed a digital city map.

Since the company's acquisition by Rupert Murdoch's News Corp. in early 1989, Etak has been very busy working on both their image and on tools that help value-added resellers and system integrators include Etak's maps in their own products. Stan Honey sums the situation up thusly in one of the many promotional pieces that have crossed my desk in recent weeks: "The Murdoch people have the kind of global vision that we were searching for, knowing that our technology was important. Seeing digital maps as a medium for business and advertising information (like Yellow Pages), and helping us to reposition Etak as a **map publisher** has added profound new dimensions to our future."

Many may have difficulty accepting this transformation of a consumer electronics company into a map publisher. Etak is not putting ink on paper--not yet, anyway--but the combination of their digital geographic data, their MapAccess tools which convert this data into colorful graphics, and their intention to distribute these products to a broad market, gives them every right to lay claim to the "map publisher" appellation. As the editor of "Electronic Publishing and Printing" pointed out in recent issue (Aug/Sep 1990), "Publishing means, quite literally, to make public...getting the right information to the right person at the right time in a form appropriate for maximum comprehension." In the end, it will be the consumers who will decide from whom, and in what form, they will purchase their maps.

There are other, similar transformations in the works. Rupert Murdoch may be leading the way and plowing up new ground, but there are other companies emerging from the computer/electronics side (as opposed to the cartographic/publishing side) that will be sowing their seeds, along with Etak's, in Murdoch's fields, in their own fields, and in the fields of the traditional map publishers. Stay tuned.



PIXEL POINTS

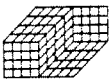
PostScript: What it is and what it means for Map Publishers

Computer graphics developers have been trying hard to make their systems easier to use (i.e., user friendly) with graphical user interfaces (GUI's) replacing keyboard input, and with special-purpose applications programs capable of performing complex graphic and database manipulations. These advances, along with improved picture quality that approximates photographic realism, make the systems approachable by non-technical operators, but they also mask the power of these new systems and increase the mysterious nature of the technology. I often hear comments such as: "These systems are great--how do they do that?" or, "Can my people handle the sophistication of these system?"

One of the latest mysteries is PostScript. The word has steadily crept into the computer graphics lexicon during the past few years. We hear talk of PostScript-compatible laser printers, desktop publishing and illustration programs that create or read PostScript files, and now map output from GIS databases in PostScript format. PostScript is supposed to make life easier for anyone working with graphics. What is PostScript, and what relevance does it have for map publishing?

PostScript is a programming language developed by Adobe Systems, a software company, to convert text and graphics into mathematical descriptions which can be interpreted by a printing device for imaging on paper or film. This page description language (or PDL), as PostScript is called, was invented by a couple of ex-Xerox employees who had worked on a similar concept while at Xerox. Initially, the inventors had rather modest ambitions: They wanted to make it possible to scale a text character up and down from a single stored description of the character, rather than requiring that a laser printer or imagesetter store a raster character (called a bitmap) of every typeface and style in every desired point size. Multiple raster fonts are necessary because scaling raster data, especially enlarging a character, diminishes the quality of the character. Letters take on the "jaggies" when pixels at the edges grow in size or are eliminated. One other problem with raster character sets is that they consume huge amounts of disk storage space.

The idea behind PostScript is to store computer program code which interprets the ASCII representation of a character (i.e., a lower case letter "a" has an ASCII code of 141), along with data on typeface, type style, point size, character spacing, expansion/condensing factors and interline spacing. The program code generates the outline of a character in vector format. The outline, not a bitmap, is scaled and then filled with pixels at the resolution of the imaging device. Adobe



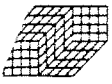
developed additional programs (called hinting algorithms) to change the appearance of characters as the characters are scaled, just like typographers change the design of "real" type at different point sizes. This concept is different from digital type producers like Bitstream, who digitize font libraries and store a character as a vector graphic. What you purchase from Bitstream is the vector data for a character in a specific typeface and style; what you buy from Adobe when you purchase a PostScript-compatible printer or imagesetter is a program that creates a specific typeface and style at any desired point size.

Adobe developers soon realized that if one could describe the outline of type and fill the outline with solid pixels, one could also read the outlines of areas and fill the areas with solid pixels, or with any mathematically described pattern of pixels. The outline of an area is described as a series of connected points in a Cartesian coordinate system, just like the data in a vector mapping system. A pattern of pixels used to fill an area can be as simple as evenly spaced lines or as complex as a halftone screen.

Let's look at how a map would be interpreted by PostScript. Maps are composed of lines, areas, and text. Colors on the majority of maps are created with varying combinations and percentages of flat screens for the four process inks (cyan, magenta, yellow, and black), or with special PMS inks. Parks, for example, are represented by a certain "color" green which can either be a PMS green or a combination of cyan and yellow. To make any color using process inks with traditional reprographic techniques requires the use of dot screens for the desired printing screen mesh (e.g., 120, 133, 150 lines per inch), and percentage value (e.g., 20% cyan and 50% yellow for a light green). The screens for each process color must be positioned at a predetermined angle (e.g., black 45 degrees, magenta 75, yellow 90, cyan 105) to prevent moire.

For a PostScript device to fill the area, it must have the means to generate the proper combination of printing screen mesh, percentage value, and angle. This is done by building a series of cells for each possible combination. The way that these cells are created is with mathematical formulas. Computer programs use these formulas and attempt to produce an accurate and pleasing representation of round, oval, or square dots by combining pixels in clusters to simulate the dots in a reprographic screen. The cells are grouped together inside an area to fill the area with the desired percentage.

I say "attempt to produce" above because in the world of computer-generated dots, one system's dots are not as good as another system's dots, and computer-generated dots are rarely as good as analog (i.e., manually produced) dots. Companies guard their cell generation formulas carefully--they're even patented and law suits are waged over



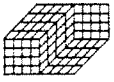
them. Adobe originally worked with Hell to incorporate that company's screening methods into PostScript, but Adobe eventually decided to develop its own algorithms. Companies like Optronics and Scitex have PostScript-compatible imaging systems, but they use their own screening algorithms, either because they assume their algorithms are superior to those used by Adobe, or because they modify hardware to improve the speed of processing.

On a map, an area to receive a screen percentage can be as thin as a casing on a road. PostScript cannot simply place a screen on a line. It must have a boundary inside which to lay down the screen cells. When a vector mapping system creates a line, like a multi-lane highway for example, that line has no thickness. It is made up of X and Y coordinates for its start and end, and additional coordinates to define its shape. Associated data is attached to the line which can be interpreted to produce the desired graphic appearance, but to create film that can be used to print the line in its desired colors, there must be a program to convert the associated data and the vector coordinates into areas that can be filled with a screen pattern. PostScript can function as this conversion program.

Now to why PostScript should be of interest to map publishers. Scitex, Intergraph, and Barco use their own programs to accomplish the vector-to-raster conversion and create film for printing. However, these three companies output only to their own expensive plotters and the plotters can only accept data from their own workstations running their own software. PostScript imagesetters, like those from Linotronic, are less than one-half to one-third the price of the those from the above companies and can accept data from a variety of hardware platforms and software.

Unfortunately today, getting from a map database to a PostScript file that can be plotted on a PostScript-compatible plotter or imagesetter is not easy. There are circuitous routes to PostScript via AutoCAD and desktop illustration and publishing programs, but these are cumbersome solutions, especially for large maps. ESRI claims to be able to generate a PostScript output file. I don't doubt their claims, I just haven't seen their process or their results. Currently, the easiest way to produce a map for output to a PostScript device is to draw the map with an illustration program, such as Adobe Illustrator, Aldus Freehand, or Corel Draw. This is not exactly map database publishing. Then there is the problem of limited size to PostScript imaging devices. The largest format size for current systems is 50 x 60 cm. Optronics claims that their 5040 laser plotter is now PostScript-compatible. I don't doubt their claim, but...

I expect we'll be hearing more about PostScript as a standard for graphic output. A standard is needed, and PostScript is beginning to



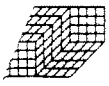
distinguish itself as a flexible and powerful tool in graphic design with promising application to mapping. I will continue to encourage mapping system vendors to offer increased PostScript compatibility.

PROJECTIONS

I must look like a walking atlas. People often stop me on the street in Boston (even when I'm not wearing Interarts' Wearin' the World jacket) and ask me how to get to... For a few years, I always carried around a couple of extra copies of the Boston Map Guide to pinpoint a destination and then surprise the lost travellers by giving them the atlas. My lifetime supply ran out in 1984, so all I've been able to do since then is give the questioners directions and then suggest that a map would be a good investment. They seem thankful for the information, but I remember that they were happier when they walked away with the Map Guide in their hands. I wonder if they're taking my advice about making the recommended investment. There are a lot of other people wondering about the same thing.

I've had an increasing number of enquiries recently concerning the size of the printed map market, particularly in the U.S. Is the market for printed maps and atlases expanding, is it stable, or is it shrinking? The majority of the enquiries come from companies that have computer-aided mapping products which should be of interest to map publishers: scanners, laser plotters, databases, GIS and cartographic finishing systems. The companies have sold systems to the major map producers in the U.S. and Europe and to many of the governmental mapping agencies, and these customers have been sufficient to get them interested in the remainder of the map publishing industry. But they have trouble understanding both the needs and size of this secondary market, that is, those companies which have not yet invested in automation. The lack of market information gives the impression that the secondary sector is relatively small, fragmented, and/or unhealthy.

Since you (map publishers) are notoriously tight-lipped about your sales, and rarely, if ever, send out news releases about revenue increases and market share gains or make excuses for poorer than expected performance--like dutiful public companies are obliged to do--a market analyst has little data on which to base an industry size estimate. We complain about the total absence of subjects relevant to map publishers at mapping and GIS conferences and the lack of understanding exhibited by computer vendors concerning the issues which are important to printed map production, but it is the resistance by map publishers to openly discuss hard financial data which inhibits strong and sustained interest in map publishing.



My years of experience in the map publishing industry, both from the inside producing and selling map products, and as a consultant to the industry, have provided me with information and insights about the exciting world of map publishing. Although I cannot discuss specific market data which I have obtained in confidence, I am determined to inform those who are seriously interested in addressing map publishing automation issues about the current state of the industry and its future prospects.

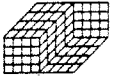
When I'm asked how big the market is for printed map products, I answer that it is bigger than most people think. I've estimated that total worldwide annual sales in recent years of road maps and atlases and city maps and atlases, which are the primary commercial map products created for mass distribution, are between \$400 and \$500 million. The U.S. represents approximately 30% of this total. These figures do not include similar maps and atlases produced by governmental bodies, such as official state road maps, county maps or city guides. Also not included in the road and city map classification are maps produced for free distribution, such as the state, regional and city maps and TripTiks created by automobile clubs like the American Automobile Association, and specialty maps produced on a contract basis, like regional bus route or subway maps..

It is extremely difficult to estimate with any degree of precision the total value of all road and city maps produced and sold or distributed, but a conservative guess would put the figure at around \$2 billion, with the U.S. generating over 50% of the total.

In the U.S., approximately 75% of total revenues from road and city map sales by private companies (\$100 million) is generated by fewer than ten companies. The remainder is produced by several hundred small-to-medium firms operating in limited geographic areas. Worldwide, fifty major map publishers are responsible for more than 50% of all sales.

These figures are for only one business sector. Additional map publishing sectors include small scale (less than 1:1 million) wall maps, geographic learning products, world and country atlases, travel guides. Then there are the governmental map publishers who sell maps in competition with private firms.

This very brief look at the map publishing market provides enough information to speculate on what computer vendors should do and what map publishers can expect from these vendors in the future. For those vendors who understand the market and the forces affecting it, there are niches which can be filled. For the majority of map publishers, especially those who have not yet automated, the price of



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entry into full-fledged automation will remain high. The reason is that there just are not enough buyers who need and can afford the larger systems to lower the unit price of these systems. If you would like to discuss the market figures and the conclusions I have drawn from them, give me a call.

The maple leaves are turning from green to red and the air is taking on the chill of a New England autumn. This is a great time of year to talk business.

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