Tektronix, Inc. Company

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field engineering news

In this issue . . .

Information Display Division —

Straying From the Beaten Path Sometimes Pays Off

Tektronix was twenty-two years old before the first Tektronix information display product appeared on the market. Since that time the Information Display Division has become a major contributor to Tektronix' growth and success. However, because information display products are not test-and-measurement instruments, they presented new challenges in development, marketing, and sales. In meeting these challenges the Information Display Division (IDD) has acquired an identity of its own — an identity with which even some of Tek's "old timers" may be unfamiliar.

To learn more about this dynamic organization and its products, FEN talked to Lang Hedrick, Operations manager, at Wilsonville.

How did Tektronix, as a manufacturer of test-and-measurement instruments, happen to get into the information display business?

Well, first of all, we had the direct-view storage tube (DVST). Norm Winningstad and Frank Consalvo thought it could be used in a facsimile transmission system. In the course of the research associated with this project (it was later dropped), they discovered that Tektronix could make a quick penetration of the computer peripherals market with the 611 Display Monitor, whose 11-inch DVST was ideally suited to the display of computer data.

Could you expand on that point a little?

Certainly. Without a bistable storage tube, the only method available at that time for generating a CRT display of computer data was the "refresh" technique. This technique requires the computer to repetitively transmit a block of data to the display device at a rate fast enough to eliminate flicker. The DVST, on the other hand, requires only one transmission of data, which it stores for viewing. This substantially reduces data transmission costs.

The 611, our first product, was designed specifically for this application and it continues to be a viable information display product. We actually entered the computer terminal business with the T4002, a computer terminal with an 11-inch DVST that sold for about $10K.

Did anyone at that time have any idea they were entering a new business that would eventually grow to its present size?

Perhaps, but I doubt it. Our experience in this respect was more in the Howard Vollum tradition — marketing a product so superior to its competition that it created, (as opposed to simply meeting) a demand — and then being surprised by the rush of orders.

You see, the small, crisp spot and high resolution of the DVST made it a superior CRT for graphic displays, and computer graphics was just then emerging as a practical technique. With the right software, reams of computer printout could be converted to graphic displays in the form of graphs, charts, isometric drawings and other graphic representations. This technique made it easy for users to visualize the results of their computations. When we introduced the 4010, with about

The instrument that started it all. The 611 Display Monitor, built around Tek's direct-view storage tube (DVST), drastically reduced the costs of displaying computer data, and started Tektronix in the information display business.

twice the performance and half the cost of the T4002, we had a real winner. Innovative engineers who couldn't afford a $10K, refreshed-graphics terminal had little trouble coming up with $4K for the superior 4010. So we were really swamped with orders.

All right, that explains how Tek got into the information display business. What came next?

Hard copy units. Very often a permanent record of a computer display is required for study or documentation. This is accomplished by a hard copy unit, which reproduces on paper the alphanumeric and graphics data shown on the terminal's display. One type gets its information by scanning the stored image on a DVST. The other copies video directly. We make both types.

Then, in 1971 Tektronix acquired Cintra, a manufacturer of desktop calculators located in Sunnyvale, California. Tek began marketing their model 909 with a Tek logo, without notable success. So the Sunnyvale facility was closed down and the desktop calculator activity was reconstituted under Hiro Moriyasu. Out of this effort came the TEK 31 Calculator, a successful product that remains a part of the IDD line.

At about the same time we acquired rights from a firm called Valtec to build our first plotter, the 4661.

What is the difference between a plotter and a hard copy unit?

It's mainly one of line resolution, as far as results are concerned. Hard copy units use a thermal or electrostatic printing process that is satisfactory for quick results, but lacks the quality and resolution required for many applications, such as producing a master drawing for the engineering department or a graph for an advertising brochure. A plotter is an electromechanical device that converts computer data to a clean, high-resolution, pen-and-ink drawing.

By this time wasn't Tektronix getting into some strange territory?

We certainly were. Here was a company with little more than a proprietary analog display technology, suddenly thrust into what was essentially a digital world. Our digital expertise resided almost entirely in the sampling oscilloscope group, under Al Zimmerman. That's where John Bowne, our first information display engineering manager came from. Of course, a lot of our product development technology was directly applicable to information display products; but we were indeed addressing new markets.

Lang Hedrick

This created some problems?

That is an understatement. Our lack of digital expertise extended all the way across the board — engineering, manufacturing, marketing, and sales. We didn't have a single software specialist on the team, and we soon found that our customers demanded software along with our hardware. In short, we just weren't equipped to handle the huge volume of new business our terminals had opened up for us.

At first we tried to handle the situation by following the established traditions and procedures that had served Tektronix so well in the T&M business. Information display products was organized as a business unit. Most of our engineering, manufacturing and marketing people came from in-house, and our products were sold by the same people that handled our T&M line.

Hiro Moriyasu

However, by 1970 it had become apparent that if we were to succeed in this lucrative new market, a new kind of business organization had to be created within the Tektronix structure. At that time, Earl Wantland assigned Larry Mayhew, Tek's International Manufacturing manager, the task of organizing and heading a completely new and separate entity, responsible for the design, manufacture, marketing, and sales of information display products. Larry was named manager of the Information Display Division (IDD), and made a vice-president in 1973. In 1975 the name was changed

John Bowne

Howard Mikesell

to Information Display Group, with Larry as group vice-president. All Tektronix products, other than IDG products, came under the umbrella of the Test and Measurement Group at that time. At about the same time, all IDG activities were moved to our new plant in Wilsonville.

If I remember correctly, these changes had some negative repercussions at the time.

A few — and only minor ones. You can't make a sudden break with established ways of doing things without stepping on a few toes; and in some areas we just had to make that break. For example, we found that the decision-making buyers of ID products were a different breed than our traditional T&M customers. They were the innovators, the "computerniks" who were "into" graphics and were able to spend the necessary money for experimentation. These people sometimes belonged to the same company as our oscilloscope customers — but they lived down the hall in the mechanical engineering or the graphic department. Others, like those involved with computer operations in banks, oil companies, and airlines, had never worked with an oscilloscope or heard of Tektronix.

We had to reach these people with our advertising — and the advertising had to be of a kind that would attract and hold their attention. We had an excellent in-house advertising group; but the traditional Tektronix ad, addressed almost entirely to the electronic engineering community, was essentially, "here is the product, here are the specs, this is the price." The formula worked fine with engineers, who needed only to *select a brand*, and who could see from the specs that we were offering a superior product. But it just didn't fill the bill for our new IDG purchaser, who might not know a megahertz from a megohmeter, and probably hadn't yet decided that he needed a graphic device at all! So we engaged an outside agency to handle information display advertising. Naturally this move caused a few "growing pains," but I think our judgment has been vindicated by the results, and that similar conflicts have been largely resolved.

Hasn't the information display group returned to divisional status with Tek's recent reorganization?

Yes, it has. Larry Mayhew is now group vice-president, Operations and Marketing Group, while Howard Mikesell has been appointed general manager of the Information Display Division. Our new organization looks like this (see diagram).

Aside from a change in title, what are the major differences in the new information display organization?

Well, as you can see, we are no longer a "self-contained" unit. We are more integrated with the total Tektronix organization than formerly. Our sales people, for instance, now report to the same management as T&M sales people do.

Isn't there still a lot of interaction between the IDD salespeople and Wilsonville though?

Oh yes. If I were to use dotted lines to show all the informal lines of communication, in addition to the simple reporting structure, the diagram would be much more complicated.

Let's go back to your description of IDD products.

All right. I believe the last terminal I mentioned was the 11-inch 4010 — the terminal that really put us squarely in the information display business. Then came the 4012, which differed from the 4010 only in that it offered lower-case alphanumerics.

IDD products now include computer terminals, hard copy units, interactive graphics terminals, plotters, graphic computing systems, software libraries, and auxiliary peripheral products. (Some recent models are not shown.)

The 4013, our next product, added APL characters. The 4012 and 4013 sold for about a thousand dollars more than the 4010.

Then came the 4014, and the 4015 (with APL) which both had 19-inch storage tubes, using commercial television glass instead of our own ceramic-envelope, flat-glass configuration. It turns out that you can go just so far with a flat-glass front plate on a CRT before you start running into severe strength problems. The 11-inch CRT, for instance, has an amazingly thick flat-glass plate to withstand the tremendous forces created by evacuation of the CRT.

When the plate starts to get about an inch thick, the CRT becomes just too heavy and unwieldy, to say nothing of the extra cost in expensive optical glass. So, by adopting a commercial television tube configuration, we were able to build larger storage tubes and gain the ability to put more information on the screen. (The curved front-plate serves the same function as the architectural arch). We followed up just last year with the 4016, a terminal with a 25-inch storage tube.

And you say all of these are graphics terminals?

Yes.

How does a graphics terminal draw a picture?

It's a simple process, really, especially with a storage tube. Let's say you want to draw a square. First, you'd give the terminal instructions to move the beam (with the electron beam shut off) to X=0, Y=0 (the lower left corner of the screen). Then you'd tell it to draw a line (beam turned on) to coordinates 0,50, say. Then draw to the coordinates 50,50; next to 50,0 and back to 0,0. This would give you a square.

Curves are drawn in the same way, except in much smaller segments, so that the illusion of a curve is produced — the smaller the segments, the smoother the curve.

Have we now covered the complete terminal line?

Robert Keyes

Oh no. So far we've just been talking about storage terminals, and there are a few more yet to be mentioned. We have the 11-inch 4006 and the 19-inch 4081 Interactive Graphics Terminal, which added a minicomputer to the basic terminal configuration.

Interactive graphics? What's that?

Interactive graphics enables the operator to make changes to a drawing without having to rewrite the whole program. Also, operators can move, rotate, enlarge, reduce, and otherwise change the displayed graphics to suit their needs.

This capability calls for refreshed-graphics, of course (otherwise the changed images would overlap); but we were able to combine the refresh and storage techniques in a DVST to gain the advantages of both. That just about covers our storage terminals.

What other kind do we make?

We have a line of raster-scan terminals: the 4023, 4024, the 4025, and our new color terminal, the 4027.

Raster scan? That's another new type, isn't it?

No. The raster-scan terminal works like a TV set. The CRT's electron beam traces a fixed pattern, or raster, on the screen, and you change the beam's intensity (or in the case of a color terminal, color) in order to get the picture you want.

There are three basic types of computer terminals on the market today: dynamic-refresh, storage and raster-scan. As we have already said, the dynamic-refresh terminal is the oldest and most expensive type. It's really tough to make a terminal of this kind under $20,000. The storage type we have already discussed at some length. The third type, the raster-scan terminal, is a significant technology, and is coming on strong.

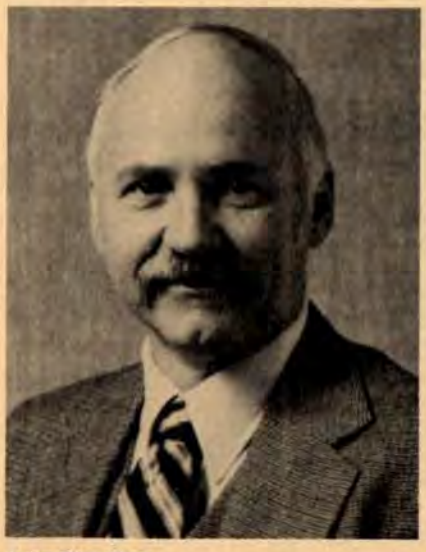
The drawback of the raster-scan system is that a diagonal line must be drawn in adjacent, short segments, giving it a "stepladder" appearance. Also, it takes a lot of memory to store all those points. This requirement made the system quite expensive only a short time ago. But the cost of memory has come down dramatically, making the raster-scan terminal a viable product. You can buy an adequate raster-scan terminal now for about $3000.

Carlo Infante

The chief advantage of raster-scan terminals is that they are more dynamic than a storage tube. That is, they allow you to do things like text editing (changes and deletions, for example) and similar tasks much more efficiently than you could on a storage tube — but at the expense of resolution and high information density.

All right, let's move on to Tek's other information display products. You have already mentioned copiers, plotters and desktop calculators. Will you expand a little on these devices?

Sure — let's take our hard copy units first. Starting out with the 4601, we developed the 4602, the 4610, and more recently, the 4631 and 4632. These are all dry silver, hard copy units whose evolution took place in parallel with that of our terminals. The 4632 is a video hard copy unit with a gray-scale capability that allows it to copy half-tone images, as well as conventional black-and-white figures.



John Stember

Our first plotter was the 4661, which was followed by the 4662 and 4663. The 4663 is an interactive, high-speed digital plotter with a GPIB interface, that uses C-size (17 x 22 inch) paper and offers a number of useful options.

Finally, we have our graphic computing system (GCS) products. Capitalizing on our experience in developing the TEK 31 calculator, we introduced the 4051 Graphic Computing System, which combined computational ability and an 11-inch display in a single desktop unit.

The 4051 was a truly innovative product — the first to implement a microprocessor in the BASIC language. Up to that time, microprocessors had been used primarily as controlling devices for things like jukeboxes and washing machines. But when Motorola came out with their 8-bit 6800, we decided to do a BASIC language implementation of its capabilities. No one had done this before. Now it is commonplace, and forms the basis of the entire hobby computer market.

The advantage of BASIC, of course, is that it is a computer language oriented toward people who work in areas other than computers — easily learned, and adaptable to a wide range of uses.

The 4051 was an instant success and still holds a major place in our product line. Just last year we introduced the 4052, basically the same product as the 4051 but about ten times faster, and the 4054, essentially a 4052 with a 19-inch DVST.

That's quite an array of products. Is there anything else?

Not in the way of major product lines. Of course, IDD offers a number of other peripheral products: matrix printers, file managers, tape recorders, disk drives, graphic tablets and some special OEM products.

Doyle Cavin

And we could spend a lot more time covering our software. You know, we have extensive libraries of software, offering a wide variety of programs and languages, which customers can use to implement their equipment. But as far as hardware is concerned, we've described the heart of our product line.

What about the market for information display products and Tek's position in that market?

The market for information display products, according to recent surveys by business analysts, is growing at the rate of 35% to 40% per year. It is tied very closely to the market for computers — and even the most conservative forecasts for the computer market have a science-fiction flavor. Tektronix holds a significant place in the information display business, and, by continuing our innovation and our emphasis on reliability and service, we should maintain, and even improve, our position.

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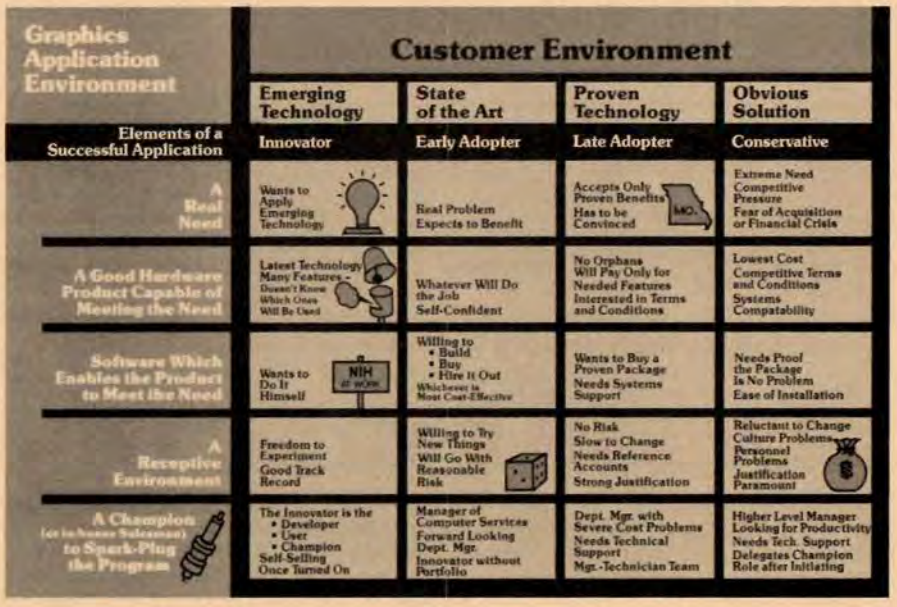
You see, we really haven't tapped the potential for graphic systems that exists today. Let me show you something we use in our seminars around the country to show people what computer graphics is all about. It's a chart called the "Graphic Application Environment" and lists what we call the elements of a successful application of computer graphics. It shows how these elements apply to four different kinds of customer environment, in terms of the customer's attitudes and needs.

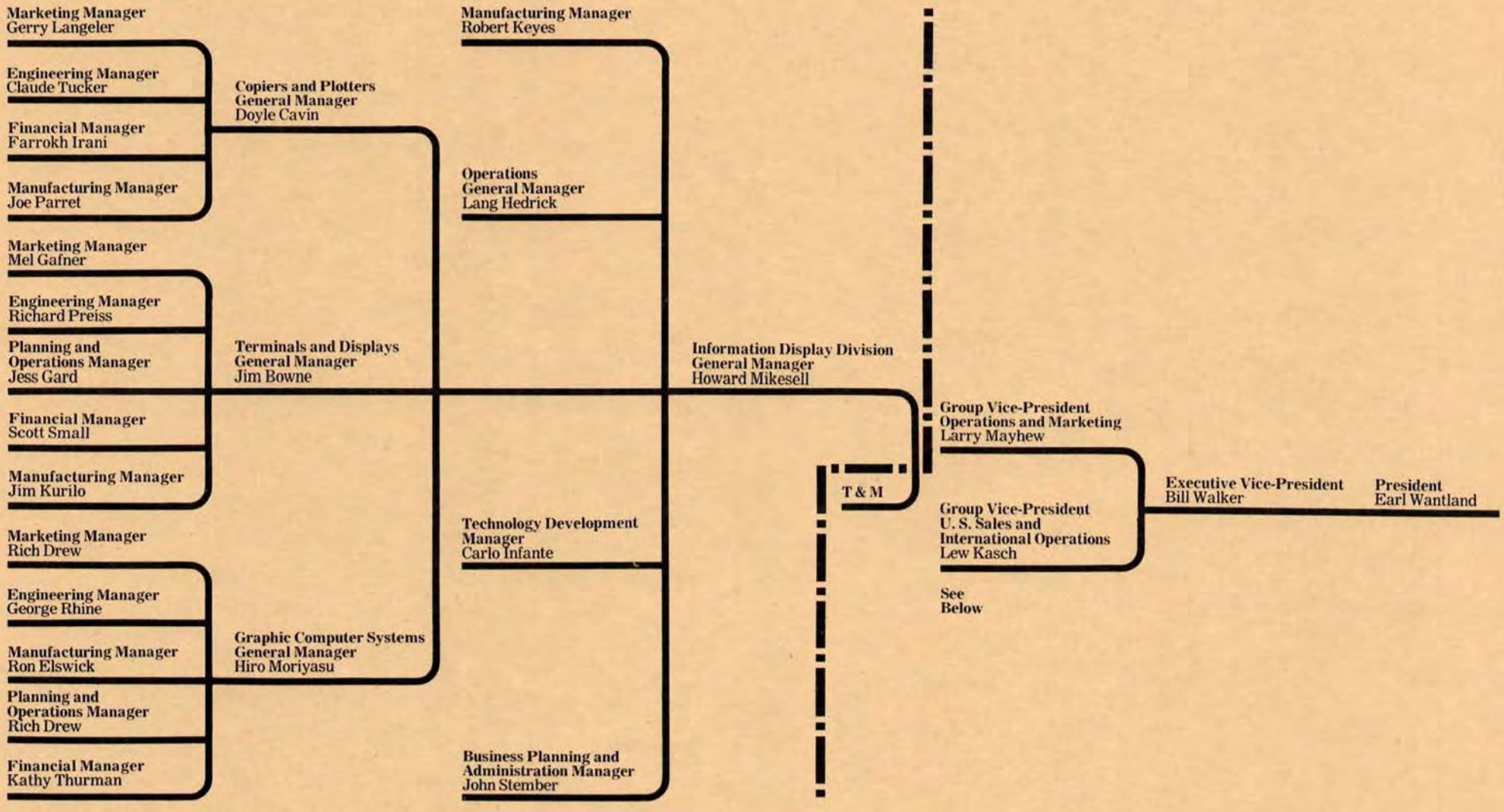
It turns out that when we first started out in this business, we attracted the innovators almost exclusively. Now the innovators are into some bigger and better things, and we have had to move in on the early adopters. We have been very sucessful here, too; because these people are very aggressive in seeking out new ways to solve their problems.

Now we have to tackle the late adopters — and this means some hard selling. And then we still have the conservatives, mostly business people, and still tougher customers. So we really have our work cut out for us; but the potential rewards are well worth the effort. ■

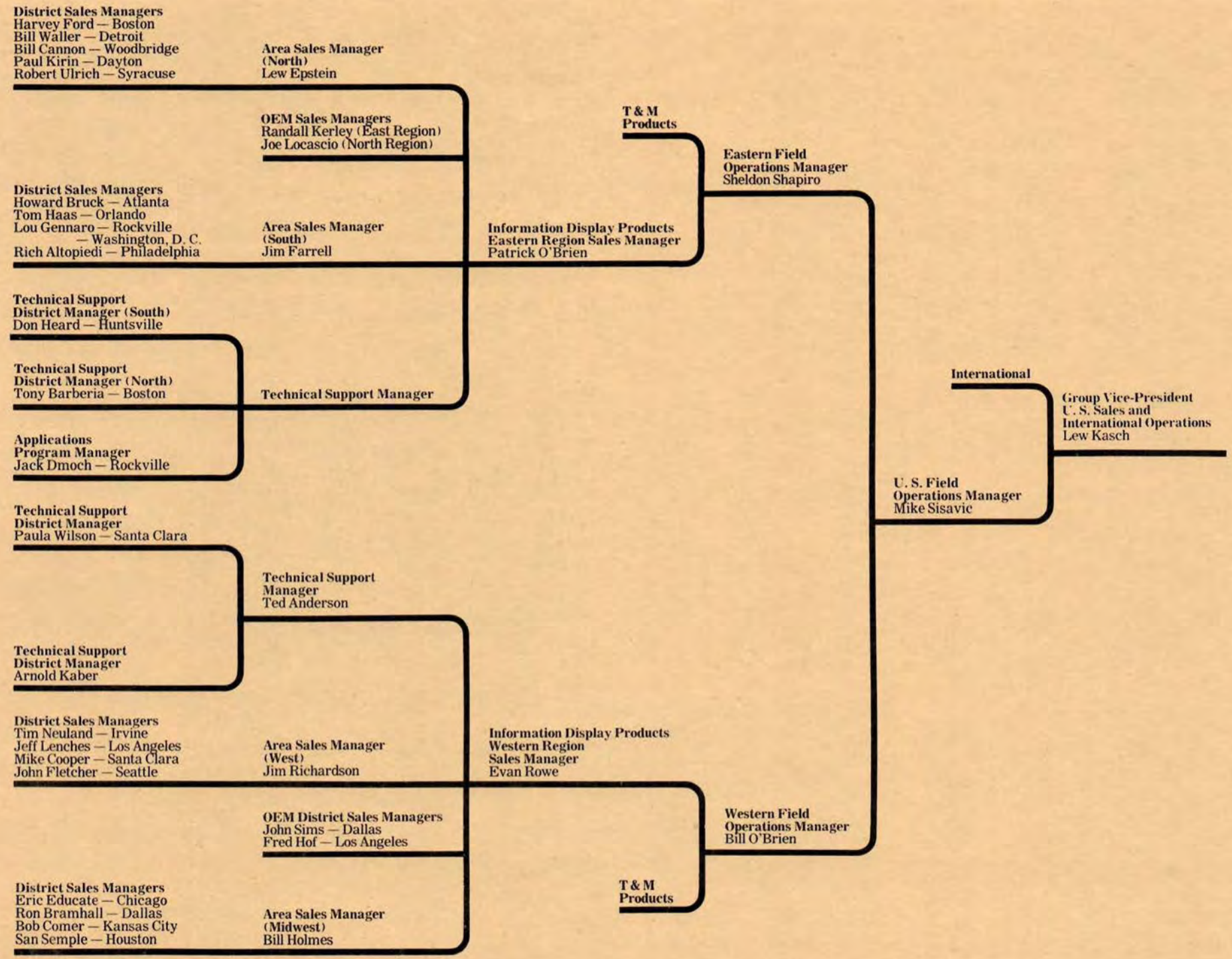


The majority of IDD sales first went to innovators, the least cost-conscious and most receptive customers for new technology. Early adopters, very aggressive in their search for problem solutions, came next. Late adopters and conservatives, potentially the largest markets, are still largely untapped and present the greatest challenges.

How IDD is organized



How IDD is organized. All functions left of the dotted line (above) reside in Wilsonville. IDD sales organization (below) retains its identity, but is now integrated with T & M Sales under central management.


District Sales Managers
Harvey Ford — Boston
Bill Waller — Detroit
Bill Cannon — Woodbridge
Paul Kirin — Dayton
Robert Ulrich — Syracuse
Area Sales Manager
(North)
Lew Epstein
OEM Sales Managers
Randall Kerley (East Region)
Joe Locascio (North Region)
T & M
Products
Eastern Field
Operations Manager
Sheldon Shapiro
District Sales Managers
Howard Bruck — Atlanta
Tom Haas — Orlando
Lou Gennaro — Rockville
— Washington, D. C.
Rich Altopiedi — Philadelphia
Area Sales Manager
(South)
Jim Farrell
Information Display Products
Eastern Region Sales Manager
Patrick O'Brien
Technical Support
District Manager (South)
Don Heard — Huntsville
Technical Support
District Manager (North)
Tony Barberia — Boston
Technical Support Manager
Applications
Program Manager
Jack Dmoch — Rockville
International
Group Vice-President
U. S. Sales and
International Operations
Lew Kasch
U. S. Field
Operations Manager
Mike Sisavic
Technical Support
District Manager
Paula Wilson — Santa Clara
Technical Support
Manager
Ted Anderson
Technical Support
District Manager
Arnold Kaber
District Sales Managers
Tim Neuland — Irvine
Jeff Lenches — Los Angeles
Mike Cooper — Santa Clara
John Fletcher — Seattle
Area Sales Manager
(West)
Jim Richardson
Information Display Products
Western Region
Sales Manager
Evan Rowe
OEM District Sales Managers
John Sims — Dallas
Fred Hof — Los Angeles
Western Field
Operations Manager
Bill O'Brien
T & M
Products
District Sales Managers
Eric Educate — Chicago
Ron Bramhall — Dallas
Bob Comer — Kansas City
San Semple — Houston
Area Sales Manager
(Midwest)
Bill Holmes