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DISPLAY NICHES

THREE PATHS TO PIXEL PROFITS



EASYUPSELL

M-AUDIO
PODCAST FACTORY



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DISPLAY THREE PATHS TO



NICHES

PIXEL PROFITS

Monitors are like French fries. Get off the fast food circuit and you can find some pretty good fries out there with fancy spices, special sauces, and so on. But most of the time, you just get the ordinary fries that come with the burger, same as everybody else. Add a little salt on the fries, get a little faster refresh rate on the screen. Maybe the contrast or backlighting is a little better on one model versus another, any maybe Wendy's tends to undercook their taters versus McDonalds, but at arm's length they all kind of look the same.

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In general, monitors are so commoditized that nobody makes more than a few bucks on them. You bundle them with PCs because you have to. Some opportunities pop up for higher-end displays from the likes of LG and Samsung, and there's a little more margin here, but you're still fighting against the fleets of retailers and e-tailers offering the same thing.

So should we all resign ourselves to a life of greasy, low-margin mediocrity in the display space? Not even. As with most commodity categories (and life in general), 80% of what's out there is a waste of time. The challenge is to keep your eyes open for the niches in that remaining 20 percent. We've been doing exactly this, and we have three display niches to recommend if you're looking to differentiate your offerings from the herd while taking a big leap up the margin ladder.

Ready? We think you'll find these prospects quite tasty.

THINK BIG WITH DIGITAL SIGNAGE

Digital signage is the art and science of putting multimedia content on display in a public venue, usually "narrowcast" over a network of some sort. These days, digital signage has become so pervasive that we often don't recognize it for what it is. For example, every time you watch that 20-minute collection of trailers, "news," and product promotions preceding the movie at theaters equipped with a digital projection system, that's signage. The content is often piped in via satellite.

Airport reader boards are the big example of digital signage everyone cites, but what about flat panels running combo meal images in mall food courts? That's digital



Now Showing. Digital signage excels in places with high foot traffic where people are prone to pausing for a moment. Signage can be informative, but a mix of information with advertising is popular with businesses.

signage. Kiosks in drug stores? Signage. That dream vacation loop playing on the plasma screen in the travel agency shop? More signage.

Digital signage is everywhere, and its growth rate leaves regular display sales in the dust. According to Doug Albrechts, vice president of sales and marketing for NEC Display Solutions of America, digital signage is seeing 35% year-over-year growth versus only 3% to 4% for the overall display market. Industry analysis house DisplaySearch noted a 44% jump in large flat panel displays for commercial use in the fourth quarter of 2005, assisted by a 56% hike in the quarter-over-quarter shipments of plasma public displays. From 2005 to 2010, DisplaySearch expects a 46.3% compound annual growth rate for 26" or larger flat panel public displays worldwide. Behind each of these displays is some sort of signage programming, much of it being piped in from outside the business using the display. Some specialist resellers have been in this field for almost two decades, but most of the industry is only waking up to the potential of signage and narrowcasting now. The good news is that the digital signage industry is still getting off the ground and may not have even hit its true growth phase yet. Most installations have been in large businesses. Resellers can now sweep in and bring signage benefits to SMBs.

In the lowest-tech instance, you could install a 24" LCD screen on a storefront wall, cable it back to a PC in a nearby room via any sub-\$100 DVI/VGA-to-USB or -coax cable, and have the PC pump out an advertorial PowerPoint presentation or even a looping video some employees threw together in Pinnacle Studio. Think about it. You could profitably install such a setup for under \$2,000 (under \$1,500 if using a PC already deployed for another low-bandwidth task), and the customer now has a marketing solution vastly more engaging than any normal endcap display could ever hope to be.

From this point, creativity kicks in. What if you have that PC power two LCDs on opposite sides of the showroom? What if each display shows a different content stream pertinent to the products near it? What if you show the customer how he can get his signage installation subsidized through co-op marketing funds provided by the manufacturers featured in his signage content? What if he gets so jazzed by this idea that he wants come up with new content every quarter or month and he wants you to handle the creation of it? Beyond that, what if the customer wants to focus on doing his job and instead puts you in charge of hosting and distributing the content you feed to his screens over the Internet? And if you run a highly mobile reseller operation, wouldn't it be advantageous if you could perform this signage management remotely from any location in the world?

I can read your mind. You're thinking, "That is the coolest thing I've contemplated since...maybe ever. But I'm not set up to do all that stuff. I don't have the knowledge or appropriate personnel." Too right. The biggest prob- ▶

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Monolithic Results. Far more than a white metal slab with a built-in screen, advertising displays such as this one, showcasing an NEC Display panel, are designed for maximum durability in very public environments.

lem with digital signage and the reason so few resellers are involved in it is the relative complexity of implementing a narrowcasting network. Fortunately, help has arrived.

"If you look at the data for the last eight months, a lot of the opportunity for sales in the display market right now is in digital signage," says NEC's Albregts, "especially on large displays and high-end SKUs with a lot of value-added features. But we realized that one of the missing components there was the expertise to talk beyond the display, addressing the other hardware and software components that are part of digital signage beyond the display. Resellers need a partner network to facilitate this and act somewhat as a general contractor.

"That's been our challenge over the last two years. We don't want to just sell the panels. We provide services ranging from consulting to hardware to software to third-party products including wireless or kiosk applications. Historically, this has been out of the realm of capability for most resellers. They're getting asked by customers how to do these things, and they're not sure where to turn. We can interact with them and general contract and educate them on the entire signage process all the way out to delivering content to the displays."

To the best of our research, NEC Display is the only manufacturer in the industry offering a total end-to-end opportunity for resellers wanting to get into signage. Consider the steps involved in a narrowcasting implementation: the display system, a PC (or several) to drive the displays, custom cabinetry construction, in-wall installation and cabling, content creation, content transmission, content manage-

ment, logging and reporting, financing, on and on and on. Signage jobs can run anywhere from \$1,000 to \$1 million or more, and the complete solution often involves one to two dozen contractors. Even the largest, most specialized resellers find it difficult or impossible to keep every aspect of a digital signage job in-house. NEC has taken the unique action of finding the right partners to fulfill all of the steps in the signage process, aggregating them, and helping resellers to win business by focusing this array of diverse professionals on each specific job opportunity.

Some aspects of digital signage are obviously more compatible with system builders than others. VARs may wish simply to buy and mark up specialized display PCs (NEC, for example, has machines designed for this task), but system builders can keep some extra margin by doing the configuration work themselves. In fact, if you consider the small form factor coverage we did in *RAM* last month, you can see how customers might gravitate to mobile-on-desktop or other small form factor designs able to offer high resolution video to multiple displays with low power consumption and essentially no noise. This becomes particularly pertinent if a signage implementation involves the construction of interactive kiosks.

Albregts notes that most narrowcast content gets outsourced by the customer. This is why resellers with expertise in multimedia creation tend to do better in signage. Slide presentations and even still photos are not uncommon in this space, but the old maxim about getting what you pay for holds true here. Signage is a contest to capture eyeballs, and the more compelling and persuasive you can make a customer's content, the better the ROI he'll see on the investment. Again, consider the 20-minute pseudo-infomercials that now run in front of digitally projected movies. Two years ago, we were all munching our popcorn while ignoring the looping on-screen slide shows. Now, even if we hate the idea of watching commercials, those 20-minute segments grab your attention and don't let go. That's signage at its slickest and best.

Naturally, NEC is not the only display manufacturer around involved in this space. However, we lean toward the company because of its long-term commitment to the niche, both in fostering a sales channel as well as optimizing its highly regarded products for signage deployment.

"We build very intensive technologies that allow us to run our displays in a signage environment," says Albregts. "For example, take tile matrixing, where you can grab 25 LCDs and make a 5 x 5 video wall out of them. You can put different images on each screen or one image on every screen to create an overwhelming video. We have Cable-Comp, which allows you to run cables for up to 300 meters without any signal degradation. Our NaviSet allows you to control an entire network of displays and troubleshoot any one of them. So if you've got a regional rollout with three or four NEC displays in 16 different locations, the company managing that network has the ability to see what ▶

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content is on each display based on our software. It can tell you if the display is on so you don't have to go out to the location and look. Also, from a compliance standpoint, it can tell you exactly what content was on the screen at what time, which is very persuasive proof if a customer is ever audited."

Due to the custom nature of signage installations, many jobs will require custom software written precisely for a customer's needs. That said, there are some out-of-the-box solutions available that can prove quite flexible. One example would be Harris' Inscribe InfoCaster (www.infocaster.tv). InfoCaster SKUs include InfoCaster Workstation, which on its own can fuel signage in a single location, to Workstation plus Network Manager and Player, which can power a global network of displays all showing different data streams anywhere. InfoCaster lets content managers combine and animate multiple data sources in an easy, template-driven format attractive enough for any venue. You might also check out Scala's InfoChannel line (www.scala.com), which works similarly to InfoCaster but puts even more emphasis on design and reporting capabilities.

Still, out-of-the-box can only get you so far. If a customer wants a system that can dynamically update inventory levels shown on store displays, for example, that's some serious custom work. Or in a similar vein, a retailer might want a signage system that could automatically change content based on other factors. If the signage campaign launched on Monday aims to sell Guess jeans and it proves so effective that stock runs out Wednesday, you want a signage



DIY Narrowcasting. Looking to turn signage into a revenue stream? Check out some of the off-the-shelf packages like InfoCaster that let you create attractive signage loops ready for distribution.

system smart enough to switch to alternate advertising while the store waits for its next jeans shipment the following week.

Another part of the value you can offer signage customers is advisory. A client's first impulse might be to run a video loop of the store manager near the checkout line where patrons are more or less stuck watching. But if the content entails a call to action, such as picking up another product, then the signage is asking patrons to leave their place in line—which they probably won't. Moreover, short content loops may prove so annoying to checkout employees that they may sabotage the system. Placement of displays is critical, and content needs to be engaging enough to draw in viewer attention but diverse enough to keep those eyeballs coming back. In short, a smart signage installation requires a fair dose of marketing savvy, and if your customer isn't up to providing those skills, then perhaps you'll need to fill in.

One potential pitfall in signage is underestimating the required resources. For example, if a client wants five screens each at ten locations, and each screen runs different content sensitive to its store location, you're talking 50 content streams. Each stream may entail a 1GB HD video file, so we're up to 50GB. Fifty gigs is no big deal when it's on your hard drive, but getting it there is the trick. Improperly designed narrowcast deployments can make content updates feel like a denial-of-service attack on the network. (It's no coincidence that tons of narrowcasts are still conducted by a content manager walking a burned DVD into a back room PC.) Moreover, money-saving tricks up front, such as opting for a one-way satellite downlink to a large customer rather than a two-way link, may come back to haunt you since you'll have no way to prove how and when ads actually ran on-screen.

If you're a small reseller focused on helping small businesses, the signage arena may sound a bit overwhelming. That's OK. Tackling a multi-regional signage job may be biting off more than is advisable right out of the gate. But consider the market. In 2003, iSuppli/Stanford Resources predicted that "retail dynamic displays" would grow 300% from roughly \$550 million to \$1.5 billion by 2008. And we've seen over and over in this industry how high-end technologies inevitably trickle into the mainstream. (Think RAID or Gigabit networking or, more pertinent to this context, large LCD screens.) Manufacturers agree that this past 12 months has marked the first time that small businesses have showed serious interest in digital signage. A single-location outfit may not need such displays, but once you have two or three outlets, the benefits start to become too compelling to be ignored. Local health- or whole food-oriented grocery stores are now rising in popularity, for instance. Consider the possibilities of signage, especially interactive kiosk signage, that could educate otherwise uninformed shoppers on the benefits of organic or naturopathic products.

As mentioned above, digital signage projects may easily

run into the tens or hundreds of thousands of dollars—more than most resellers will want to float from their own pockets. This is one more area where NEC has made arrangements to facilitate sales.

“I can’t stress enough what a tremendous value financing is to VARs,” says NEC’s Albregts, “because if someone wants to roll out a digital signage network, even if it’s three or four locations, they may not want to spend the up-front costs. It may be out of the scope of their IT budget, or even if it’s not out of the scope of their budget, they don’t want to tie up their cash. Most VARs don’t feel comfortable financing that kind of a deal, so we offer that as a pass-through option for those integrators. If it’s \$100,000 over six locations, NEC can help a VAR finance that on behalf of an end customer.”

More important than any other message we’ve been hearing about digital signage is the fact that resellers are fielding many more queries than ever before from customers, but most resellers have no idea how or what to reply. This is the time to learn. Modest signage jobs are within any competent reseller’s reach, and the more savvy you get with partnering in this space, the bigger the jobs you’ll be able to take on.

CASE IN POINT: FRIENDLYWAY

Founded in 1998, friendlyway (www.friendlywayinc.com) is one of the U.S.’s largest interactive kiosk resellers and presently has display systems posted in over 100 of the Fortune 1000. Company CEO Alexander von Welczeck notes seeing a convergence going on between self-service kiosks and digital signage. The company has a couple of products



A-List Returns on a B-List Budget.

Careful panel placement can not only promote return business but also increase impulse buys. “Sure it costs ten bucks,” your subconscious thinks, “but doesn’t that popcorn in the video look yummy?”



Building the Wall. One of NEC’s many areas of signage expertise is in facilitating “video walls” in which several panels are tiled into a jumbo display. Content might be different in each screen or one image could be spread across all screens.

that address this, most notably the welcome and impress systems, which have larger displays. The impress, for example, comes with displays of up to 40 inches currently.

Another crossover trend von Welczeck sees developing is the use of “topper” or “slave” displays. The best example of this, again, is the impress system, which embeds a large, portrait-oriented touchscreen at roughly chest level, then another non-touch display above it more or less higher than eye level. Such topper screens currently run up to 32 inches and are meant to display signage content while the primary screen acts as a welcome or registration interface.

As you might expect, kiosk implementations are no less tricky than “regular” signage deployments. You still have screens built into custom cabinetry wired to PCs that get fed narrowcast content. The big difference is that kiosks usually have touchscreens and more interactive software.

“Our software has three parts,” says von Welczeck, “and we had to design it in-house at our European sister location. The first part is the Secure Browser, which allows for front-end lock-down on interactive devices. Secondly, there’s the Composer environment, which is a desktop creation tool that helps one rapidly create digital signage for self-service applications. And the third is called the Client Manager, which allows you to set up networks of systems and manage them and narrowcast to them. Plus there are some reporting features.”

Interestingly, the Wi-Fi Alliance sees kiosks as one of the fastest-growing segments in the wireless services sector. This works two ways, since not only does Wi-Fi eliminate the headache of cabling back to a PC for narrowcast data but it can also serve as an access point for custom- ▶

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An Upstanding Solution. The friendly-way van is a touchscreen kiosk designed to blend advertising with customer service. Options include keyboards, printers, and barcode scanners, but it's the kiosk software that matters most.

ers. With 802.11n and possibly upgradeable "draft-N" gear coming out soon, this would be a great chance to upgrade clients' wireless networks while also addressing kiosk and signage needs.

Friendlyway only installs LCD screens, which is common throughout the kiosk and signage world. Even in environments in which video is played continuously, thus allaying any burn-in worries with plasma, LCD is about 2.5X more power-efficient than plasma, which is no small concern for large devices designed to run from 12 to 24 hours per day. (Also consider that a 24 x 7 device is likely to need upsells such as uninterruptible power supplies and possibly fail-over PCs.) On the other hand, plasma still has a lower cost of entry in larger screen sizes, which helps explain the 56% jump in commercial plasma shipments alluded to earlier.

Additionally, Friendlyway derives a sizable chunk of its revenue from kiosk rentals as well as professional services including program planning, user training, regulatory compliance consulting, and focus group studies. Smaller resellers may need to do some homework to find providers for such value-adds, but being able to offer these items to signage customers can make the difference between a decent one-time sale and a lucrative, ongoing revenue stream.

Ultimately, the biggest persuader in the kiosk business is ROI. Kiosks excel at reducing unnecessary expenses, whether that entails staffing humans at an information desk or having to keep printing pamphlets over and over for lobby handouts. Naturally, kiosks can never replace an informed, creative, helpful employee, but they can definitely assist in streamlining and optimizing a company's human

resources.

"Go to technologyport.com," says von Welczeck. "We recently enabled them for a self-service kiosk and digital signage program for the state of Pennsylvania. These systems are essential virtual visitor centers. So in lieu of having two or three physical centers throughout Pennsylvania, in the future they'll have more than 40 via interactive transactional kiosk systems that actually combine digital signage, as well. They each have a 32-inch topper screen that allows for information, advertising—content that supports the virtual visitor center."

TAPPING INTO TOUCHSCREENS

Kiosks segue nicely into touchscreens, our second hot niche in the display market. If you've been to a restaurant recently, you've probably seen touchscreens in action. In fact, hardly any POS systems are now in development that don't use touchscreen technology. Most new ATM machines are touch-based. Street of Dreams-style houses are rife with touchscreens for home automation. Many podiums in lecture halls now integrate touch monitors for controlling presentations. This author's dentist installed a touchscreen system in every patient area as a more efficient way for workers to access patient data while wearing gloves and/or holding instruments. The touch market is everywhere now.

Data from Planar Systems (www.planar.com), an Oregon-based LCD monitor and touchscreen manufacturer, notes that the 2003 market for touchscreens in the U.S. was \$265 million, but annual growth for 2005 and beyond was projected at 30% in the retail segment alone, which accounts for only 40% of the overall touchscreen market. (Surprisingly, gaming comes in second at 25% market share. Historically, touch in gaming has meant casino machines and the like, but don't forget that the Nintendo DS is touch-based, too. You're not likely to see much revenue from gaming handhelds, but you may yet get a piece of that market in the form of smart convergence devices.) According to Bill Nulf, director of channel sales for touchscreen industry leader Elo TouchSystems, channel business for Elo has more than doubled in the past three years, and that's only with selling through four specialty distributors, ICG (www.icg.com) being chief among them.

Many touchscreens have specially modified enclosures that help them to be spill-proof, and you can probably think of several applications off the top of your head (from kitchens to manufacturing lines) wherein liquid resistance would be desirable. Then you have the additional cost of the touch technologies—different metals, transceiver parts, and so on—and suddenly it makes more sense why touchscreens cost significantly more than their regular LCD counterparts. Whereas a conventional 17" LCD monitor might cost well under \$200, expect 15" to 17" touchscreens to run anywhere in the \$400 to \$800 range, with the lower end usually employing resistive technology. ▶

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As opposed to digital signage, though, price is much less of an entry barrier. It's easier to demonstrate ROI from increased transactions rather than ambiguous increases in revenue from advertising. As such, touch is quickly becoming (or perhaps has already become) the operator input of choice in retail, fine dining, and fast food, which are all particularly focused on checkout transaction speeds. You may not have the ability to penetrate touch systems into major restaurant chains (they'll likely be running such systems already), but local-level chains are still prime candidates.

"For touch applications, the big verticals are still POS, hospitality, and retail," says Elo's Bill Nulf. "After that now is probably medical—portable pharmacies, check-in counters, things like that where you combine lots of people standing with a need for screens that are quick and easy to clean. Number three, gaming is getting really big, too—casino gambling, slot machines, bingo, that kind of stuff. We're also seeing uptake in process controls, fabs and manufacturing. Texas Instruments, for example, used to have stuff hanging off their machines. Now, they just do it all with our touchscreens. Airline control—not necessarily in the cockpit, but cabin control for turning all the movies on, lights, stuff like that is now driven by touch. And home use even—people hooking it up and driving their security, lights, stereo, etc.—is getting really big."

Dell caused some waves relatively recently by entering the touch market with a single resistive technology 15" SKU priced under \$500. (Most name brand 15" touchscreens start with a street price around \$550.) On some occasions, Dell's part even hit as low as \$350. Elo's Nulf



An Easy Touch. Long a pioneer and leader in the touchscreen market, Elo TouchSystems offers a full spectrum of touch-sensitive panels, from the value-oriented 1515L (pictured here) to all-in-one, option-packed touchcomputers.

notes that this admittedly decent quality unit stole some market share in the beginning, but the end result was that the low entry point served to increase awareness of and interest in touchscreens sufficiently to lift the entire market, thus boosting business for everyone, particularly in the 5- to 10-user account segment.

The kicker with touchscreens, of course, is application software. You can't very well walk into a business, push for a touchscreen sale, and then not offer the customer an application to make use of the hardware. When we started looking at the touch industry in 2002, resellers were usually forced to partner with ISVs in order to tailor unique solutions for each customer. Thankfully, the rise in the touch market has spawned considerable vendor interest in off-the-shelf solutions.

"There is always enough software now," says Nulf. "There are so many ISVs out there, it's just not a problem. I mean, if you want to do a pizza place, go to the Web, and you'll probably find your choice of ten reputable software packages. Maybe they'll need a little customization, maybe not. At the low-end of the business, some older systems can be converted to touch just by installing new hardware."

System builders will likely be inclined to purchase touchscreens and tie them to their own small boxes. Small businesses in particular may prefer this route because of the potential cost savings. However, businesses wanting to project more of a sleek image may want to dispense with the cabinetry or visible cable clutter associated with separate PCs and touchscreens and instead opt for an all-in-one "monoputer" or "touchcomputer" such as Elo's 1529L. The 1529L is based on a 15" touchscreen, fanless 1 GHz VIA Eden CPU, 512MB of RAM, and Windows CE, 2000, XP Embedded, or XP Professional. Options include an integrated magnetic strip reader and a rear-facing vacuum fluorescent or LCD display for customers. A PCMCIA slot provides for wireless connectivity in addition to the integrated 10/100 port. Resistive, infrared, and surface wave touch technologies are available. End-user pricing generally starts around \$1,500, so you can see that system builders do have the ability to provide a strong supporting PC, even in a Mini-ITX form factor, plus 15" touchscreen for well under that price level.

That said, Nulf notes that all-in-one sales are showing marked acceleration as of late. The compact design and numerous mounting options of well-crafted touchcomputers carry their own inherent value. The Elo 1000 Series in particular allows for considerable flexibility for customers who may need to upgrade to full functionality in stages. The model can be sold without the integrated computer, and even touch capabilities can be stripped out and added later via screen attachments and a discrete controller.

"Resellers just need to start by asking the touch question," says Nulf. "Are they calling on any small ma-and-pa restaurants or hospitality-type customers? That's the ▶

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easiest entry. Then secondly, if they're doing any supplying into hospitals or the medical field, that's another way to step in easily. If you're supplying a dentist's office, dentists now use touch for check-in or going through patient records, etc. Obviously, a reseller isn't going to bag Costco. That kind of thing goes through an IBM or NCR. But there's plenty of regional business, and I can see that in ICG's numbers. Resellers are starting to come onboard with touch technology."

As you consider your customer base or even wander through your everyday life, look for places where lines of people appear. Would kiosks or self-checkout machines help? Anyplace where mouse usage is awkward, there's a touch technology opportunity because touch will enable better business flow and higher customer satisfaction. And there are plenty of more creative applications, such as using touch systems to conduct surveys a la TouchPoll's solutions

(www.touchpoll.com). Of our three niches, touchscreen sales is the most mature, but the opportunity among small businesses is still in its early stages. Now that panel and system pricing has dropped so far in the last couple of years, companies that might have been hands-off about touch in the past should now be more receptive.

MULTI-MONITOR MANIA

Ironically, when we at RAM sat down to plan this article, multiple-monitor deployment was nearly an afterthought. Little did we understand or appreciate at the time that this particular niche is without question the most accessible to resellers of any size as well as being the largest in terms of volume opportunity. And not just the largest by a pinch. We mean a gaping, mind-numbing chasm.

Unlike signage and touchscreens, multi-monitor is something virtually any user can find value in—corporate ▶

INSIDE TOUCHSCREENS

Touchscreen technology was invented in 1971, long before GUIs came into vogue but just after Douglas Engelbart's invention of the mouse the preceding year. Without GUIs as a popular paradigm, touchscreens were very difficult to pull off, although once mice became popular, everything fell into place. In essence, touchscreen technology was an effort to replicate the mouse's benefits without the desktop peripheral, complete with special commands based on double-clicking/tapping, object dragging, and so on. Early designs used infrared technology, but over time five primary touchscreen technologies evolved.

Infrared. The earliest touchscreens used an array of infrared light transmitters and receivers, passing beams right above the plane of the screen glass. If a finger or other object blocked a particular beam intersection, the system could translate that coordinate into an on-screen cursor location. Another infrared method evolved later that registered changes in surface resistance caused by the increased temperature under a warm fingertip. Of this latter technology's several shortcomings, the risk of cold hands was a big one.

Surface wave. This is essentially the same principle as the original infrared approach, only here ultrasonic waves are used in place of infrared beams. Surface wave systems work well in clean environments, but they are prone to signal disruptions caused by dirt and such on the monitor's glass. When unobscured, though, surface wave can yield accurate resolutions of up to 4096 x 4096.

Capacitive. If you've used a mouse pad in a notebook in the last many years, you've experienced capacitive tech-

nology. Two layers of electrical conductor grids create a surface electrical field. The electricity in the human body has the ability to distort this electrical field, which is why your fingertip works on a mouse pad and a piece of plastic does not. Some systems require that a conductive device be held by bare fingers.

Resistive. Resistive panels are coated with a conductive and resistive metallic layer that registers a current change at the point of contact with any object, whether that object is conductive or not. PDA screens are generally resistive. Elo TouchSystems calls its own spin on resistive technology Five-Wire. Like capacitive screens, resistive panels are tolerant of dirt and weather elements. However, resistive screens tend to have less clarity and are more prone to damage through scratching than capacitive parts.

Dispersive Signal Technology (DST). Developed by 3M, DST places sensors on the backside of the glass panel. When an object touches the front side's surface, mechanical energy is created in the form of waves traveling through the glass. The sensors detect and interpret the source point of this energy and pass it to the computer. Whereas all other touch technologies rely on the distortion of a field on the panel's exterior, DST has no such reliance. DST panels don't care about capacitance with a conductive finger or stylus, they tend to be brighter and sharper than other touch displays, and they remain accurate in the face of dirt accumulation, weather, scratches, and other conventional touchscreen enemies. 3M Touch Systems last year launched a version of NEC's 4010 40" LCD display enabled with DST.

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or consumer, it doesn't matter. And unlike many desktop enhancements, the primary benefit here is not about useless eye candy or improvements in gaming. (In fact, only a small minority of games are designed to make proper use of more than one monitor.) The bottom line with multi-monitor is about fundamental productivity gains. When you spread a desktop across two or more screens, you can see more, toggle windows less, make clearer decisions, and accomplish more work in less time.

Scientific studies proving this point are still rare, but the evidence is starting to accumulate. The first major finding was in a study conducted in 2003 by NEC-Mitsubishi, ATI, and the University of Utah called "Productivity and Multi-Screen Displays." The results stated: "Participants in the study considered multi-screen configurations significantly more useful than single screens and preferred multiple monitor setups on every measure of usability. They found them 29% more effective for tasks, 24% more comfortable to use in tasks, and found it 39% easier to move around sources of information."

Next up is a series of more recent studies conducted by the Visualization and Interaction for Business and Entertainment (VIBE) group within Microsoft Research, which created a 42" widescreen display with 3072 x 768 resolution—essentially three side-by-side XGA screens blended into one curved Plexiglas sheet. Microsoft's investigation found that users' productivity increased anywhere from 9% to 50% depending on the application or activity.



No More Slouching. Nobody argues that multi-monitor displays can enhance productivity, but be careful about ergonomics. Ergotron recently debuted a line of stands capable of easily raising screens up and down to best match the height of each user.

Moreover, the group discovered that a broader display field can improve the user's memory. "There's something about engaging the peripheral vision that improves your spatial memory of what has gone on," noted one Microsoft researcher. Investigators were also surprised to find that women achieve greater spatial recognition and navigation improvement than men from a larger display field.

Jon Peddie Research also polled several thousand people on many aspects of multi-monitor adoption and usage.

"We did a study on efficiency gains from multi-monitor use," notes company president Jon Peddie, "and the gains ranged from 0% to 100% or more. The overall standard deviation settled in around 25% to 30%, and this is for users of everything from everyday productivity programs to high-end graphics packages. This is why I cannot understand why the monitor guys are not all over this. They see the same data you and I do, yet they don't seem to push multi-monitor usage for some reason."

By and large, we would agree. When's the last time you saw a manufacturer or distributor mount an ad campaign based around multi-monitor benefits backed by a discount bundle? Tour the major monitor manufacturer sites and you'll be hard pressed to find so much as a case study on multi-monitor, much less a white paper or dedicated site area. Not until we stumbled across a dual 19" NEC LCD setup on an Ergotron stand bundled with an NVIDIA Quadro NVS 285 (more on these items below) at CDW for \$1,169.95 did we find one smart exception to the rule.

NEC Display, seemingly the much-needed innovator in the business display world, did offer us one case study regarding Software Spectrum, a multi-national IT services provider. Software Spectrum outfitted 500 employees worldwide with dual-monitor setups. Customer service reps immediately reported a minimization in scrolling, navigation, and printing necessary in order to view pertinent customer information. Customer hold times went down, as did printing costs, productivity went up, and there was no negative impact on labor costs. NEC's case study also notes that Forbes.com experienced a 50% drop in editorial production times among copy editors who adopted dual monitors.

Irresistible, right? Every customer should want one...or two or three. You would think so. But the question is: Why is there so little multi-monitor demand?

"There's a whole lot of ignorance and stupidity going on with regard to multi-monitors," says Geoff Amthor, president of Digital Tigers, one of the leading manufacturers of multi-monitor solutions. "Anyone who's ever used it will never go back. It's like you walked in and your IQ jumped 20 points. What you can conceive in your mind you can now see better, and you're not so much like a dog chasing its tail jumping around from place to place.

"So what's the market for multi-monitor?" Amthor continues. "Well, it's everyone. If you think when you use a computer, if you're not like a teller just pounding out ▶

[DISPLAY NICHES]



Seven Screen Stunner. Digital Tigers is one of the industry's best multi-monitor solution vendors, as this Zenview Arena Elite indicates. Financial traders are the backbone of of many-screen sales, but the market is quickly widening.

some rote activity, you're the target market. Seventy percent of computer users should be using multiple monitors. The reason that's not happening is not rational. It's not economic, because people have the money to do this. So any kind of market projection is merely guessing at the question of when are people going to stop being stupid. When will the light reach their brains? I mean, Forbes recently did a piece on Bill Gates, and they showed him in his office with three monitors, and he's like a kid in a candy store going on about the productivity benefits of this. And I'm like, man, what took you so long? We've been doing this for over ten years! I don't know why it didn't occur to him sooner. I don't know why it hasn't occurred to everyone. Our competitor is not Dell; it's ignorance."

Seventy percent of users perhaps should be using multiple monitors, but, according to Peddie's study, only 32% of users polled actually do. (That number rises to 41% among road warriors.) Moreover, Peddie estimates that less than 3 million currently operational systems, or under 3% of all systems in use, are equipped with multiple monitors. Those two sets of statistics may seem to conflict, but remember that, among other factors, a user might have four or five PCs but only outfit one of them with multiple displays.

"We asked the people in our survey if they used multiple monitors," says Peddie, "and for those who didn't, we asked why not. They told us it was too expensive, no desk space, too complicated. On some occasions, I even asked people, 'Did you know you could do this for free if you just buy a monitor?' And they all said, 'Uh, no. Nobody told us that.'"

In fact, nearly all PCs built in the last seven years, laptops included, are capable of running multiple monitors with little if any additional hardware. Most of the software necessary to enable this is available for free from various manufacturers, and monitors continue to drop in price. The issue largely comes down to the perception of costs, desk space, and ignorance regarding multi-monitor benefits. Awareness of capabilities is no longer an issue since, according to Peddie's research, 95% of users are now aware that more than one monitor can run from a single PC.

As Peddie indicates, the cost to go from single- to dual-monitor output (cost of the second monitor excepted) is potentially nil. All but the lowest-end video cards now come equipped with two display ports, and enabling these for multi-monitor use involves little more than checking an option or two in the display adapter driver's properties. In modern integrated graphics chipsets from ATI and NVIDIA, users can add a dual-output graphics card based on the same manufacturer's GPU, leave the IGP output enabled, and suddenly have triple-monitor capability. (Unfortunately for business users, this triple-head capability is not currently possible when pairing an ATI- or NVIDIA-based adapter card with an Intel IGP chipset.)

Taking it up a notch, now that we have affordable dual graphics slot motherboards based on ATI's CrossFire and

NVIDIA's SLI, you need only install a pair of mainstream cards (likely under \$300 total) to obtain quad-monitor support. But what do you do beyond triple- or quad-monitor output? That's where we cross over into the realm of professional display solutions.

In the professional multi-monitor segment, NVIDIA is the name to know. The company now controls over 80% of the space, having knocked former titan Matrox into the background and driven has-been heavyweight 3DLabs out of the pro graphics market altogether. NVIDIA's Quadro NVS family, produced and marketed through PNY Technologies (www.pny.com) in the U.S., specializes in 2D output across many displays.

There are three basic cards in today's NVS line, all of which use passive cooling—a good thing to keep in mind for clients who value low noise. The Quadro NVS 280 supports two displays via a dongle from one external port and uses the 32-bit PCI bus. The NVS 285 is the same 21W part, only migrated into your choice of PCI Express x1 or x16 formats. The now-defunct PCIe-based NVS 400 added a second GPU in order to drive four displays, and now the NVS 440 adds a bridge chip between the two GPUs for better performance, particularly in 3D applications.

Like the NVS 285, the 31W NVS 440 comes in x1 (\$449) and x16 (\$499) versions. According to NVIDIA, most users won't realize any performance difference between the two editions in 2D applications, but constriction may set in with 3D programs. Overall, the NVS 440 performs in league with the consumer-level GeForce 6200 or 6600 parts, so make sure buyers understand that this is a work card, not a gaming solution.

Perhaps you're wondering why anyone would pay \$499 for a quad-output card when substantially faster performance can be had across four monitors with SLI for under \$300. When we popped this question to Shawn Worsell, NVIDIA product manager for Quadro, he started off with a few notes on increased latency when communicating between cards across the PCI Express bus, but having done a fair bit of SLI testing in-house, we weren't biting too hard on this hook. Ultimately, the real answer comes down to scalability.

"If you need more than four monitors," says Worsell, "what's your solution if you go with discrete GeForce cards? You're stuck. But with the x16 440 plus a x1 440, you can have up to eight displays driven by two cards. Use two x16 cards on an SLI motherboard along with the x1 440 and you can go up to 12 displays. You're only bound by the number of slots. Our NVS solution has the scalability you just can't get from a consumer product."

NVIDIA produces separate drivers for the Quadro and GeForce families, but there's enough overlap between the two that you can, for instance, run a x1 NVS 440 card alongside a GeForce 6600 and still get six-monitor output—even if you're on a 6100/6150-based IGP motherboard.

Next logical question: Who on Earth needs more than

four monitors? Well, even for word processing, multiple browser windows, Acrobat, and Photoshop, this author long ago outgrew two displays and now wonders how long it will be before three feels too cramped to bear. A large and increasing number of creative professionals are in the same boat. Surely, there's a level of diminishing returns when adding displays, but so long as each new monitor yields enough gain in productivity to justify its cost, why not add it?

Traditionally, the leading market for multi-monitor deployment is financial traders, who strive to make money on the information they can see and assess at once. The little bit more data a trader takes in could make a \$10,000 difference in just one day. This is why the finance sector hardly blinks at the added expense of going multi-monitor.

To sink its hooks even further into this primary multi-monitor market, NVIDIA did some fancy tweaking and enabled user profiles within the display drivers. So a trader can walk up to any eight-monitor desk, for example, log in as himself, and his applications and desktop arrangement will come up exactly the same way regardless of their location. If you're dealing with three, four, five displays, you don't want to have to rearrange and reconfigure everything each time you switch offices and log in. These profiles are a great value-added productivity angle inherent to the NVS line.

"After traders," says Digital Tigers' Amthor, "our next big market is military, and then it quickly gets more horizontal. We get a lot of people who trade on the side in their home offices and so on. But doctors, lawyers, Web developers, designers—these people all love multi-monitor. Then ▶



Quad-Screen and Scalable. NVIDIA's Quadro NVS 440 lets you keep adding as many monitors as your PC's slots will allow. You might start with a x16 PCI Express NVS 440, then add a x1 NVS 440 in another slot, yielding support for eight screens.

[DISPLAY NICHES]



The Multi-Mon Server. Serious multi-monitor displays need serious horsepower driving those screens. Optimized units such as this Digital Tigers Hyperion take care to deliver extreme video bandwidth with minimal system noise.

we see a lot of groups who think they should economize on their monitors when in fact the opposite is true. The hardest areas to crack are the general business markets because they're so locked down. Some people are stuck in this movement that says there should be no desktops at all, only laptops, and if there's going to be a desktop, it better cost less than 500 dollars. These people don't want to be innovative. But even within these companies, there are areas you can break into."

Digital Tigers focuses all of its product families on multi-monitor systems. Most notable is the company's Zenview line of multi-screen displays, running from the two-screen Zenview Duo 17A (twin 17" LCDs; \$899) up through the Zenview Arena Ultra HD (\$7,499), comprised of a 30" main panel flanked by two 20.1" LCDs in portrait orientation all topped by three landscape 20.1" screens.

The hottest seller, according to Amthor, is the Zenview Trio 19S (\$1,799), a triptych of 1280 x 1024 (SXGA) 19" screens mounted on one stand. Digital Tigers uses Samsung for all of its displays, although the 19S uses the highest spec parts, featuring a 1000:1 contrast ratio and 178-degree viewing angle. Within the product line, you'll find some interesting value points. For example, there's a \$600 spread between the Zenview Trio 20S (three 20.1" screens) and the 21S (three 21.3" screens), even though the resolution between the two SKUs, and thus the amount of information that can be displayed, is identical.

One thing that differentiates multi-monitor vendors is the refinement of their software. Multiple monitor support in Windows is present but rudimentary. NVIDIA gives us

a better sense of refinement with its Quadro NVS drivers. But Digital Tigers and its Zenview Manager title (free with displays; \$75 separately) show how multi-monitor should be done.

As you know, if you run more than six or seven apps at once, their taskbar buttons start to condense so much that you can no longer tell what each button represents. Zenview Manager creates a separate taskbar for each monitor. You can not only assign applications to open on a specific monitor but resize, position them precisely, and save the arrangement for reuse on each new system startup. There are plenty of other, smaller features, but one of our favorites is the ability to span a wallpaper across all screens rather than the usual Windows approach of cloning the same shot to every panel.

Another of our favorites in the Digital Tigers lineup is the SideCar series. SideCars are PCMCIA-based boxes (ExpressCard is coming soon) housing NVIDIA- or Matrox-based display adapters. Different models allow for up to four monitors to link into the SideCar. Add in the laptop's own screen and you now have a five-screen display system. For presenters who want to run multi-monitor setups in different locations, SideCars are an easy way to leave bulky monitors at the various sites and only haul one notebook around to power all of them in turn.

Now, don't get into serious multi-monitor configurations and think that any ordinary system is up to the task of powering all of those apps running on all of those displays. Streaming video may be 2D, but it's still bandwidth- and processing-intensive. John Peddie told us that he firmly ▶



Big Displays for Little Laptops. Accessories such as the Digital Tigers SideCar let you power multiple monitors from a single box. Clients might leave monitor banks in each office so that only a presenter's laptop and SideCar need to move between them.

[DISPLAY NICHES]



Small Card, Big Desktop.

The VillageTronic VTBook binds one or two monitors to the notebook's own display. One popular application is to add a portrait monitor alongside the notebook's display for document editing.

advocates a 512MB video card for powering a triple- or quad-display array. Geoff Amthor takes a broader, system-wide approach. He cites a minimum of 2GB of system RAM, 256MB on the graphics card, and dual processing, whether that's dual-core or dual-CPU.

In fact, if you want to start selling multi-monitor into larger accounts, you'd do well to study and/or resell Digital Tigers' line of Stratosphere display workstations. Currently, the flagship of this family is the Hyperion, a dual Opteron beast founded on an nForce Pro motherboard, NVIDIA GeForce or Quadro graphics, at least 2GB of memory, twin 500W silent power supplies, and a 1,500VA TrippLite UPS. Amthor notes that inclusion of a voltage regulating UPS is now standard on all models, and since implementing this step Digital Tigers has not had a single power-related support issue.

The company is also obsessive about reducing noise output, knowing that users willing to pay several thousand dollars on a display system are also likely to not want system noise disturbing their concentration. Digital Tigers even goes so far as to import a special Xeon CPU heat-sink from Europe that is not available anywhere else in the States. Also noteworthy is that Digital Tigers negotiated a zero dead pixel warranty policy from Samsung, which supplies all of the company's panels. Digital Tigers is able to pass this policy along to resellers.

Such measures are what make the difference between an exceptional multi-monitor solution and a passable one. In the end, though, don't underestimate the power of a pass-

able multi-monitor solution for those with modest needs. To anyone who has never moved beyond the single-screen paradigm, going multiple is like achieving enlightenment.

"If you can go to your customer and set them up with multiple monitors on their desktop," says Amthor, "they're going to remember you for the rest of their life. You'll be like their first girlfriend. The trick is how to get this in front of them. Walking around beating the drum on the street is not going to get people to buy it. People don't understand why they would want to do that. You have to show them. If you walk in the door with a vertical solution for a radiologist or a real estate agency or whatever, and you show them how your solution can be even more effective and efficient on a multi-monitor setup, the system and software may get you in the door but the multi-monitor will close the sale because you've got a vastly more exciting solution than everybody else. Stick with what you know, what you're good at doing already. Multi-monitor just makes it better."

Naturally, Digital Tigers is not the first or last word in multi-monitor. While the company invests a considerable amount of energy into efficient packaging, kit setup, and so forth, competitors in the space abound. For instance, Ergotron (www.ergotron.com), a 20-year veteran in this space sold through major channel distributors, specializes in display mountings. The DS100 Triple-Monitor Desk Stand retails for \$299 and mounts three VESA standard LCDs of 19" or less on a single base. In June, Ergotron will debut its Dual (\$269) and Triple (\$299) Display Lift Stands, which allow for up to five inches of display height adjustment with fingertip ease for users who want to fine-tune their ergonomic positioning. Even without such extras, stands are an affordable, no-brainer value-add once the multi-monitor concept has won a new devotee. When you get to three monitors, desk space starts to vanish in earnest and cable clutter takes over. Good stands will remedy this.

The Trident XP2-based VTBook from VillageTronic (www.vtbook.com) is a direct rival to the SideCar that can add up to two additional monitors to a laptop's display courtesy of a CardBus slot. The Magma PCI slot expansion enclosures from Mobility Electronics (www.mobl.com) offer an intriguing way to add multiple display cards to a single system for additional monitor support. Of course, Matrox (www.matrox.com) is still cranking out dual-, triple-, and quad-head cards, and Colorgraphic (www.appiangraphics.com) FireMV cards leverage ATI's 2D workstation chips in dual- and quad-monitor card configurations.

With the hardware settled, you can then move into multi-display presentation software, screen savers, management utilities, and much more. One of the best best consolidated link collections we've found for multi-monitor resources is at www.realtimesoft.com/multimon/products.asp. Check it out and be amazed at the dazzling opportunities waiting for you.

