

**Partitioning Digital Worlds: Focal and
Peripheral Awareness in Multiple Monitor Use**

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Partitioning Digital Worlds: Focal and Peripheral Awareness in Multiple Monitor Use

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ABSTRACT

Software today does not help us partition our digital worlds effectively. We do it ourselves. This field study of users of multiple monitors examines how people with a lot of display space organize and arrange information. Their second monitors are not generally used as extra workspace, they are used for secondary activities related to principal tasks, for peripheral awareness of information that is not the main focus, and for easy access to resources. The second monitor improves efficiency in ways that may be difficult to measure yet can have substantial subjective effect. The study provides specific illustrations of shortcomings of today's systems and applications: The way we work online could be improved substantially at relatively low cost.

Keywords

Awareness, multiple monitors, displays

INTRODUCTION

As more of our activities are supported digitally, we use more applications and devices, at work, in the home, on the move. The goal of getting information to and from "anyone, anywhere, at any time" is seductive and is reflected in the CHI 2001 theme.

Yet we all realize that information overload is a major concern: we cannot handle "everything, everywhere, all the time." We need to partition our digital worlds. Software today does not provide much help with this, but it could, if we had more understanding of how to help people organize.

A person with one computer and a monitor is like someone with a one-room house or a village with a single general store: everything must go into it. This is the dominant mode of computer use. Much effort has gone into helping us organize this space, with windows, frames, icons, menu bars, task bars, and so forth.

With the spread of networks and the Web, the amount of accessible information is rapidly overloading our displays, which have not grown at the same pace. As described in the next section, this has led to substantial efforts to make more efficient use of the space on our monitors.

Many people are acquiring additional devices – laptops, home computers, personal digital assistants (PDAs). Often the goal is to enable access to the same information from any location – to obtain multiple views into the same space. By itself, this does not address the overload problem. Just as houses have several rooms and towns have many stores, our digital worlds need partitioning, and interfaces that support it sensibly.

Single monitors that are now available are not large enough, do not extend into our peripheral view, and software has trouble sensing where our attention is focused.

In addition, single monitors, like a one-room house, do not provide structural support for partitioning space.

Multiple monitors for a desktop computer are now relatively inexpensive. But software supports them poorly, in part because multiple monitor use is relatively new and we do not understand how people make use of them.

Early in the era of graphical user interfaces, Cypher [1] envisioned software environments that support multiple activity structures – virtual "places" one moved among, each supporting one activity. Henderson and Card's Rooms system [4] was a software instantiation of virtual places. Software that supports multiple desktops realizes much of this concept. Assumed throughout the early work was a single physical display.

Harrison and Dourish [3] "spend some time thinking about how people turn a space into a place" in the context of shared media spaces, from text-based MUDs and MOOs to video conferencing. They argue that *space* is an opportunity, whereas *a place* is imbued with meaning. In their case, this is social meaning, rooted in community practice. But individuals also transform space into place.

This paper brings together these threads, suggesting that the amount of information available has amplified our need to partition our digital worlds into different places, and that multiple monitors can be used to do this in a way that conveniently correlates physical spaces with virtual places.

After motivating the field study of multiple monitor use, I describe a range of behaviors and provide specific suggestions for improving software interfaces to a technology that could spread very rapidly.

THE WORLD THROUGH A 17-INCH WINDOW

Most of us view our digital worlds through a monitor. A large monitor a few feet away covers less than 10% of our visual field, the area we can focus on by moving only our eyes. It covers less than 1% of the area we can see with a quick neck movement.

You would find it frustrating to navigate and understand your physical surroundings if your view was restricted to 1% to 10% of its normal range. With a monitor, you view a growing digital world without the eye and neck movements that are central to vision in the physical world. You make little use of peripheral vision.

The size of a standard monitor has increased slowly. It has not kept pace with Moore's Law. However, our digital world—the amount of potentially useful information that is accessible to us from our drives, over our intranets, via the Internet, and on the Web—has grown much faster than Moore's Law. Information related to our tasks; information about the status of team members, their activities and work products; organizational information; reports from professional and educational organizations; commercial and leisure opportunities; news, sports, and financial bulletins; messages from friends and family...

Some information we want to see as soon as it is available. Other information we prefer to have batched and sent periodically. Some things should not interrupt us, yet be available at a glance when we have time for them. Other information we prefer to get only upon request.

Work proceeds on several fronts to meet this challenge:

Much larger high-resolution monitors. Wall-sized flat-panel displays are plausibly on the horizon and can be simulated now, as in the GMD DynaWall composed of three SmartBoards [7]. They will be very expensive.

Head-mounted displays and other immersive environments. These will be useful in places. Head-mounted displays may achieve a reasonable cost, but they are inherently single-user and inhibit interaction. Navigating the virtual space requires mastering new input devices and adjusting to the mismatch between real and perceived movement.

Ambient information. As demonstrated by Ishii and his colleagues [5], external events of interest can be signaled by digitally controlled environmental lighting, sounds, air motion, and perhaps even smells.

Ubiquitous computing, information appliances. Instead of a single computer and display, many artifacts could have specialized displays or other output devices [6]. This will come at its own pace and price. In a sense, it is an extreme case of multiple monitors. The infrastructure and design to make this practical are major undertakings. In contrast, the infrastructure for multiple monitors is already in place.

Better awareness and notification indicators. This is a major focus of CSCW research and product development. It focuses on how to make the best use of individual displays. Windows are minimized, sounds and pop-up boxes signal events; indicators are squeezed around display borders where they are least likely to be buried, small windows block "full screen" expansion of a work window to avoid being buried; "alpha-blending" creates translucent windows that float over other windows, simple key sequences bring different windows or entire desktops into view, border menus disappear until hovered over, and so forth. In one of many studies, Gutwin et al. [2] tested six awareness indicators and identified two that performed best.

Dual or multiple monitors. For a decade, Macintoshes have allowed a person to use two monitors on one machine as a single surface, dragging objects from one to the other. Windows 98 and 2000 also support multiple monitors.

Multimonitor use, requiring a second monitor and video card, has a noteworthy advantage in the quest for display real estate: It is available and relatively inexpensive. Monitor prices are falling and two standard monitors cost much less than one very large monitor.



Figure 1. A 2-monitor configuration. Note bezels interrupting the display surface.

Dual monitors have drawbacks. They take up more desk space. They are not supported by old operating systems or by all computers – few laptops are easily converted to two-monitor configurations, for example. Another problem – or opportunity – is that systems and applications that do support multiple monitors do not do so very well.

One interesting constraint is that the displays do not connect seamlessly: a few inches of metal or plastic separate the surfaces even when the monitors are side by side, as in Figure 1. A window opened across two monitors is interrupted. On first consideration this is purely a hindrance, but it provides some benefits. It forces people to think about the positioning and size of windows and other screen objects. Without this constraint, a “maximize window” operation or casual decisions can govern placement. Also, placing an object on one display or the other can help the system or an application deduce where a user’s attention is directed, so that the software can behave more appropriately. These issues are discussed below.

Despite the drawbacks, multiple monitors can address the explosion in interesting, accessible information. They are invariably popular with those who try them. One reviewer of an early version of this paper wrote that she did not have enough desk space for two monitors; within two months, she and everyone in her lab had acquired a second monitor.

This study addresses the following questions: How do multimonitor users make use of the extra space? Is the second (or third) monitor an extension of their workspace, or do they use it for different purposes? How can software exploit this capability more effectively?

FIELD STUDY BACKGROUND

Dual or multiple monitors (“multimon”) usually refers to a single processor with multiple video cards and monitors in simultaneous use. The system treats the independent displays as a single continuously addressable space, so objects can be dragged from one monitor to another and can straddle monitors.

This was the arrangement at 13 of the 18 sites studied. The focus is on the behavior of people working with interrelated displays, so a few variants were included that also involve simultaneous use.

Method

Participants were recruited primarily through two channels. The author’s organization has an email distribution list for those interested in multimon. A query to this list yielded 7 volunteers. Another 7 participants were recruited from outside the company as part of a general effort to find participants for usability tests. All 7 were already using multiple monitors in their work. Another 4 interviews were obtained opportunistically; two were recruited by word of mouth and two were interviews that primarily focused on PDA use and turned out to be relevant.

These participants are relatively experienced computer users, as is usually true of leading-edge technology adopters. Inexperienced users are likely to have fewer online activities and demands and will probably benefit less from dual monitors – until they become more experienced. The number of interviews was sufficient to reveal both patterns and diversity in use.

Apart from the latter two, all participants were interviewed in their workplaces with their system at hand. They did not work during the interview, but currently open windows provided a snapshot of their work when the interview began and much of the interview consisted of exploring that configuration and reviewing other activities that they carried out on the system. Interviews were scheduled for an hour and usually ran over. Offices or workspaces were photographed and some sent screen captures of their configurations. Participants received a gratuity for helping.

Participants

The nine external participants included four CAD designers, two managers of small businesses who worked primarily from home offices, a field sales engineer, and a 911 operator.

The nine in-house participants included four developers, three testers, one usability engineer, and one program manager. Two were actively involved with developing or testing multimonitor use at the time of the interview. All were technically expert, knowledgeable users.

Two-thirds of the participants had used multiple monitors for one to three years; two had used it for 4 months or less.

MULTIPLE MONITOR CONFIGURATIONS

Physical layout

Nine of the 18 participants had one processor and two stationary desktop monitors. Three others differed only in having a third monitor, one of which had been acquired just prior to my visit. Of these 12, six had monitors that varied in size and six had same-size monitors. Monitor sizes ranged from 15” (for the smaller of a pair only) to 21” with 17” and 19” the most common.

In addition, one person had managed to configure a laptop to behave as a second monitor, varying from the norm only in that one monitor was mobile and smaller.

The five remaining participants had more radical variations. Two had hand-held computers (PDAs) that they leave connected and constantly synchronizing with their desktop system when at their desk. They could not drag a window from one display to another with a mouse, but they used the PDA display as an extension of the primary monitor. One person had a second monitor that displayed the same image as the first, but with a different resolution. Often used for graphics, one monitor displayed the big picture, the other showed a subset in greater detail. One participant had two PCs and two keyboards and used portals on each PC to drag objects (but not open windows) back and forth. The 911 operator used multiple workspaces but not monitors; she had one monitor that with a single keystroke could bring in a second display. (This orthogonal capability, an early recognition of the usefulness of multiple workspaces, has long been available on Unix systems. The CAD designers had system software that provided this ability to change ‘desktops’ *as well as* dual monitors; switching desktops changed both monitor displays.)

Frequently the monitors were not placed as close together as possible, as can be seen in Figure 2.

Logical organization matches physical layout

All participants with full-sized monitors arranged them horizontally on their desks and configured them in the same logical relationship. (Multimonitor software permits one to place monitors in any relationship to each another: monitors that are physically side by side can be arranged logically as one above the other, in which case dragging something down to the bottom of one causes it to appear at the top of the monitor next to it. Not surprisingly, no one made use of this capability.)



Figure 2. A 3-monitor configuration. Displays are not pushed together to minimize gaps.

OBSERVATIONS

1. A second monitor is not treated as 'additional space.'

Most people reported rarely straddling a single window across two monitors. One expressed surprise himself that he did not. As noted above, monitors were often not pushed close together, increasing the discontinuity.

Even CAD designers, who often work with large, complex graphical objects, reported rarely extending a window across two monitors. Instead, they typically maximize a design to fill one monitor entirely, leaving the other monitor free for other uses. One said "AutoCAD is on the right-hand side, that's my primary (monitor). This is more my miscellaneous, everything, on the left-hand side." 'Miscellaneous' meant desktop icons and shortcuts, email, ICQ, AOL buddy list, a CD player, Groupwise Notify, a calculator, a game, and a small AutoCAD window to examine details not visible in his primary monitor view.

A demonstration that multiple monitors can be more about partitioning than increasing space is provided by the two participants who dock their constantly synchronizing palmtop computers next to their desktop monitors. One keeps his calendar visible on the palmtop, the other keeps email visible. The increase in space provided by the palmtop display is not significant and there is no

information on the palmtop that is not on the desktop computer. The value is having instant access to a resource in a known location in peripheral vision.

A 21" monitor has twice the display space of a 15" monitor. However, a user of a 21" monitor is not forced to consider how to segment their digital world to the extent that a dual monitor user is.

When a user has monitors of different sizes, this becomes another consideration in designating specific objects to specific monitors – spreadsheets or other potentially large applications are directed to the larger.

2. Distribution of tasks among monitors.

People generally indicated that one monitor was used for their "main" or "primary" task – writing code, working on a CAD design, preparing a document, slide presentation, or graphic image, and so forth. This is the task to which most keyboard and mouse activity is devoted over time. The separation of tasks was quite conscious: several respondents said "I use the second monitor for (other tasks)."

Sometimes the second monitor is used as an equal partner in the primary task, notably when material from one object is being copied into another. But people reported almost always using it for secondary or alternative purposes. These are principally of three kinds (with some overlap):

Secondary tasks in direct support of the primary task.

"With this I can very easily glance and read and see what's going on."

– Developer referring to monitor used for compile and debug tools

A developer or tester working with source code on the primary monitor often devotes the second monitor to windows (at times more than 5) used to identify variables appearing in the code, report on compilation tasks, provide debugging readouts, and so forth. Once dragged to the second monitor, these windows are used more for reading than for interaction.

Some CAD designers have a variation on this practice. Rather than extend a model to cover two monitors, they maximize the drawing space on the primary monitor by dragging toolbars to the other monitor. This includes basic toolbars that they would keep open when using a single monitor, but it also includes advanced toolbars that they would not sacrifice display space for on a single monitor. One had 11 toolbars open when interviewed; he could easily find and invoke advanced functions. Another window open on his secondary monitor provided a second view into the object that he used to locate parts to copy for reuse in the primary window.

'Live' information channels from the outside.

"They pop up, they go on top, but they don't take focus so that I'll keep working but I'll see that it's there..."

– Tester about reminders that appear on secondary monitor.

Communication channels to people and events are often placed on a secondary monitor. These include email; instant messaging, ICQ and Groupwise Notify (linking participants to colleagues, friends, and/or family); and news alerts (news headlines, specialized news filters, sports bulletins, stock quotes) from different external sources, often set to be updated at intervals such as every half hour or twice a day).

A benefit that was often mentioned is that interrupts from 'push' applications are much less disruptive when they can be confined to a second monitor, with updates available at a glance. Software is not always able to deduce where we are working and when we can be interrupted; this allows users to make the determination.

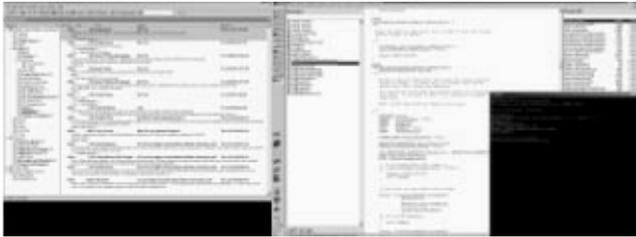


Figure 3. A bitmap from a 2-monitor configuration.

Figure 3 shows one arrangement (the screen capture software does not explicitly identify screen boundaries). The smaller monitor on the left is devoted to email, the larger monitor on the right holds source code and programming windows.

Use of a second monitor as an information channel can be an alternative to using it to support the primary task, or used in conjunction with it. Communication windows can be buried under or tiled with code tracking windows, for example.

One developer on numerous project-related distribution lists filtered incoming email into folders. His secondary monitor was devoted primarily to displaying his email folder hierarchy. The count of unread messages in each folder is indicated parenthetically in blue next to the folder name. He reported that frequently during the day he would glance over and check these counts for unusual activity, interrupting his work to open email only when he noticed a frenzy of activity. Other users also monitored email folders.

These windows support communication that is important, but not critical enough to merit interrupting their principal activity. Burying or minimizing these windows on a single monitor could have a similar effect, but now they can view the windows with a glance, without lifting their hands. When communication does become the primary task, some participants mentioned that they would move their email window to their primary monitor to "do email." Others shifted their attention to the monitor on which the communication application resided and worked there.

Personal resources

"If I ever watch media events, NetShow, I'll usually have it in the far right-hand corner (of monitor on right), because to me this is the farthest stretches of my desktop."

Common uses of the secondary monitor were for background resources such as To Do lists, contact lists, calendars, and audio controls for playing digital music.

Web browsers were frequently exiled to the secondary monitor. Depending on the page open in a browser, it could fall into any of the three categories listed above.

3. When a button click is too much.

"It's not intrusive in the sense that I have to click a button to see my calendar." – Field sales support

"Alt-tabbing around, I got sick and tired of it."

– Engineer, explaining why he had added a third monitor

Given the ease of minimizing and restoring a window, why is a second monitor desired? Repeatedly, people indicated that they considered it a great relief not to have to use buttons, "escaping from the need to Alt-Tab." The ability to avoid a few keystrokes is welcomed with great subjective enthusiasm, although it might be difficult to obtain an objective measure of efficiency gain. Several factors are implicated.

One is that sometimes it *does* require something of an effort to get to a buried window and back. Some users noted that with many windows minimized, "Alt-Tabbing" to get someplace and back is tedious.

Finding features buried in menus is even worse. Opening toolbars through the menu system to find a rarely-used advanced CAD function is much more time-consuming than visually scanning the full set of functions on a second monitor. The latter approach then requires only a single mouse movement and click to invoke the action.

When a second monitor displays processes that support the primary task, it reduces the cognitive load by allowing rapid glances to check on information; for example between a bird's-eye view of an entire graphical object and a close-up of a detail. One respondent explained "I can just read here and turn my head and go to the line, as opposed to reading the number, Alt-tabbing and then maybe forgetting the number or getting distracted."

When accessing communications from outside, there is convenience and an "out of sight, out of mind" element. A glance at a second monitor to see who has sent email is less disruptive than moving a mouse to open and then close an email window. In contrast, windows that are minimized or buried are easily neglected. Informal awareness systems that rely on desktop video, for example, suffer due to the large windows that they require. Efforts to address this include notification sounds and animations, which can be effective but distracting.

The significance of the ability to cleanly shift attention was underlined by this observation: Although people did not

straddle windows across monitors, they usually avoided cluttering the right side of the left monitor or left side of the right, making an effort to keep icons, menu bars, audio controls, and other small objects on the left of the left monitor or the right side of the right, far in the periphery. In this way, there was little distraction when they glanced between the principal windows on each monitor.

4. People like multiple monitors.

"I would not go back." "(Without it) I feel very limited." "It has spoiled me." "A single-monitor system with Alt-Tab, it's not as easy for me to go back to a single-monitor system."

These comments reflect the overwhelming consensus of those interviewed. Some were considering adding a second monitor to their home computers and one had done so. A CAD designer who was initially skeptical and the last in his shop to acquire a second monitor is now enthusiastic and "can't imagine" not using it: "You end up with a lot of just, minimization... a lot of extra work."

What is required to provide dual monitors? Many organizations today have unused 15" monitors in abundance, and they are not expensive. The principal requirement is a second video card.

5. Applications do not make good use of multiple monitors.

"You intuitively think a window should show up... it shows up on a different monitor."

"Most apps will start on the primary monitor even if they were located on another monitor."

One described his ultimate in frustration. During breaks he plays a computer game in which one amasses points by executing a variety of maneuvers to commit mayhem. To access unfamiliar advanced features, he must pause the game, bring up the Help display, then close Help and resume the game. As he does this, his second monitor is blank. Games, he pointed out, should detect the second monitor and make Help and resource status constantly visible there.

Multimonitor development has focused on getting the display software and the application program interface to work, with little attention to the human computer interface or intelligent exploitation by system or applications. Even a multimonitor installation program was careless: Clicking on a menu item on one monitor caused a dialogue box to appear on the far corner of the other monitor, where it easily went unnoticed.

Multiple monitor display space is handled with a single coordinate space, which includes negative numbers when a monitor is to the left of the primary monitor. Many applications cannot handle negative numbers. "This is a demonstration of what most apps do wrong, how they're not multimon aware," explained one respondent, demonstrating an object popping up a dialogue box far from a user's focus of attention.

One user prefers to keep desktop icons on the far right of his rightmost monitor, but when he invokes the 'arrange icons' utility, it moves them to the left. So he moves them back each time.

Systems can support multimonitor use better and serve as an example, but applications will make a real difference. Most have given no thought to how they appear on dual monitors. Dialogue boxes and other items are placed randomly or inconsistently. There is no memory for where interface elements were placed when an application is reopened. Several informants laboriously and regularly rearrange multiple windows or drag toolboxes into place.

Progress is slow, primarily focusing on avoiding the most obvious clumsiness. The next step is to exploit multiple monitors positively when they are in place.

The PowerPoint application simultaneously illustrates the potential for intelligent use of multimon and the need to better understand its use. If one is editing slides on the secondary display (as defined by the system during installation) and opens 'Slide Show View,' the slide show appears on the primary monitor. One can continue editing and see the changes reflected in the slide show, or advance the slide show.

This terrific capability even pre-dates system support for dual monitors. Unfortunately, it is not discovered by some (perhaps most) multimonitor users because they edit slides on the primary monitor. When the Slide Show is opened in that situation it replaces the normal edit view, leaving the other monitor untouched. A great demonstration, rendered less effective by not matching the pattern of use.

I was told of a CAD programming application with similar capability: one can program on one monitor and see what is happening in AutoCAD on the other.

"Thank God they finally made it multimon aware."

– Engineer describing an internally developed utility

THE BENEFITS OF ARBITRARY DIVISION OF SPACE

Most users initially consider a second monitor to be inferior to a twice-as-large monitor. I began using dual monitors myself only because of the substantial cost difference. In retrospect, it seems clear that a single large space is not always preferable. The ability to park objects out in the periphery is an advantage.

Consider, as an analogy, space in a house. People generally value large rooms, and they value more rooms. A one bedroom house with a large bedroom is not the same as a house with two moderately sized bedrooms. In the latter case, the second room is used for different purposes – perhaps as an office, a guest room, or both. One *could* use the master bedroom for these purposes, but doesn't, even if it is twice as large. The wall makes a difference.

Similarly, with multiple monitors, the division into two spaces can facilitate versatility in use.

Consider the difference between a single large meeting room and several small breakout rooms. Each arrangement can be valuable, but different tasks are optimal in one or the other. As with monitors, rooms of equal size may be arbitrarily assigned different functions, whereas rooms of different size may be assigned functions in part based on the requirements of different tasks.

Very large displays will find significant uses where they can be afforded. This includes those shared physical spaces where large, manually updated status boards are found today. The popularity of 21" monitors indicates that further growth in display size will also be welcome on the desktop, particularly as flat-panel displays come down in price.

Yet there will remain a place for the arbitrary division of space provided by multiple monitors. We prefer a house with several rooms – accepting the arbitrary constraints – rather than one large room in which we could freely arrange things. The users with their miniscule palmtop displays running alongside their large PC monitors made this point: The benefit was not the small increment of space, it was the partition: space with a dedicated purpose, always accessible with a glance.

OPPORTUNITIES FOR DESIGN

“It would be really neat if they could realize that maybe the Help should show up on another monitor.”

– Respondent discussing an office software application

“It would be a dawdle, just give me a spec.”

– Developer who was asked the difficulty of coding two application enhancements for dual monitor users

Doubling (or tripling) display space will not solve our information management problem, but it will help. Not all information is equal –we want some things brought to our attention, others we want available in the periphery. Multiple monitors do this naturally. They segment display space in a manner that is clear to both the human and the software... if the software takes notice.

Most multimonitor users dedicate one monitor to the focal task and use the second for peripheral awareness and less frequently used resources, but get little assistance from applications in arranging things. More often than not, applications make awkward use of the capability.

Consider the CAD designers, who opened toolbar menus and dragged them to the second monitor for easy reference and access. At a bare minimum, the system should remember placement so people do not have to repeatedly organize themselves. It would be even better for the application to propose a logical arrangement of all toolbar functions on the second monitor.

Every designer should consider the multimonitor scenario, however briefly, during the design process. When two design alternatives are roughly comparable, one may lend itself to more graceful use with a second monitor. Opportunities to exploit a second monitor are often evident,

as exemplified by making status and help information visible for fast-paced games. Almost any application could find some peripheral information that would usefully be placed in the periphery.

Of course there is a down side. If our primary applications colonize the second monitor, we reduce its usefulness for notification and awareness of external events and for easily accessing personal resources. Thought must be given to the division of features between multiple monitors. Applications might be advised to resist using all available space; if not we may need three monitors.

An opportunity exists to design suites of awareness and notification features that draw on the full range of communication and agent software that a person selects. Space could be segmented according to events originating with team members, organizational changes, news and alerts arriving over the Internet, and communications from friends and family.

Multimonitor use has been too rare to be a priority for most developers. But as some begin to exploit the capability and monitor costs continue to drop, use could snowball. Seeing benefits, more people will obtain second monitors, making their support more worthwhile, and so on... Intelligent design can get ahead of this curve and increase the acceleration along it.

CONCLUSION

In hindsight, these findings may appear to be “common sense,” but relatively few people demonstrate awareness of them. For example, one of the world’s largest companies recently had a “Single Pane Of Glass” campaign to limit use to one computer and one monitor per office. The resulting warehouse full of extra monitors were sold for \$25 apiece. And, as I have noted, almost no designers, developers, testers, or usability engineers (including some who use multiple monitors themselves) consider multiple monitor scenarios for the applications they are building. But this could change.

“The other parts of the company are seeing the CAD department and how productive they are with the dual monitor thing... The more times you have to flip, and flip from one screen to the next or open and close sessions, you lose your train of thought... and they’re starting to see that, and then they’re having a change of attitude.”

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