



# Increase Workplace Productivity through Intelligent Display Features and Design

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This whitepaper explores ways in which computer monitors can play a role in improving employee comfort, job performance, and productivity.

## Introduction

As companies of all types and sizes struggle to survive and thrive in a competitive economy, increasing productivity can provide a crucial edge up on the competition. Finding new ways to boost employee productivity (or stem the sources of its drain) is worth the effort. Even small gains, multiplied across all employees, can result in considerable bottom line savings. The less quantifiable benefits can be even greater, as happier, more productive employees have lower medical costs, work more effectively away from the office and are less often absent.<sup>1</sup>

Numerous studies have demonstrated the positive productivity effect of variables ranging from office temperature and workstation ergonomics to workplace health programs and an employee's relationship with their boss.<sup>2,3</sup> With over two-thirds of all workers relying on desktop computers to get their work done and professional employees spending an average of 30% of their workday in front of their computer, it makes good business sense to explore the ways in which this equipment can be optimized to improve productivity.<sup>4</sup>

Much has been written on the benefits of ergonomics.

Recommendations on workstation set up and posture to minimize productivity-sapping muscle strain and long-term repetitive injuries are readily available. Often overlooked by busy employees and employers, taking the time to set up ergonomically correct workstations can reap ongoing dividends in employee comfort and satisfaction – which have been conclusively linked to greater productivity and reduced absenteeism.

Key recommendations for monitor positioning include:

- Position monitor directly in front of you and at least 20 inches away
- Place monitor so top line of screen is at or just below eye level
- Place monitor perpendicular to window to minimize glare

For complete guidelines see: [https://www.osha.gov/SLTC/etools/computerworkstations/components\\_monitors.html](https://www.osha.gov/SLTC/etools/computerworkstations/components_monitors.html)

Computer monitors can play a role in improving employee comfort, job performance and productivity, often by making it easier for users to comply with the above guidelines.

Among the ways that displays can offer productivity-boosting benefits are by offering:

- Increased screen real estate via larger screens, dual/multiple monitor set up and higher resolution
- A clear, wide viewing angle
- Flicker-free screens
- Optimized, preset viewing modes
- Ergonomic stand design
- Screen protectors for privacy and glare reduction

### Display Area: Pixel Count Matters

Several years ago, when the majority of workplace desktops still held just one display, numerous studies revealed the productivity benefits of dual displays, with findings consistently revealing that two (or even three) displays was better than one. Studies conducted by Microsoft and others, which required multiple-monitor neophyte users to complete several different tasks, switch from one task to another, and remember data, found productivity increases ranging from 9% to 50%.<sup>5,6,7</sup>

Businesses began taking their cue from gamers, who had long known that more monitors equals greater speed, and began standardizing on dual desktop displays for many information workers. Users found they saved time previously spent switching between applications and windows, and gained greater control over their workspace.

As one New York Times author writing on the subject enthused: “Once I saw how [dual monitors] improved my productivity, I was an instant convert. I should not have been surprised. Survey after survey shows that whether you measure your productivity in facts researched, alien spaceships vaporized, or articles written, adding an extra monitor will give your output a considerable boost — 20 percent to 30 percent, according to a survey by Jon Peddie Research.”<sup>8</sup> Subsequent independent research had similar findings, revealing increased productivity on many types of tasks when an additional display was added.<sup>9, 10</sup>

It's the total screen real estate (pixel count) that delivers the productivity boost, whether achieved via multiple monitors or a single larger screen.

Results from these studies, which included wide aspect ratio displays, also pointed at today's prevalent understanding of the issue, which is that it's the total screen real estate (pixel count) that delivers the productivity boost, whether achieved via multiple monitors or a single larger screen.

Among the findings:

- Increasing screen space increases productivity
- When multiple windows are used for typical work, the standard 17-inch monitor and smaller are considerably less productive choices than larger options
- Large widescreen monitors can be equally or more productive than dual screen monitors
- Both are more effective than smaller, single screen monitors
- The relationship between productivity and screen size follows a bell curve, with the peak being around 26 inches for most business applications

As a general rule, more screen space equals greater productivity, up to a point – which studies suggest is around 26 inches. For specialty applications, such as financial trading, however, where it's common to employ multiple 27" and 30" displays, productivity can increase at sizes well beyond this guideline.

For more general business uses, added screen real estate saves users time previously spent switching between applications and windows, and delivers greater control over their workspace. Determining the best approach for any individual comes down to the type of work performed. Interpretation of the research as well as anecdotal evidence indicates that for most people who do heavy text- or spreadsheet-based tasks using relatively few open applications, a larger screen will be somewhat more beneficial than dual displays. For those who prefer delineation between two or more running applications, windows, or workspaces, multiple displays may be easier to use.<sup>11</sup>

Use cases for increasing productivity through the use of greater screen space include:

- **Programming** – View code on one display (or one side of a large display), documentation on the other (or other side)
- **Writing/editing** – Keep web pages, documents and other reference content open and visible while writing an email, article or report

- **Spreadsheets** – View one large spreadsheet across the entire space or simultaneously work with more than one visible spreadsheet
- **Design** – Compare drafts; keep pallets and tools open and visible away from main work area; and easily zoom into detail across entire space
- **Information tracking** – Keep email, market tickers and other stats visible on one screen while working on the other
- **Shopping** – Compare products and pricing without having to switch tabs or jump among windows
- **Gaming** – Experience more of the action by extending game play across a wide screen or multiple displays
- **Multitasking** – For entertainment or work; keep a video or webcast on one screen while checking email, social media or blogging on the other

The aforementioned New York Times reporter, who mentions using his dual displays for several of the above activities, sums up the time savings gained by the use of greater screen real estate:

“With a single monitor, I could jump between applications with a mouse click or a keyboard command (Alt-Tab, in Windows), but not nearly as fast — and small delays add up when you repeat them dozens or even hundreds of times a day. With my dual displays, I simply sweep my mouse from one screen to the other<sup>12</sup>”

**Productivity bottom line:** Whether achieved via large screen size, higher resolution, wide-screen aspect ratio or multiple displays, more screen real estate delivers notable productivity benefits. Which configuration is best varies and is dependent on the individual and the type of work performed.

## Expanded Viewing Angle

Viewing angle, measured from both side-to-side and top-to-bottom, is the maximum angle at which a display can be viewed with acceptable visual performance. Additionally, the wider the viewing angle, the less image degradation as your view moves from the center of the screen. Several variations on LCD technology offer differing degrees of viewing; however no LCD is capable of attaining full 180° horizontal/180° vertical viewing. The maximum possible horizontal/vertical viewing angle available today is 178°, which is delivered by premium panel technologies such as ViewSonic’s SuperClear® and SuperClear Pro line of displays which is engineered with industry-leading IPS (In-plane switching) and MVA (Multi-domain Vertical Alignment) panel technologies.

## Ergonomic Best-practices for Multiple Display Use

Correct ergonomic placement of one display directly in front of the user, with the other(s) at an angle for secondary usage, will enhance comfort and minimize muscle and eye strain.

For full recommendations on display positioning see: [https://www.osha.gov/SLTC/etools/computer-workstations/components\\_monitors.html](https://www.osha.gov/SLTC/etools/computer-workstations/components_monitors.html)



The wider the viewing angle, the more effective screen real estate to work with, which, as discussed above, corresponds with greater levels of productivity. Outside of any display's stated viewing angle, images will lose contrast, become blurry, faint, or poorly saturated and text can be difficult to read. This color degradation, reduced brightness and diminished contrast is generally negligible for users working on smaller displays, such as 13"-17" laptops, both because the edge-to-edge angle isn't very extreme and these users generally work within the center of the screen.

In many cases however, expanding a user's viewing angle to the maximum possible 178° horizontal/vertical will be notably beneficial. This is particularly the case for graphic designers and other creative professionals, as well as those who want to profit from the use of more than one display.

Without the benefit of a wide, 178° viewing angle, design professionals will experience noticeable color shifting and reduced brightness from the center of the screen out to the edges. This means they will confront color, brightness and image-depth changes whenever they look at a region of the screen from any position other than directly head on. This color shifting can be a critical problem for professionals whose job performance and creativity rest on their ability to accurately perceive and work with color.

Multiple monitor users can similarly benefit from wide 178° viewing. As noted in the previous section, ergonomic guidelines advise multiple-monitor users in any profession to place one display directly in front of them, with the other(s) placed to the side of the central display. Ancillary monitors can be positioned in-line with the primary display, or inclined at an angle toward the user. Either way, because the side monitors are farther from the "front-and-center" position, color shifting toward the edges will be even more visible. These users will achieve the maximum amount of usable screen real estate with a wide-angle display.

ViewSonic® monitors with SuperClear® MVA or SuperClear IPS technology leverage over 25 years of display technology development to deliver unmatched 178° horizontal and vertical viewing. Designed for

Full 178° viewing is particularly beneficial for creative professionals and users with more than one display.



creative pros and other uncompromising users, SuperClear displays deliver brilliant, true-to-life color, ensuring high color accuracy and consistency from screen to print. Wide viewing angles virtually eliminate color, contrast and clarity shifts when at any angle or as the image is moved across the screen.

Productivity bottom line: The extended viewing angles offered by a high-quality IPS or MVA display can be a critical performance- and productivity-enhancing tool for creative professionals, multiple monitor users and other uncompromising users.

### True Flicker-Free Design

Computer-related eye fatigue is an often under-recognized condition that can impact employee comfort, job satisfaction and productivity. Web developers, writers, graphic designers, call center operators and others who spend extended time in front of a computer screen, however, can attest to the reality of dry, aching eyes, headaches and a general sense of fatigue. Research on the topic backs up their experience, revealing that screen-related eye problems are widespread, with anywhere from 50%-90% of those who work at a computer screen experiencing symptoms of what has been termed “computer vision syndrome” or CVS.<sup>12</sup>

Fortunately, CVS has not been shown to cause long-term damage to the eyes. However, problems ranging from eye irritation, headaches and blurred or double vision are far too common. This eyestrain can lead to minor annoyances like eye twitching and red eyes as well as significant discomfort, physical fatigue, increased work errors and, ultimately, decreased productivity.<sup>13,14</sup>

Computer vision syndrome is the result of several factors related to the use of computer screens, including some that can be controlled by the user environment, such as distance from the monitor, glare and lighting. Other factors, such as contrast and flicker are related to display settings and the quality of the display. Flicker, the result of rapid variations in brightness, can be a significant factor in CVS, causing eye strain and fatigue by requiring the pupils to continually adjust size to accommodate the stark changes from bright to dark.



Normal

ViewSonic  
Flicker-Free Technology

Even when not visible, flicker is a characteristic of most LED backlit screens, which use a technology called pulse width modulation (PWM) to dim LED screen brightness to comfortable levels. Conventional LED monitors have relatively long on and off periods between “pulses.” With this type of display, screen flicker is often visible to the human eye at any level of brightness and the more brightness is dimmed, the more apparent it becomes.

Higher frequency displays are better able to mask screen flickering by producing faster PWM cycle times with shorter periods between pulses, giving the illusion of a constant, steady stream of light. While these displays are an improvement over conventional technology, imperceptible light modulation still exists and continues to adversely impact the eyes and nervous system, despite the lack of visible flicker. Methods for testing your monitor for imperceptible flicker can be found at: <http://www.flatpanelshd.com/focus.php?subaction=showfull&id=1362457985>

Displays with a true flicker-free design, such as ViewSonic's Flicker-Free Technology, nearly eliminate this hidden source of eye strain and discomfort. More than simply giving the illusion of freedom from flicker, ViewSonic Flicker-Free displays eliminate it through the use of DC-modulation, which maintains a steady stream of direct current power to keep the screen backlight continuously turned on. There is no change in the level of lighting at any time and a steady, controlled current is maintained even at the highest and lowest ranges of adjustable brightness. Such consistency is ideal for minimizing eyestrain, fatigue and other symptoms of CVS, which can be a hidden source of drain on employee productivity.

**Productivity bottom line:** The eye irritation, headaches and fatigue caused by computer vision syndrome can result in unhappy, less productive employees. Displays that spare users from even imperceptible flicker can eliminate a major source of CVS, helping employees achieve greater comfort, performance and productivity.

## Optimized Viewing Modes

Just as flicker results in eyestrain, fatigue, and a corresponding drain on productivity, so can viewing a screen with sub-optimal settings for a particular type of content. Eye care professionals recommend the general setting adjustments shown to the right for the health and comfort of your eyes.

While these general guidelines are certainly useful, they also require a good deal of time-consuming tinkering with display settings, particularly given that various types of content are best viewed with different setting combinations. Displays with preset viewing modes, such as ViewSonic's ViewMode™, let users easily select from among setting combinations optimized for the most comfortable viewing of specific types of content.

Along with providing more comfortable, less fatiguing viewing, ViewMode™ technology enhances the visual impact of on-screen content by optimizing the R, G, B gamma curves for different types of digital content. Optimized for different viewing scenarios, these ViewMode presets adjust and control the grayscale purity and brightness intensity of each scale level to deliver better front-of-screen performance.

In addition to calibrating gamma curves, ViewMode also offers the ideal color temperature, brightness, contrast, saturation and hue to best suit each on-screen scenario. Best of all, users can easily select the optimized mode for their current task at the touch of a button, safeguarding their valuable time as well as their eye comfort.



ViewMode offers 5 different scenario presets, including game, movie, web, text and monochrome settings.

**Text mode** – ViewMode for text provides a more comfortable, easier-on-the-eyes reading experience. Contrast, brightness and color temperature are fine-tuned to reduce eyestrain. The sepia-toned background – similar to the color of pages in a printed book – offers an ideal combination of contrast and comfort for reading PDFs, documents and text-heavy web content.

## Recommended Display Adjustments to Reduce Eyestrain

### Brightness

- Adjust display brightness to approximately the same level as the brightness of surrounding workstation.
- If the white background of a document looks like a light source, your display is too bright; if it seems dull and gray, it's probably too dark. Both extremes can cause eyestrain.

### Positioning

- Glare from windows, inconveniently located light sources and reflective surfaces can irritate eyes.
- If possible, close blinds and reposition your display to minimize glare; if not, invest in an anti-glare screen protector

### Text size and contrast

- Enlarging text size and adjusting the contrast between text and background can notably increase comfort, especially when reading or composing long documents.
- Text that is 3x the smallest size legible from a normal viewing position is easiest on the eyes.
- Busy backgrounds and low contrast between text and background should be avoided
- Dark text on a light background is the most comfortable to read.

### Color temperature

- Short wave blue light is associated with greater eye strain than longer wavelength hues, such as orange and red.
- Adjusting your display's color temperature to lower the amount of blue light will result in greater long-term viewing comfort.

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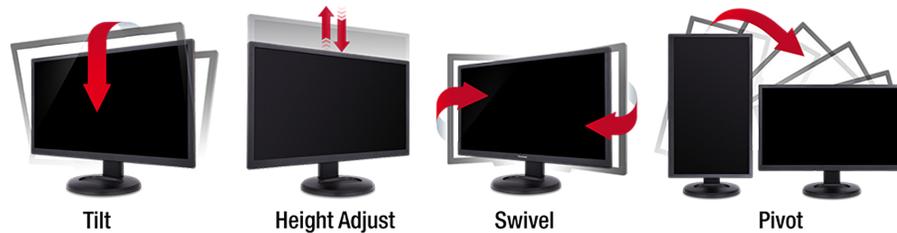
**Web mode** – With an adjusted gamma curve for improved contrast and color reproduction, ViewMode™ web mode improves viewing of photos, graphics and image-heavy web pages. Offering improved color richness for visual elements from skin tones to scenery, web mode delivers enhanced viewing that is limited only by the quality of the content itself.

**Mono mode** – Delivering added shades of gray, mono mode provides clearer and more obvious detail, making it ideally suited for viewing black and white content. It instantly transforms the display into a useful tool for students, professionals, and black-and-white photographers.

**Movie mode** – Optimized for any type of video content, movie mode reduces eye fatigue with contrast settings designed to make large and detailed scenes more well-defined and easier to see. Fine-tuned to deliver more available shades of gray, ViewMode movie mode prevents over-saturation of on-screen colors and softens image outlines for easier viewing, which is particularly beneficial for viewing spectacular cinematic night scenes.

**Game mode** – To enhance darker scenes and improve visibility in brighter ones, game mode adjusts the gamma curve to create deeper, more stunning details. With ViewMode game mode preset, gamers no longer need to turn up the brightness on their screens to experience more balanced screen color performance.

**Productivity bottom line:** Comfortable employees are happier employees. Happier employees are more productive. Optimizing display settings can increase visual comfort but can also be a drain on time. Displays with preset combinations of settings optimized to the most common viewing scenarios allow users to quickly achieve more comfortable viewing for their unique and variable content needs.



### Ergonomic Design

The science of designing the job, equipment, and workplace to fit the worker, ergonomics has become a guiding principle influencing designs that result in more comfortable, healthy and productive workplaces.

The use of products that enable a good ergonomic fit can reduce strain, discomfort and injury along with reducing worker compensation claims and other costs associated with these physical complaints, while also improving morale, productivity and profitability.

A review of multiple studies examining the impact of office comfort on productivity published in the Journal of Facilities Management found substantial evidence supporting the claim that office comfort affects productivity.<sup>15</sup> One case in point, at one company where employees received ergonomics training as well as ergonomically designed keyboards and chairs, the prevalence of uncomfortable musculoskeletal symptoms was reduced by an average of 40%.<sup>16</sup>

Along with chairs and keyboards, proper ergonomic positioning and comfort during computer use is affected by the fit of the user to their computer display. Back, neck, shoulder and eye discomfort can all increase when a user is improperly aligned with their display.

The Department of Labor Occupational Safety and Health Administration (OSHA) offers specific recommendations for display positioning to “reduce exposure to forceful exertions, awkward postures, and overhead glare, [which] helps prevent possible health effects such as excessive fatigue, eye strain, and neck and back pain.”<sup>17</sup>

Computer monitors with ergonomic design features support the goal of a more comfortable and productive work environment. In particular, ergonomic stands enable the adjustment of three key variables identified in the OSHA guidelines: viewing distance, viewing angle and viewing clarity.

Conventional displays generally offer some degree of front-to-back tilt. Advanced features found on displays with ergonomic stands, including ViewSonic® Graphics and Professional series displays, can include:

- Height adjustment – allowing the monitor head to move up and down
- Pivot – enabling screen orientation adjustment from horizontal to vertical
- Swivel – enabling horizontal screen rotation of up to 360 degrees

**Productivity bottom line:** Displays with ergonomic stands offer greater user control over placement and positioning, which can be adjusted according to unique applications, environments and user needs for greater overall comfort and productivity.

### Screen Protectors

Screen protectors offer an easy way to safeguard the privacy of on-screen content, as well as to reduce reflection and glare. Their use has correspondingly been shown to increase productivity. Research replicating typical work environments indicates that employees may be 50%-70% less productive when their visual privacy is at risk.<sup>18,19</sup> With the prevalence of visual hacking on the rise due to the ubiquity of camera-equipped smartphones, the use of privacy screens can be an important addition to organizations' productivity-boosting toolkit.<sup>20-23</sup> For more information on the benefits of screen protectors, see the ViewSonic white paper: Privacy screens: The simple way to protect assets and improve productivity.

**Productivity bottom line:** Cost-effective and simple to install, privacy screens offer an easy way to boost productivity by improving employee confidence that their work is not being observed by others. Privacy screens with glare reduction provide the added benefit of reducing eyestrain, for a more comfortable, efficient and productivity-enhancing work environment.



## Conclusion

Careful selection and use of desktop displays can impact employee comfort, job satisfaction and productivity, particularly for the many workers who spend hours each day looking at their monitor. The adage “a happy employee is a productive employee” is conclusively supported by much research. Physical comfort is a crucial component of the contentment equation, and can increase job performance as well as reduce absenteeism.

Choosing displays that offer ergonomic stands, preset viewing modes and true flicker-free technology can help improve employee comfort, engagement and performance. The use of multiple displays or large, widescreen displays and screen protectors has also been shown to boost productivity. Finally, for some users, the expanded viewing angles offered by a high-quality IPS displays can notably impact job performance.

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