Video Wall Technologies Compared

Over the last decade, video walls have proven their effectiveness in a range of applications—from control rooms to public spaces—allowing for more effective communication, enhanced information sharing, and improved collaboration. Video walls provide unique advantages over the use of a single large format display, and oftentimes they are the only solution that can accommodate spatial constraints while delivering scale.

As more and more businesses look to invest in a video wall solution, manufacturers are responding with a variety of video wall technologies. Such abundance of options makes the selection of the video wall technology extremely challenging for buyers.

Is there one technology that trumps all? What is the right way to compare the options? Read on to learn how to choose wisely!

To help you navigate the complex world of video wall technologies, Samsung PID team has put together a brief guide on most popular solution types. Below we examine advantages and disadvantages of LCD, LED, and DLP video walls relevant to the most common applications.

We will begin with an overview of the salient features of each technology and then recommend the best selection approach.

**LCD video walls**
LCD video walls are the most widely adopted technology in the market. Liquid crystal displays (LCDs) are flat panel displays composed of a layer of liquid crystals aligned between two polarizing filters. Application of the electric current reorients the liquid crystal molecules, blocking the light or allowing it to pass through to form an image. Modern high-performance video walls are built as an array of professional grade narrow bezel LCD panels, with the size of each individual panel varying based on the project requirements in terms of space and resolution.

SDC PID recently introduced LCD video wall panels with the world’s slimmest bezel. These extreme narrow bezel (ENB) models feature a 1.7 mm bezel. Download specifications here.

Key performance characteristics of LCD video walls are:

**Visual performance**

- LCD video walls are able to provide **high total resolution**—Full HD (1,920 x 1,080)—due to their **high pixel density**. This makes LCD video walls viewable from close distances without image quality loss and eye fatigue. LCD video walls are most suitable when exhibiting images with lots of detail and text.
- LCD video wall solutions come in a variety of **brightness** options with adjustable settings (500-700 nit), making them a great contender for environments with changing lighting conditions or with substantial ambient light.
- Modern LCD panels yield **broad color gamuts** and produce accurate, true colors for lifelike images.
- LCD walls deliver wide **viewing angles** (up to 178 degrees).
- While **bezel** width used to be a slight disadvantage of LCD video walls, the technology is quickly moving towards nearly bezel-less solutions, with extreme narrow bezel models offering as little as 1.7mm width. This is crucial for providing disruption-free visual experiences, especially in contexts where highly detailed content needs to be presented.
**Reliability**

- Deliver 24/7 performance over extended periods of time.
- Commercial grade panels are robust and resistant to environmental stressors, such as heat, moisture, and dust.

**Design considerations**

- Panels are lightweight and have a slim profile, resulting in spatial efficiencies and allowing flexibility in choosing mounting options.
- LCD solutions offer increased design flexibility – they are scalable, allow for easy size adjustments, and can accommodate curved surfaces.
- LCD video walls are easier to install.

**Cost of ownership**

- Long lifespan (SDC ENB panels offer operational warranty of over 100,000 hours at 24/7 operations).
- Minimal maintenance as the technology doesn’t come with consummable parts.
- Eco-friendly solution with low power consumption.
- Moderate initial cost.

**Direct view LED video walls**

Direct view light emitting diode (LED) displays are made by arranging hundreds of LEDs directly on the glass panel. Each pixel of a D-LED is comprised of 3 sub-pixel LEDs (red, green and blue). By adjusting the voltage to each sub-pixel, the screen recreates the intended image on the screen.
Since each pixel is made from the three diodes, reducing the size of individual diodes has been a focus of the LED technology players. While the original technology was only used for outdoor installations where displays were viewed from a distance, modern LED panels have shown promise with finer pixel pitches.

**The highest resolution LED walls for indoor use can cost you as much as $25,000 per square meter.** That means that if you were interested in a billboard-sized indoor display, you’d be looking to spend around $500,000 or more.

Key performance characteristics of the direct LED video walls include the following:

**Visual performance**

- Because of the nature of their design, even the latest LED video walls cannot provide as high of a **resolution** and **pixel pitch** as LCDs. Therefore, this technology can only be employed where content is viewed from the distance.
- **Intense brightness** (from 800 nit for indoor to 4,000 nit for outdoor) is the main advantage of LED displays because of the direct light emission. The downside to the high brightness is that it is hard to reduce brightness below 500 nit, which makes it unsuitable for the dark room installations.
- Direct view LEDs provide wider **viewing angles** than DLPs because of the direct light emission. Nevertheless, due to the round shape of individual diodes, they emit more light towards the front—hence when viewed from the side they may produce subpar brightness and color variability compared to LCDs.
- Panels deliver seamless, **bezel-free** design.

**Reliability**

- LEDs have a long useful life.
- Weather resistant to a range of temperatures and humidity levels.

**Design considerations**

- Direct view LED panels are lighter than LCDs.
- Provide design flexibility of shape—flat, curved, or cylindrical—for customized installations.

**Cost of ownership**

- High resolution LEDs are substantially more expensive than LCDs and even DLPs.
- Low maintenance costs.
- Energy efficient.
- Easy to access and service as panels are light.

**DLP video walls**
Digital light processing (DLP) technology uses the optical semi-conductor—digital micromirror device (DMD). This DMD chip is an extremely precise light switch that enables light to be modulated digitally. Under each DMD mirror, there is an electrode causing this mirror to tilt either toward or away from the light source, creating monochrome images with precise shades of gray. Next, the monochrome image is translated into color. A color filter—called the color wheel—is placed between the source of light and a DMD mirror panel. As the color wheel turns, it shines various colors on DMD mirrors, coordinating with each mirror position and producing the color image.

The latest iteration of the DLP technology as it pertains to video walls is the rear projection cube (RPC) solutions with LED light sources.

Let’s examine the unique characteristics of this technology.

**Visual performance**

- DLP video walls deliver relatively **high total resolutions** and a range of aspect ratios.
- DLP displays are **not as bright** as LCDs or direct view LEDs and require control over the ambient lighting conditions. They are not suitable for high ambient light rooms or outdoors.
- DLP solutions provide **broad color gamuts** and superior color fidelity.
- DLP **viewing angles** are narrower than those of LCD or direct view LED video walls.
- While not totally seamless, DLP video walls have **bezels** that are as narrow is 0-0.5 mm, providing nearly undisrupted viewing.

**Reliability**

- DLP video walls can deliver 24/7 performance over extended periods of time.
- DPLs are vulnerable to vibration or instability, sensitive to humidity and heat. They require a temperature controlled stable indoor environment.
Design considerations

- DLP panels are heavy and fragile, with large and deep footprint.
- Cubes need to be mounted to the floor.
- DLPs provide good design flexibility with a variety of options regarding the size and shape, allowing for even non-rectangular and curved installations.
- It is a stackable solution with an advantage of a built-in mounting system—LCDs require mounting frames or have to be adjacent to a wall.
- Require significant efforts during installation and assembly.

Cost of ownership

- Initial cost is significantly higher than that of the LCD technology but lower than of direct LEDs.
- Power consumption is comparable to LCDs.
- Screens are prone to be damaged easily and might need replacement.
- Long lifespan (60,000-100,000 hours at 24/7 operations).

Selecting technology based on application needs

We recommend choosing the display type based on application and installation requirements.

To briefly summarize pros and cons of the video wall technologies discussed:

- LCD video walls are affordable, easy to install and maintain, deliver superior visual performance on all characteristics. They are thin and provide design aesthetics and flexibility, and are highly reliable and resilient. Bezel is the main shortcoming of the technology if legacy solutions are employed.
- Direct view LED solutions’ main advantage is their bezel-free design, extreme high brightness (suitable for outdoors), design flexibility and customization, as well as resilience. However, the cost of the modern, high resolution options may be prohibitive for most buyers.
- DLP solutions deliver high visual performance and nearly bezel-less viewing experience with
superior reliability for 24/7 environments. Nevertheless, these systems are bulky and require additional space for installation and maintenance.

With these characteristics in mind, make sure to evaluate the objectives of your installation and generate requirements and specifications accordingly.

Control rooms

When video walls are employed in the control room setting—reliability, visual performance, and cost of ownership might be primary decision drivers.

For a control room used in security applications, a video wall may function as a dashboard to promote monitoring, situational awareness, and collaboration. Oftentimes security facilities and military operations centers have limited space and require high reliability and highest possible picture quality. For such applications, we would recommend LCD solutions.
However, when a control room’s primary purpose is big data interpretation, requiring showing and examining content with a great level of detail—such as in research facilities—cost and space might be a lower priority comparing to nearly seamless viewing on scale. In this case, DLP or LCD video walls can be a better option than LED.

**Retail, corporate, and public spaces**

For retail, corporate, and public spaces visual performance, design, and low cost of ownership may take precedence over other considerations. If you are looking to display large visuals in outdoor public places where the user will be at the distance from the screen, then direct LED might be a viable option. However, if you are displaying content with the high level of detail in close proximity to the viewers, require high resolution, or have spatial restrictions, LCD video wall is your best option.

**Technology distribution within the video wall market**

Let us look at the market distribution of different applications and video wall technologies.

**Market distribution by the panel type**

LCD technology dominates the video wall market because of the greater balance between its performance characteristics and total cost of ownership. LCD video wall market is expected to further expand, driven by the extreme narrow bezel segment. In the future, widespread adoption of the technology will be facilitated by nearly bezel-less designs.

Direct view LED market share size is quite small comparing to LCDs—but with the new generation of fine pitch products (1-5 mm LEDs) and further cost reduction, this technology’s share of the market is projected to grow at the expense of DLP.

Due to its high reliability and nearly seamless design, DLP still works for specific demands of certain control room applications or installations in large, dark spaces, but DLP video wall market share is expected to decrease in the future to the benefit of other technologies.

**Market distribution by the application**

Now let’s look at the panel shipment volume based on application. LCD remains the prevalent technology across all sectors, LED walls are largely employed within retail and public space applications, and DLP is predominantly used in specialized control room settings.
Video Wall Technologies Compared

- **Control room segment**
  - Control room: 38%
  - LCD: 73%
  - LED: 25%
  - DLP: 2%

- **Public space segment**
  - Public space: 25%
  - LCD: 81%
  - LED: 16%
  - DLP: 3%

- **Retail segment**
  - Retail: 21%
  - LCD: 82%
  - LED: 17%
  - DLP: 1%
All video wall technologies have a range of unique characteristics that make them a great fit based on the requirements of each individual installation—desired features, application, environment, and budget.

We hope that this overview helped you to consider what requirements your installation should satisfy and to start considering specific technologies that can help you achieve your goals.

If you have any questions or need help in finding the best video wall solution, please do not hesitate to contact the Samsung Display team.