Projectors 101:
Educate Yourself About Projectors

The Projector Expert White Paper Series
Overview: When Should I Buy a Projector Rather Than a Flat Screen Television?

Often, for gamers and movie viewers, a projector offers a more affordable way to capture immersive and compelling big-screen entertainment. For businesses, a projector provides flexibility and big-screen images that add impact for better business results.

You probably want to buy a projector if:

You want the largest possible picture. On the high end, projectors can be used to create a very large image size, as much as 300” or more. Most produce high-quality images at a size of 90 to 180 inches. Flat screen televisions, by comparison more commonly offer screens from 32 to 70 inches. Professional installers, working in large venues, can double stack multiple projectors to create huge images.

You don’t have the budget for a flat screen TV. Particularly with projector technology dropping in price, a projector may be the least expensive option to create a big-screen viewing experience at home. At the same time, television technology has also dropped in price—so there is some crossover between higher-end projectors and smaller HDTVs.

You don’t have enough space for a large TV. A small projector can easily perch on a coffee table, shelf or bookcase or be mounted on the ceiling so that it takes up little to no floor space. When not being used, a projector can be tucked away in a closet and then brought out for special events and parties (Super Bowl, Academy Awards, etc.) or set up outside to create an outdoor home theater experience.
You want to take your games or movies along with you. Portable and ultra-portable projectors can be readily taken to different locations to share games, images or movies with others. Some of these projectors can also be used outdoors or in other locations where a television is not readily available.

You want to create an immersive 3D experience. Some projectors integrate 3D capabilities. 3D content from video games, movies and sporting events delivered from video game consoles, Blu-ray 3D players or satellite televisions look more realistic and are much more engaging when displayed with image sizes greater than 100 inches. In addition, 3D projection offers a wide viewing angle that optimizes the experience for multiple viewers.

You want to customize your sharing and viewing experience. Especially for business users, the ability to project documents and share presentations is important. A projector with a Secure Digital (SD) or microSD card slot and built-in media player may provide PC-free viewing of Microsoft Office files (Word, Excel and PowerPoint), as well as Adobe PDF documents, pictures, videos and more. Portability ensures that you can share media anywhere.

You don’t want to buy multiple displays. Even if you want to create a smaller image (50 or 70 inches), a projector can provide a budget-friendly alternative to purchasing flat screen televisions for more than one room. A projector can be easily moved to wherever you want to view your content.

Technology Buying Decisions
What’s My Primary Use?

When choosing a projector, users should first consider how the projector will be used. Although projectors are often used for a myriad of activities, from video games and movies to presentations, one use will usually stand out. For best results, choose a projector that provides the key features that support the primary activity of your projector.

Large Venue: These projectors, which are used in rooms that support large audiences, need high brightness and good contrast. Most users will also want to consider other high-end features such as network support for remote management and control, a dual-lamp design for robust operation and multiple lens choices for installation flexibility.

Conference Room: A high-lumens projector will deliver bright and clear images that will provide impact for presentations even in rooms with ambient light. Look for a data projector that comes with a feature-rich remote control and easy-to-use features so presenters waste no time in getting to their presentations.
Home Office: Often, small office users are looking for a projector that is affordable and portable—so that it can be moved to allow presentations to happen wherever needed. Traditional lamp projectors provide higher brightness and business-ready features for organizations that need the most presentation punch. Meanwhile, LED technology provides long-life operation without maintenance, while Optoma’s Pico projectors fit readily into pocket or briefcase to take along.

Home Theater: Big-screen images are the key for a home theater, along with vibrant colors and excellent picture quality. Look for a “multimedia projector” that delivers high color saturation and robust contrast ratio to ensure that movies and other projected images provide an exciting and immersive experience. Projector size will drop down on the list of important features, while an easy-to-use remote control will still be a must-have. You may want to consider 3D capabilities to allow viewing of the quickly growing list of available 3D movies, television and other content.

Gaming: Gamers basically want it all from breathtaking video to easy-to-read text, so resolution, brightness and contrast ratio will all be important. Integrated stereo audio capabilities give gamers the versatility to take their gaming wherever they go while maintaining gaming excitement. In addition, 3D capabilities will create a future-proof way to take advantage of new and emerging 3D gaming titles.

Mobile: If you know that you’ll want to take your projector along wherever you go, you’ll probably want to consider a Mobile LED or Pico projector. These projectors, which weigh from less than three pounds to just a few ounces, often provide PC free viewing of Office documents, as well as quick-to-project features to let you get up and running quickly.

Education: Projectors are basic equipment in classrooms. In these rooms, short throw and ultra short throw projectors let educators create large and impactful images even in small spaces. 3D and interactive features further enhance teaching.

Interactive: These projectors are an excellent solution for classrooms and training facilities that want to enhance learning and get students involved in presented subject matter in new ways. Interactive projectors, which mimic a smart board, can project on any surface in the classroom, making educational applications compelling for students. These projectors work seamlessly with interactive software applications which are run on a computer and projected on a screen.

Whatever your main use, it is important to understand the basics of projection before investing in a projector. Think through the basic questions outlined below to find out the right projector for your business or home.
Light Source: Lamp or LED?

Most projectors use a specially-designed, high light output lamp, which provides brightness to project an image. Lamp-based projectors provide the greatest brightness and are the choice for those who need to project to large audiences or rooms that have ambient light. Projectors in this category also tend to offer the most advanced features, such as networkability, high brightness and more. Lamp-based projectors are the choice for larger rooms and applications where high brightness is needed.

The smallest projectors, called Pico projectors, use solid state technology, such as Light Emitting Diodes (LEDs). LED technology has not achieved the highest levels of brightness yet, but do offer good color quality. These units, which are designed for portability, are desirable for low power consumption (which enables use of battery power and increases portability). LEDs last 20,000 or more hours without needing to replace the light source. LED projectors are a great option for those who need portability.

LED projectors generate less heat and demand virtually no maintenance. Meanwhile, since LEDs incorporate no lead or mercury, these projectors provide a compelling solution for those seeking a greener projector.

The LED-based design, in addition to being environmentally friendly with low power usage and does not use mercury and other hazardous materials, allows for cool operation which in turn allows for its compact size.
How Long Will My Lamp Last?

Most projectors use high-intensity discharge (HID) lamps as a light source. Lamp life is measured in hours (example, 4000 hours), which for most users will translate to years of use. Over time, the brightness of the lamp will deteriorate. When buying a projector, it is important to consider not just the cost of the unit, but also the cost of replacement bulbs, factored over the life of the projector.

An LED light source has an estimated lifetime of more than 20,000 hours (equivalent to using the projector four hours every day for over thirteen years). LED is incredibly cost effective compared to lamp-based projectors. For example, users with a lamp-based projector would have to replace the lamp in the projector at least four times over 20,000 hours of usage—at a cost of over $800, compared to the completely maintenance-free LED lamp.

3D or Not?

Many projectors promise to be able to deliver 3D images. However, there are a variety of terms, each one meaning something slightly different. “3D-Ready” and “3D-Capable” projectors, for example, will accept and display 3D signals from a computer with 3D content and a 3D capable graphics card. These projectors, meanwhile, must be paired with a converter box, such as Optoma’s 3D-XL box, in order to project 3D content from Blu-ray 3D players, set top boxes and game consoles. Finally, to be “Full 3D” compatible, the hardware must support High-Definition Multimedia Interface (HDMI) 1.4a which will allow it to connect directly to a broad range of 3D output sources including television set top boxes, Blu-ray 3D players, 3D gaming systems and more.

3D features are important if you are intending to invest in the equipment and content to project in 3D. However, investing in a 3D-Ready projector, the main component of your 3D system, gets you only part way to 3D display. You also need a 3D-compatible video source, 3D glasses and 3D content.

Check carefully to ensure that all the elements of your 3D system are compatible. For more information on 3D projectors, read Optoma’s white paper Clearing the 3D Confusion: What You Need to Know, which can be found at www.optomausa.com.

How Much Brightness Do I Need?

Brightness (how much light the projector can produce) is measured in “ANSI lumens.” The brightness level that you need will depend on three factors: the content (movies, presentations, games, etc.); the image size (measured diagonally in inches); and the brightness of the room (ranging from dark to full lights). Each of these elements affects the others. For example, if you want to project a large image to a large audience, you should choose a bright projector and dim the lights as much as possible. If you want to project a detailed image, you may want to minimize the brightness of the room.
When choosing a projector, aim to buy a product that is best suited to your most-often chosen activities, such as sharing business presentations, watching movies or playing games. When using your projector, optimize the light in the room to the brightness of your projector. Brighter rooms need a projector with higher lumens. For dark rooms, 1000 to 1200 lumens should be sufficient, although often classrooms and conference rooms need 2500 lumens or more. In addition, if you are projecting large images clearly, you’ll want a projector with a higher brightness rating. When choosing your projector, consider your application, the size of your group, the size of your room, the screen size and the amount of light in the room.

### How Many Lumens Do I Need?

<table>
<thead>
<tr>
<th>Lumens</th>
<th>Who Should Use This</th>
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<tbody>
<tr>
<td>500 or less</td>
<td>On the go, small groups</td>
</tr>
<tr>
<td>700 to 1000</td>
<td>Budget conscious, small groups of five to 10 people</td>
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<tr>
<td>1000 to 2500</td>
<td>Normal business and classroom use, as well as home theater, groups of five to 15</td>
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<tr>
<td>2500 to 4000</td>
<td>Projecting in conference rooms and classrooms</td>
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<tr>
<td>4000 lumens and up</td>
<td>Large conference rooms, auditoriums, concert halls, bars, nightclubs, churches and other large venues</td>
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### What Resolution Do I Need?

Resolution is the term used to describe the number of pixels, used to display an image. Higher resolutions, meaning that more pixels are used to create the image, allow you to display more information (greater detail) on your screen and create a crisper, cleaner image. Today, you’ll see a number of possible resolutions: SVGA (800x600 pixels), XGA (1024x768 pixels), WXGA (1280x800 pixels), 720p (1280x720 pixels), 1080p (1920x1080 pixels) and WUXGA (1920x1200 pixels). You can see this is a broad range of resolutions with the number of pixels used ranging from 480,000 up to 2,304,000.

For entry-level presentations, 800x600 pixels may be sufficient, but for other uses (such as larger images or advanced presentations) you’ll want a higher resolution, such as 1080p. The highest resolutions may be needed for presenting detailed autoCAD drawings, photos or video. Some notebook computer users may want to choose a projector that supports widescreen resolutions.
What Contrast Ratio Do I Need?
Contrast ratio measures how well a projector can reproduce black and white (or how black is the blackest black and how white is the whitest white). The simplest way to explain this measurement is to say that it’s the difference between the darkest and brightest spot on the image being displayed, which is communicated as a ratio.

Although contrast ratio is of interest to those using projectors for still presentations (especially if the presenter uses a lot of text or black and white charts in the presentation), this measure is more important if you will be projecting video. Basically, a higher contrast ratio indicates a greater ability for the projector to show subtle color details and tolerate extraneous room light. Keep in mind that when there is ambient light in the room, the practical contrast ratio may be dramatically reduced.

What Input/Output Options Do I Want?
Today's projectors offer an array of input and output connectors. A projector with both HDMI and VGA ports lets you connect to a variety of video sources, including set-top boxes; DVD, Blu-ray players; camcorders; PCs; video game consoles; and AV receivers. HDMI (High-Definition Multimedia Interface) supports, on a single cable, any uncompressed TV or PC video format, including standard, enhanced and high-definition video. VGA allows users to readily connect the projector to a PC or other VGA-compatible device.

What Should I Consider Concerning Projector Size and Weight?
Common sense should reign when deciding on what size projector to buy. The smallest Pico projectors can be readily slipped into a pocket or briefcase, while larger, but still portable projectors can be brought along with little effort. Consider whether you will be travelling with your projector and choose accordingly. Many projectors weigh six pounds or less and come with a carrying case or backpack, making them easy to carry along. For a heavier projector, a hard-sided case with wheels will ease transport. Pico projectors, meanwhile, weigh in at less than half a pound and fit into a pocket, purse or briefcase easily.
On the other end of the spectrum, mountable projectors can be much heavier. With the appropriate mounting hardware, these projectors can be safely mounted on the ceiling in a way that accommodates the projector weight. On the high end, installation projectors which are mounted in large auditoriums can weigh 50 pounds or more. These projectors should be installed by a professional installer to ensure safety and best performance. Meanwhile, ultra short throw projectors designed for classrooms and home theater projectors weigh around 15 to 20 pounds and are designed to be easily mounted.

**Are Projectors Environmentally Friendly?**

Every projector manufacturer has its own Green policy that covers the types of materials used in manufacturing and how products are handled at end of life. Normally a European standard, many projectors sold in the United States comply with RoHS (also known as Lead-Free) and WEEE (which sets collection, recycling and recovery targets for electrical goods). LED-based projectors, which naturally use less power, are attractively green choices.

**What Else Do I Need to Know?**

Today, projectors are a common tool in many businesses and a staple of home entertainment in some homes. These products continue to evolve to deliver higher brightness, better picture quality, sophisticated features and more. To figure out what kind of projector will best fit your specific needs, visit Optoma’s solution finder at http://www.optomausa.com/products/solution-finder.
Optoma is dedicated to leading product innovation with products that deliver the best of the newest capabilities, as well as accessories to help users get the most out of their projector. For more white papers, case studies, tools and product information, visit Optoma’s Web site at www.OptomaUSA.com.

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