igloo

What to consider when selecting the display technology for your immersive space

LED panels or projectors?

How do projectors and LED panels compare?

At Igloo Vision, we've been creating standout immersive installations and events for clients around the world for over a decade.

That means we know what you need to bear in mind whether you're installing an innovation hub, customer experience centre, immersive sales suite, and so on. And that goes for cylinders, domes, cubes, immersive workspaces, etc, etc.

Every Igloo installation or event is powered by the Igloo Immersive Media Player, which is a content-agnostic and display-agnostic tool to get your digital content into a shared immersive space.

As more-and-more clients are investigating the possibilities of shared immersive spaces, they're asking about the best display technology to power those spaces.

Increasingly, they're wondering whether to go with an array of LED panels or a rig of projectors.

And sometimes, clients might have already made their mind up - but might not have weighed-up all the considerations there are when choosing one type of display over the other.

So, we wanted to put together this primer on the two technologies and how they compare in the areas that matter most.

The Igloo perspective

Because our Igloo Immersive Media Player is display-agnostic, it doesn't matter to us whether your immersive installation ends up using projection or LED.

What does matter is using the best display for your use case. And because we've created all sorts of innovation hubs, simulation rooms, marketing suites, visualisation spaces, customer experience centres, and so on, we know exactly what to use for whatever your use case is.

But remember, this is a snapshot

The great thing about what we do is that technology is racing ahead, both in the world of projection and in LEDs.

That means ever-more functionality at ever-lower costs as the respective manufacturers pack more-and-more features into their solutions. So as we write from 2020, we can't wait to see where both technologies move over the next few years.

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1 The display - how will it look?

Of course, the most important factor in the decision on display technology is how the display will actually look. And what you need from your display will, naturally, depend on your use case.

How bright does your display need to be?

We perceive the light from LED panels and projectors differently. This is because LED panels directly emit the light, whereas projectors throw out their light onto a screen, and that light is then reflected back to our eyes.

So it's probably not surprising that LED panels get brighter than projectors. This makes them ideal for displays where there's a lot of ambient light. It's why, for example, you'll be used to seeing LED panels for outside displays - think Times Square in New York. It also makes LED panels great for broadcast situations. With projection, the ambient light impacts the projected light between the projector lens and the screen.

In those scenarios, you may also be using a lot of stage lighting. So bright LED panels will be able to shine through all that ambient light. With virtual and hybrid events and presentations becoming more the norm, LED panels are the perfect display for combating the ambient light.

Green screening in a galaxy far, far away...

When filming The Mandalorian, a curved LED screen was used instead of a traditional green screen. Actors performed inside a massive 270° LED screen, which played back digital 3D environments interactively. The environments were rendered and lit as if from the perspective of a real camera in Unreal Engine. Basically, it meant they could create fantastic scenes without the need for on-location shooting. And the super-bright LED screen could combat the ambient stage lighting. It even helped to light the film subjects themselves.

This said, depending on how long you'll be looking at the display, a super-bright LED panel isn't always the most comfortable viewing experience. Reflected light is easier on the eyes, and viewing content via projection can reduce eye strain (if you think about it, reflected light is how we're used to seeing the world around us, so it's more natural). So if you're looking to use an Igloo as a classroom, where students need to look at the screen for a long time, projection may be preferable.

While projectors tend to get bigger the brighter you go, this isn't the case for LED panels, which is something to bear in mind when space is at a premium. However, projector technology continues to move apace and there are new innovations that solve this particular problem, such as separating the light source from the projector head itself.
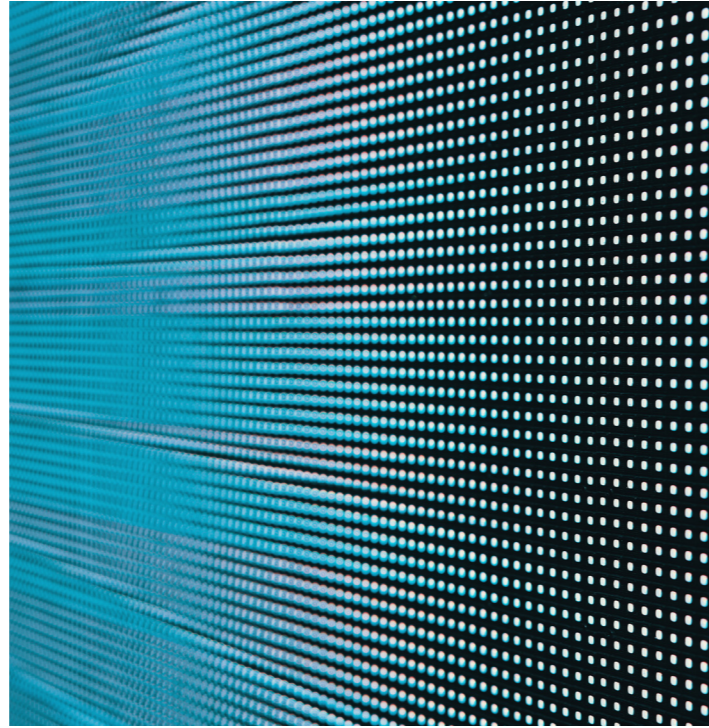
How much control do you want over contrast?

With projection, you can get greater control over fine-tuning your black levels compared to LEDs. But projectors will never reach the same level of contrast.

With LED panels, you can get super-great contrast. That's because, to get black, you actually 'turn off' the bulb emitting light for a particular pixel. Projectors can't do this - so with LEDs, you get 'blacker blacks' than you would with projection.

And, you will need to bear in mind that the darkest a projector can get will depend on a combination of the colour of your projection screen and the level of ambient light. It's possible to get ambient-light rejecting screens that can combat some of the ambient light, but this does come at a higher cost.

How lifelike does the image need to be?

Particularly for clients with a simulation or visualisation use case, image fidelity is incredibly important. If you really want to transport your teams or audience, they need to almost forget that they're looking at a simulated image. And, in this all-important regard, projectors will generally win out.

Have you ever noticed the screen-door effect when looking at LED panels?

That's caused by the ever-so-fine lines between the pixels - the eye sees the lines rather than the image itself. And it's something you can often notice even just a few feet away from an LED display. (As an example, for LED panels with pixel pitch of 1mm, you'd need to stand just over five feet away to avoid the screen-door effect - and to get smaller pixel pitch, you'll be paying for the privilege.)

Or put another way, fill factor is an important metric when looking at LED panels and projectors. Fill factor describes the area of a pixel that is active - the higher the better. And projectors tend to have a higher fill factor.

For the most seamless image, you need to pack in as many pixels as possible into the same space. When you're after a lifelike display, fill factor is super-important to avoid the eye being able to see those individual pixels.

2. The cost - what works best for your budget?

For many clients, cost is a big factor (possibly the biggest) in decisions around installations. And, of course, the more technical or complex your needs, the more expensive your display technology will be.

When you go brighter, or go higher resolution, the costs will increase accordingly for both LED panels and projectors.

Still, for both technologies, you can scale-up or scale-down according to your budgetary constraints. For example, with LED screens, if you want to reduce the screen-door effect you'll need to upgrade to a higher pixel pitch, which will cost you more.

And, for projection, if you want to reduce shadowing as you approach the screen, you'll need to use ultra-short-throw lenses which will bump-up the costs. Similarly, for super-bright, super-sharp imagery, you'll most likely be looking at laser projectors over lamp projectors - which are again pricier.

Right now, on a like-for-like basis, projectors tend to win out. In the case of one anonymous Igloo client, when pricing out a design using LED panels, the cost was estimated to be around US$2-3 million, whereas the same design using projection came out around US$600,000 - that's quite a premium.

But, as manufacturers continue to pack in more capabilities at lower costs, we'll see these margins get ever closer.

At Igloo, we're familiar enough with both kinds of display that we can work with you to tweak specifications of either LED panels or projectors to come out with a cost that suits your budget and your needs.

The installation - which technology will work best for your space?

What are the heating, ventilation and air conditioning (HVAC) considerations?

Naturally, both display technologies generate heat, so both will come with HVAC considerations. The bigger and brighter they are, the more cooling you'll need. And the HVAC itself will take up space in or around your installation.

For LED panels, you may need to consider including space behind your LED array to allow for proper ventilation which can add to the space needed.

It can be a similar story for installations using projection rigs, as you will probably need to have an air conditioning unit outside of the installation itself to avoid encroaching on floor space.

Once again, this is something that's being worked on by manufacturers. LED panels are constantly being refined to be more heat-efficient. And more-and-more LED panels expel their heat from the front row, reducing the need for air conditioning behind the panels. Meanwhile, projectors can be designed to separate out the heat-generating light source to a different location, along with its associated heat management requirements.

> **Because we've worked on all kinds of immersive installations, in all kinds of locations, we're well-equipped to advise on HVAC requirements. Whether it's installing a standalone structure, integrating into existing space, or advising on a brand new building, we can bring in our expertise.**

How easy is it to install, calibrate, maintain and upgrade the display?

Of course, LED panels do have an easy advantage in that you don't need to warp and blend your content, which you'll always need to do when you have multiple projectors for an installation. The proprietary Igloo Warper software helps to make this an easy proposition for projection mapping, with the option for us to remotely warp your system if needed.

It's often assumed that LED panels are lower maintenance than projectors. When we're comparing lifespans of up to 100,000 hours for LED panels in some cases, against lifespans of between 20-30,000 for laser projectors, it's easy to see why.

However, for whatever reason, some LED panels won't reach the predicted lifespan. And, when purchasing you will need to get a few extra - that's because, if a pixel fails in your display, you need to replace it with a panel from the same batch. Otherwise, a replacement panel won't match the rest of the panels in the display.

While projector installations do have several components to consider - the projectors themselves, the rig, the screen - this does make for a modular installation. So, when looking to upgrade, you can do this bit-by-bit, rather than needing to upgrade or replace the entire lot as you would with an LED installation.

But if you're looking to achieve an ultra-bright display with projection, the size of the projectors can hamper you - indeed, if you want over 20,000-lumens, you can be looking at a projector weighing well over 100kg. That's not to mention the complications of installing a rig of perhaps five of those beefy projectors; you've got to ensure your rig can support such weight.

> **Both types of technology come with their own quirks and installation considerations. We can work with you and other contractors (architects, builders, integrators) to ensure everything is fitted perfectly.**

What about screens?

Because the LED panels themselves are the 'screen', there's less to consider in terms of installing the corresponding infrastructure. And, with curved LED screens available, it's possible to create a wide variety of screen shapes and sizes.

For projection, you'll need to rig the projectors themselves, whether they're ceiling-mounted, floor-mounted, wall-mounted, or on a standalone truss. And you may need to get a screen too - that's the case if you're installing an Igloo cylinder or dome.

But, projection mapping allows you to quickly and easily project onto existing walls, floors, ceilings. Indeed, with the Igloo Immersive Media Player, you can retrofit existing meeting rooms simply by painting the walls an appropriate colour and installing projectors. No need to fit with new LED displays. But you'll certainly need multiple projectors to cover every inch of a room, with more needed for more oddly-shaped rooms.

Also, for unusually shaped installations, LED displays can be difficult to source - for one Igloo design, the required LEDs would have taken up to 18 months to arrive from the vendor.

> **If you're looking to transform an existing space with minimum fuss, projectors and projection mapping could be the way to go - although a paint job might be in order to get the perfect projection 'screen'.**

When deciding on your display solution, you need to bear in mind your use case

Here are some possible scenarios:

THE USE CASE	PROJECTORS	LED PANELS
Outdoor display or signage	The display will be easily washed out by the ambient light, even when using the brightest and most expensive projectors.	Super-bright LED panels will be able to combat the ambient light for a clear image.
A simulation or visualisation suite	You can get true-to-life imagery with projection that can enhance the sense of presence for participants. When done with ultra-short-throw lenses, you'll be able to get even closer to the screen without shadowing.	Depending how closely the LED panels will be viewed, the screen door effect can hamper the seamless image which can break immersion. Higher pixel pitches can combat this and improve the viewing distance.
An open-fronted installation	Depending how 'open' the system is, brighter projectors will be able to combat some of ambient light and still produce a clear image.	LED panels will, again, easily shine brightly against the ambient light for the clearest possible display.
An immersive workspace	Projection can be easier on the eyes and make for a more comfortable viewing experience, especially after a long time and would be suitable for team meetings.	Depending on the size of the room, people may be close enough to experience the screen door effect. LEDs, as direct light sources, may not be as comfortable for long-term viewing.
Broadcasting or virtual stages	Broadcasting requires bright studio lighting which will cause projection to appear washed out.	The bright LED panels will still look incredibly vibrant even against studio lighting and will look great in a broadcast. And, because an LED panel's refresh rate can be up to 3120hz, this reduces the appearance of flickering when filmed.

We hope this gives you some food for thought on which technology is best suited to your particular use case

And to give you an idea, Igloo immersive technology has been used to create:

- Innovation hubs
- Immersive meeting rooms
- Customer experience centres
- Data visualisation suites
- R&D facilities
- Training centres
- Site offices

In the end, both display technologies can be used to create standout installations. And, because the Igloo Immersive Media Player is ever-so-flexible, at Igloo we're able to create immersive installations that will not just meet your expectations, but exceed them whether we're using LED or projection.

For more information

Igloo Vision is the shared immersive space company

From bases in the UK, USA, Canada and Australia, we work with clients worldwide. We've delivered over 500 immersive installations and events. We've created unique installations for the likes of:

- Accenture
- Microsoft
- Cushman & Wakefield

- NTT
- Lendlease
- Lanes Group
- Marriott
- Extell

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