Projection mapping primer

Great projection mapping projects are the successful combination of powerful ideas and compelling structures, the right technologies, experienced, skilled people and creative work that make audiences stare in wonder.

Getting started requires an understanding of the stakeholders, technologies and operating demands, as well as how to think beyond a structure or object as a screen, and develop a big idea and plan that has a lasting impact.

Defining the key players

There are many players who are involved in conceptualizing, creating and appreciating stunning projection mapping displays. The following are some of the groups that come together for a typical installation, but this may vary depending on the project.

**Clients:** They initiate the request for a projection mapping installation and define the core requirements for the project. They can include anyone from consumer brands, museums and government to nightclub and theme park operators.

**Stagers:** The specialist companies that focus heavily on the event business, usually renting the projection and related hardware needed to “stage” events, and providing the assortment of skills and experience needed to design, manage and execute projection mapping spectacles.

**Content Developers:** While many staging companies have in-house creative capabilities, production studios focus specifically on the output of the projection systems. They conceive and produce the video and motion graphics that transform objects and structures.

**Systems Integrators:** Professional AV and IT systems companies have the necessary experience and broad understanding of all the requirements - from optimal technology choices to light and noise restrictions - needed to execute successful projects.

**Audience:** No amount of investment in technology or creative matters unless it has the desired effect - from pure wonder to calculated brand awareness - on the viewing audience.
## Projection mapping display components

### Scaling, warping & blending systems

Production and playback systems organize and choreograph motion graphics, video, stills, sound and live camera feeds across a broad canvas illuminated by multiple projectors and sources.

Often, one visual is too large to be driven by one projector, so edge blending and related tools stitch multiple displays together to create one image with no perceptible seams. In other cases, technology does the work to create a mosaic of visuals. This scaling, warping and blending is achieved with software or with hardware management and switching devices supported by software that can layer, mix, define, shape and blend sources.

### Playback devices

Any PC or video source can send a display signal to a projector or management and control device but several companies have developed PC-based playback systems that are specifically tuned to the high-performance demands of projection mapping projects. These devices are capable of sending out resource-intensive, uncompressed video and doing real-time video processing. Some incorporate the show controls of scaling and blending systems.

### Software

Pure-play software companies focused on demanding projection work development tools make projects easier to set up and optimize for the viewing audience. Many companies offer tools that manage soft-edge blending and image warping and make what can be a long, painstaking process of aligning projections and stacking projectors relatively fast and easy. There are also software applications designed to make real-time projection - for users such as live performance veejays and live theater designers - both flexible and simple to use.

### Displays

Many display manufacturers offer consumer and office-grade projectors, but very few of those companies have the engineering, experience, installed footprint and support to drive super-bright visuals for mapped surfaces of any size.

The same technology foundation that drives the most advanced digital cinemas around the globe is used for a variety of powerful commercial projectors applied to mapping. Projector choices are driven primarily by the amount of lighting power needed by the project.

### Vision systems

A handful of companies have developed solutions that take much of the complexity out of managing and unifying multiple displays. These systems can blend the outputs of multiple projectors - even commodity, non-professional projectors - and deliver them as unified, malleable displays.

### Enclosures

Specialty companies design and fabricate enclosures for sensitive projection systems that offer protection from the damaging effects of heat, cold and condensation - both for temporary and permanent installations.

### Additional sensory features

Audio and olfactory are also important considerations to support and enhance the projection mapping event, creating a multi-sensory experience.

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Christie also offers hardware and software solutions that accomplish expert scaling, warping, blending and content management — easy to integrate, use and maintain.
Putting a project together

Objectives
The best technical and creative work invariably traces back to a well-considered and fully-defined set of communications objectives. The client should be clearly able to express an idea and a desired outcome.

That outcome can be generating excitement and viral buzz about the public launch of a new consumer product or brand. But it can as easily be an effort to help make an audience aware of a milestone - like a centennial - and reflect that in visuals that make people both appreciate and understand the significance.

It can be a monumental statement or used to help create or complement an environment – like ambient visuals for a party. In those cases, the visuals are intended as accents that energize the space and set a tone but are not intended as focal points.

Audience
Many questions need to be asked and explored about the audience for a projection mapping project. These include:

- How large is the crowd? Are they seated or standing?
- How far back will they be?
- How wide is the viewing zone and will those at the sides see the visuals properly?

- Does the performance include audio and if so, what’s the audio delivery technology?
- Is this a scheduled performance that people come to watch with a hard start and finish or is it intended as continuous ambient material? Or something else?
- Do the content plans and objectives make sense for the composition of the expected audience and the tone of the event? (For example: Is what’s planned appropriate?)
- Are there any aspirations to make the event interactive with audience participation through gestures, sound or other means?
Characteristics
What are the characteristics of the structure or object that will be mapped and how will its contours, shades and physical properties affect the ability to deliver a compelling visual spectacle?

Traditional projection works with flat, planar surfaces that offer uniformity and a surface optimized for visuals. Projection mapping is almost invariably applied to surfaces that are not flat or uniform, or in some cases, even solid. Projections have been done successfully on vapor screens created by water jets.

Ancient castles, cathedrals and massive, complicated and modern structures present endless variations in surfaces, color and dimension. A castle will have different types and shades of stone, as well as crenels, merlons, slits, hoardings, rounded towers and curtain walls that somehow have to be unified for a cohesive visual presentation.

If the surfaces are outside, the color may change when it rains and make a light surface dark and the projection muted.

Ultra-modern structures, like the sails of Sydney’s iconic opera house or cylindrical curves of New York’s Guggenheim Museum, present a uniform color palette, but are anything but flat, requiring precision scaling, warping and blending.

Even the tall, rectangular modern office towers in city centers around the world present challenges. They’re usually flat and uniform, but the glass of the office windows – or the full tower facade – can’t reflect light. Projections pass through unless the glass gets a layer of reflective film or scrim.

Finally, the sheer scale of the targeted surface will dictate how many projectors, and what kind of lighting power, will be needed.

Site conditions
Technology and creativity can overcome the characteristics of most structures and objects targeted for projection mapping projects, but a thorough site inspection at the start of any project is essential.

Both the technical and creative leads need to inspect the site and the environmental and physical conditions that can affect the presentation and technical operations.

Those considerations include:
- The amount of ambient, surrounding light
- Obstructions on the projection path, such as trees, streetlights and power poles
- For live performances, the movement of people potentially in the projection path
- The distance, location and height of projector positions, which informs decisions on the brightness and number of projectors needed, as well as the lenses and media devices
- Power availability
- Weather conditions, not just temperatures and moisture, but wind as well
- Rooftop access or line of sight window access

Local approvals
Projects in public spaces will almost invariably be subject to the rules and regulations of local governments, and those can vary considerably even within the same metropolitan area.

Bylaws affecting advertising, lighting, noise, temporary structures, public gatherings, traffic and parking may all affect not only the scale of a project, but also whether it will even be allowed. It may take multiple approvals – because of jurisdictional rules and coverage – to get approval for one event.

Involving someone on the project team familiar with the local government and its regulations is often critical to executing a project, particularly on the planned timeline.

Timelines
Every project is unique, but more time for planning, development and execution tends to have direct ties to excellence.

Projection mapping projects have been pulled off in as short a period as one week, but industry experts prefer to have much more time to fully deliver on objectives, as well as control costs and minimize chaos. The most ambitious projects can take a year or longer from the idea stage to the event launch. Some have taken many years in planning and approvals.

Integrators and staging companies can often respond on relatively short notice, but what truly takes time is the creative. Minutes of motion graphics and video can require weeks or months of work to take through the idea stage, storyboard concepts, drafts, revisions, rendering and testing.

In rare cases, creative is available that readily translates to the targeted projection surface. But projection mapping done
Projection Mapping Primer

Two Months Out
- Site planning completed
- Approvals/permits completed
- Technology reserved
- Site infrastructure booked

One Month Out
- Final versions of content being completed

Two Weeks Out
- Client sign-off on content
- Content rendered
- Site preparation started

Two Days Out
- Equipment arrives onsite
- Final set-up
- Onsite testing
- Dry runs

Event Date/Launch

Project team
Typical projection mapping projects include these key roles, along with the teams and individuals who support them:

Producer – The overall project lead – usually someone who bridges both creative and technical skills.

Projection designer – The person who is experienced both with the design and the media.

Technical director – The person in charge of the technical scoping and execution of the project.

Creative director and design team – Charged with driving the creative process.

Project manager – While the producer handles the project at a macro level, a project manager is critical to mind and guide the 100s or 1,000s of details.

Lobbyist – The person charged with gaining approvals for use of logos in public spaces or projection on buildings from cities, municipalities, etc.

Installation team – Very different and distinct skills are needed to get the structures, cabling, connectivity and other elements in place at the event site, and then do the precision work necessary to optimize the presentation.

well is much more than finding a massive surface to run broadcast or online creative. The best projects use structures as so much more than screens.

Local approvals can also stretch timelines because of paperwork, process and even public hearings.

Budget
Brighter projectors and software are steadily reducing costs on projects by illuminating a broader surface with fewer projectors and either automating or greatly simplifying many of the planning and set-up tasks – like alignment – that historically have required many man-hours.

But some things – such as creative costs – can’t easily be resolved through technology.

The good news is the producers of most projects, unless they are designed to be permanent, can limit capital costs by renting the projectors, related technology, structures and other gear required to execute an event.

Once a site survey is done, an experienced producer will have the knowledge and tools to estimate how many projectors will be needed and what supporting infrastructure is required on site. The producer, creative director and client need to then collaborate and reach decisions on the breadth and complexity of the creative, which will help arrive at an estimate on those costs.

Because of the complexity of projection mapping projects, and since no two projects are alike, each installation requires careful budgeting so that costs can be contained while achieving a spectacular show. Depending on the requirements, an installation may also require as much coordination and equipment as a major public concert in an urban area.

However, experience is showing tangible returns in ways such as earned media from both mainstream and social media. The buzz from big events has direct monetary value. The organizer of a massive projection event in Moscow for Russia’s Alfa-Bank suggested, for example, the overall costs were in line with a month-long national TV and outdoor ad campaign, but probably much more effective in media terms.
The big idea

The true wonder of projection mapping comes from the effect of the illusion, where the audience cannot really piece together what is going on.

A structure they thought was familiar is transforming in front of them – in crazy, visually wonderful ways – and they can’t quite figure out how.

“It’s magic,” says projection mapping expert Bart Kresa, “when the audience doesn’t see this as being done with projection … when the audience doesn’t really know how it happens.”

Kresa has used projectors to shape-shift everything from a Chiang Kai-shek Memorial in Taipei, Taiwan to a Warner Brothers backlot with overpowering color and organic motion visuals.

In its highest forms, projection mapping is art on a massive scale – the transformation of a familiar object or structure in a way that makes people stare in pure wonder.

One of the things we are always trying to do,” explained Obscura Digital co-founder Travis Threlkel in a presentation, “is inspire people and capture the audience’s imagination … get people thinking and dreaming.”

Obscura has celebrated the beauty of Islam on the marble walls and towering minarets of an Abu Dhabi mosque and turned the seaside facade of a San Francisco science center into a living lab.

Storytelling power

From telling the story of a city on a wide stretch of riverside grain silos to bringing an ancient Egyptian temple back to life, projection mapping has enormous storytelling power, and offers an equally huge creative outlet to digital artists.

“The cool thing about having pixels everywhere in these massive megapixel canvases is the potential - potential realized on physical real estate, with the necessary resolution, to convey an exhibitor’s theme in any way imaginable,” says Roy Anthony, a senior solutions architect at Christie Digital Systems.

But it’s not always about grand scale. Among the projects guided by Anthony was an augmented reality demo that enabled car shoppers to change the look and color of a car using a touch screen with precision projections on a 3D-printed scale model of an Audi R8.

Coming up with and then executing the big idea for a projection mapping project requires a blend of vision, ingenuity, technical knowledge and considerable experience. More and more tools are coming along that make execution easier, but being technically able to do something doesn’t mean the output will be great.

Starting with a concept

That big idea first needs a concept and visual narrative built around it. On ancient or landmark edifices that storyline may come relatively easy, as the visuals are often tied to the history of the structure and its surroundings.

In other cases, big surfaces tell entirely different stories tied to an event or brand, working with the surface primarily for its visual interest and sheer scale.

Fundamentally, projects need a purpose and goals. “We always begin with our objectives,” says Threlkel. “What are we trying to do?’ … and then we work backward from there.”

The biggest challenge is the structure – be it a building, famous landmark or even an object, like the dish of a giant radio telescope used to mark the 50th anniversary of the space age. What are the limiting characteristics of the shapes, dimension and base colors?

Production teams have different styles and workflows to tackle these challenges. Some will work around the most visually demanding elements, avoiding them or building them into the narrative. Big, vibrant colors and intriguing motion visuals can draw the eye from problematic surfaces, or simply overpower them with colored light.

Using tools & experience

Other producers apply tools and experience to incorporate challenging shapes and textures into a presentation. To architecturally map the Sydney Opera House for the landmark YouTube Symphony Orchestra performance, Obscura used millimeter accurate laser scans of the interior concert hall and an aerial site survey – the data collected from a helicopter.

The sheer scale of a projection event can itself be part of the big idea, using dozens of projectors to fully, cohesively illuminate a big structure. But the experts say “big” can’t be the only characteristic.

“I like to do a project in such a way that it looks very organic,” says Kresa. “We bring it in as art. We create a fantasy world and put people in a dream state. We try to make it impossible to comprehend what’s going on before their eyes.”
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