Revit & 3ds Max workflow for Iterative Design.

10% Theory – 90% Actual project experience

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Today, dedicated 3D visualization is a common practice in medium-to-large architecture and design firms. Inherent to its in-house nature, the specialization particularly focuses on supporting projects iteratively through the design process. For those of us who use 3D as a key tool for validating design decisions quickly and interactively, we see the design process at the center of the 3D artist’s workflow. This class will guide Autodesk 3ds Max software users through the steps involved in creating a proven 3D workflow that takes advantage of linking capabilities of Autodesk Revit software models inside 3ds Max. You will learn useful practices and tips and tricks that facilitate design exploration and subsequent production-level design visualization.

Learning Objectives
At the end of this class, you will be able to

• Recognize and take advantage of the added value that 3ds Max brings over Revit in visualizing design iterations
• Apply a robust Revit-to-3ds Max workflow by understanding 3D data flow between the two applications
• Generate design iterations efficiently by combining Revit parametric modeling with the powerful editing capabilities of 3ds Max
• Use techniques and tips that help you create effective renderings in 3ds Max to support and present design solutions

About the Speaker

Santiago has worked as a 3D artist and consultant in leading 3D visualization practices for more than for 17 years. As an architectural degree graduate, his experience resides mainly in rendering, animation, and post-production applied to architectural visualization projects. He is currently the head of the 3D Visualization and Simulation Group at Payette, a 150-person architectural firm in Boston, Massachusetts. Apart from managing the group, he also specializes on design, implementation, and training of workflows, integrating a range of different rendering and modeling tools. Santiago is also an award winning 3D artist who is passionate about visualization as a means to convey intent and style, taking the practice past the photo-real formula and towards a design-oriented process.

His presentations and awards include: AU 2010-2011 lectures: 3ds Max Compositing Power; Office lectures: Innovation in 3D Visualization; Realism vs. Believability; Arch.Biennial Digital Architecture Award.

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Learning Sections

REVIT TO MAX WORKFLOW

I- REVIT TO MAX LINK
Learn the steps to create a reliable Revit-to-Max live link

II - ITERATIVE RENDERING
Use 3ds Max to produce iterative design visualization

III- ITERATIVE MODELING
Take full advantage of 3ds Max to assist the iterative design process

IV- FROM ITERATIVE TO FINAL RENDERING
Learn tips to enhance your draft renderings and create presentation material
Our Workflow

One Project, Two Teams: Design and 3D Visualization

Both projects and 3D visualization staff collaborate and complement each other to develop design iterations. The communication is bidirectional as design decisions are evaluated with renderings and informed back to the revit model. Once advanced 3D visualization software such as 3ds Max can connect to Revit models with a live link, a new venue is open for parallel and complementary design support.

The (4) Elements of a Revit to Max Project

Inside our 3D Visualization Group, these projects can vary in duration from a week to even months and generally are correspond to a design phase. During this period, design visualization tasks can vary in software and application, yet we can divide them in (4) stages, two modeling and two rendering.

I- Revit to 3ds Max Link
Before the revit model is linked inside 3ds Max the first goal consists on making the revit model compatible or “link-friendly” with 3ds Max. Additionally, is very common for the 3D group to continue working in the revit model to further design aspects of the project being evaluated exclusively with the 3D group. That means both revit and 3d-vis teams work and design in parallel inside revit.
II- **Iterative Rendering Techniques**  
Once the revit model is linked the 3D group focuses on setting up the scene with optimized materials, lighting and render settings that allow fast and iterative draft rendering updates through the design process.

III- **Iterative Modeling Techniques**  
Our approach when working with Revit linked projects during the design process is to think creatively about what’s the most efficient tool available for each design task. There are design opportunities where 3ds Max modeling capabilities provide a faster and interactive approach to design evaluation or in some cases with a level of detail otherwise impossible inside Revit.

IV- **From Iterative to Final Output**  
Once the design process is completed, the focus shifts from generating iterative rendering to producing presentation material, a time when more traditional 3d visualization takes place by enhancing rendering quality and adding the artistic elements needed to successfully market the design to a client.

These workflows are the core of this class and are explained individually in the next sections.
Why use Revit?
At Payette, the 3D visualization team acts simultaneously with project design teams during all phases of a project to produce renderings. In the past, the 3D team would create a new model using Sketch-up and/or AutoCAD each time a rendering was requested. As Revit has become more prevalent in the office the 3D team has begun using the team’s working model for their renderings creating a truly collaborative design process.
Model Management

Project Browser Organization
The key to a success when working collaboratively with one model is the model ORGANIZATION and COMMUNICATION. We have found that creating sub-categories to organized views has become essential, especially when working with a large team.

Worksets
No matter the size of the project, using work-sets to create a central file is good practice. Work-sets will become essential when setting up new views, exporting and working with a visualization team.

Often times renderings are asked for in the middle of a design exercise to study specific façades or rooms. The project team may have other priorities unrelated to the rendering task. We find this especially to be true in the early phases of design where the project team has not yet defined all the boundaries of a particular space, ie modeling walls at dropped soffits.

To overcome this problem, we create a “3D VIZ” work-set which is OFF by default in all views. It is in this workset, that the 3D visualization team can create modeled elements that will not affect the
project team’s workflow and documentation. Often times after decisions have been made; the
design team will incorporate components of the “3D VIZ” work-set into the main model.

The key to working together in the same model is an open line of communication.

**View Creation**
Create an individual 3D View for each export/link. The general rule of thumb is “if you can see it, it
will export/link” – any category, component or work-set that is hidden in the view will not link to 3D
Max. By using the section box command we can easily control the extents of the rendering. We use
work-sets to control large portions of the building’s visibility. For example, Exterior Rendering –
Turn off Fit-out Workset). This will dramatically decrease the rendering time.
The use of view templates will help if you are linking several similar view types to render. We turn off the following categories: Furniture, Casework, Electrical Outlets, Entourage, Mechanical, Plantings, Raster Images, and Topography.
Materials

As our export/linking preference is “by materials” it is very important to keep an organized material library. We choose to organize our materials by category – followed by specific details, types, colors. Ideally, any families that are used in the project will link to the same materials. When collaborating with the 3D team, we have found an increased amount of materials in each project.

Material Browser

Although very special material properties can be Revit material editor it is not necessary. It is more important for each material to have an individual name. This will be crucial when mapping materials with VRAY. This also allows the shading, surface patterns and cut patterns to be used solely for documentation purposes.
**Design Options** – The project team can develop specific building components, materials or even entire sections of the building within the central file. Design options are viewed base and therefore multiple views can be set-up for multiple export/linked images. Design options can become ____ when over-used.
**Work-sets** – Work-sets can also be useful in design studies especially when dealing with larger scale changes. We often use work-sets in lieu of design options when we have multiple options of where a building might be sited in an early concept phase.

**Phasing** – For multi-phased projects, Phasing can be used to show future (or past) building and components. We often use phasing when working on large scale master-plans.
Multiple Copies of Model – Although not ideal, this is the quick and dirty method to develop multiple options within Revit very quickly. Using the Section box, one can create individual views for export. We have used this technique when studying facades and overall concept planning.
Linking the Revit file

At the core of our 3d project is the Link tool, since it allows 3D Visualizers to update a revit model on demand and effortlessly while keeping any scene properties intact. Materials, object properties, mapping and other modifiers are all kept as the project design evolves in the revit team.

**RVT/FBX file format**

Before the FBX link option was available, DWG had (and can still have) its value as an alternative format to link Revit models inside 3ds Max. Later on we noticed FBX (which is used also under the hood for .rvt direct link) has been improved and optimized, and included features that fit better in our iterative design process. By accessing the .rvt file directly there is no need to export from Revit and the process can be done on demand from 3ds Max. I haven’t though noticed any optimizations in the process as time still equates to nearly the same as opening a revit model, exporting the fbx file and linking it inside 3ds Max.

**Combine By Revit Material**

This is for us the key feature that makes Link that powerful. With this option 3ds Max combines all the Revit elements that share the same material appearance in a single object. This is the perfect level of granularity needed for 3D visualization where material appearance is the key property needed for rendering. 3ds Max can handle better fewer objects of high poly count than the opposite. *Combine by Revit Material* produces the least number of objects needed therefore improving the faster 3D viewport navigation and selection, which is key in any 3D visualization workflow.

**Revit View**

As explained earlier, 3ds Max filter revit objects based on Revit views which allows for separation of one Revit file in two or more links. This is very practical and time efficient for large Revit files where there are clear pieces that can be updated separately.
Materials Options:

Most of the options inside the Revit Preset settings are self-explanatory with convenient default values in general. In the Material section though is particularly not important to us to keep a link with Revit materials. We do the following:

Materials – Keep 3ds Max materials parameters on reload:
We leave this unchecked. If checked 3ds Max makes sure the name of the materials is the only property that can’t change from the revit file material names keeping the rest of the materials properties intact.

Materials – Keep 3ds Max materials assignments on reload:
We check this option since we replace Autodesk materials with our own materials, material naming is not important to preserve. As explained earlier, the materials properties in Revit are not used and only convenient to combine the objects inside 3ds Max.
II. Iterative Rendering

3ds Max has powerful rendering and features that combined with the appropriate workflow can result in speed and versatility improvements. In many design situations, rendering speed can be the key driver that makes 3ds Max essential when compared to Revit or even other dedicated 3D visualization tools.

Tips and Settings

Much of the rendering work the 3d visualizer performs at this stage can be optimized with simplified settings to maintain rendering times low and better support the iterative design process. The simplification doesn’t mean taking workflow shortcuts instead is based on parametric simplifications which can be adjusted to higher quality settings for final renderings. We provide below some tips and techniques that help us manage render times and achieve a targeted rendering turnaround.

Camera

The goal during this stage is to define useful exploratory views to help inform the design process.

Tip:

- Camera and Sun placement: Each camera location will usually require a new sun location, for this reason we animate both the camera and sun on each frame to create different views. It does require some discipline in keeping the AutoKey button active only when moving camera and sun objects or adjusting camera parameters but we prefer this simplified approach instead creating multiple cameras and sun objects. Exposure and color balance is generally fine-tuned for every view as well. With this setup batch rendering can be performed by rendering a sequence of frames.

As seen in the screen capture above, both camera and sun objects are animated at multiple frames, each frame holding a specific view.

Lighting
Adjusting sun orientation is an iterative process, shadows and image contrast can affect substantially the view of the design. Each project has its own lighting challenges and opportunities it requires iterative exploration to get the best combination of contrast, shadows, highlights and reflections.

We use:

- Default Sun and Sky: Vray has optimized this lighting solution and a clear sky is generally a good lighting condition for iterative design renditions.

- Simplified interior lighting: Whether we are adding artificial lighting for interior spaces or reinforcing day lighting through openings we, prefer simple VRayLights for most of the cases.

We stay away from:

- HDRI Lighting: Also if it is important to show the design at unusual conditions, such as dusk or cloudy/muted daylight 3ds Max allows for specific day lighting conditions via HDRI Environment maps. HDRI Lighting can take additional rendering time and we use it mostly for presentation renderings to help define the mood of the image.

- Photometric lights: Are used only when lighting distribution is important to inform the design. In these cases, VrayIES default settings are very simplified but provide a decent approximation.

**Materials**

It’s convenient sometimes to optimize materials to avoid advanced features that require CPU processing time. As we render with Vray we initially use a script to convert Autodesk materials to Vray materials.
We use:

- Draft quality reflections: Reflection glossiness is processed faster with values closer to 1. We do tend to use just Highlight glossiness with lower values to instead simulate diffuse light reflections with minimal processing impact. We also keep glossiness subdiv parameters low as seen below.

- Material and maps libraries: Even though we define some basic materials on the fly, we replace many scene materials with already created and proven ones from on our material libraries. Defining material libraries from previous projects has been very useful and a huge time saver, especially when includes complex material properties. For us, there is no need to be consistent with materials naming from Revit since, as specified in the link options, Revit materials or their names are not kept linked in our workflow.

We stay away from:

A few material features can impact render times so their use depend on their value in informing the design. Some of the material features we avoid at draft stage are:

- Glossy refractions: Key in final rendering of frits and sand blasted surfaces, we prefer to use a lower refraction value as a simplified approach during draft stage.

- Fresnel reflections: Used only in presentation renderings for better rendition of woods and plastics.

- Displacement: In general, we avoid rendering surfaces with 3D properties and we instead use bump maps to achieve a simpler and faster effect.
**Render Settings (Draft)**

Even when simplified material, lighting and objects are used, rendering times can grow exponentially depending on key settings in your Rendering Dialog and it’s not only about the image output size, most of it is dictated by sample settings. Examples are shown for Vray rendering.

**Linear Workflow:**
We use linear workflow in our projects by applying gamma 2.2 projects as can be seen in both the 3ds Max Gamma and LUT settings and in the V-Ray Color mapping settings.

![Image of Gamma and LUT settings in 3ds Max](image1)

![Image of V-Ray Color mapping settings](image2)

**Image sampler:**
Low settings on image sampling as the ones shown will create “noisy” but faster renderings.

*Min/Max subdivs* and *Noise threshold* shown are the key values that have greatest impact on the rendering time and quality.

If even after using these lower setting the render times are still too high there is always the option to use the *Global subdivs multiplier*. This is a one stop multiplier for sampling quality used in irradiance map, brute-force GI, area lights, area shadows, and glossy reflections/refractions. Our experience suggests that values as low as 0.3 can render acceptable results.

**Indirect Illumination**
Default low or very low quality settings are generally a good start. *HSph. Subdivs* is the main parameter we tweak if we want to improve the indirect lighting quality(higher), or speed up the process (lower).
Iterative Rendering with ActiveShade

Maybe the single feature on 3ds Max that I believe have impacted the most in our iterative rendering workflow is the new GPU rendering support.

3ds Max’s Activeshade rendering hosts the new unbiased GPU render engines. These engines take full advantage of Advanced Graphic Cards (GPUs) to generate physically accurate imagery progressively and in iteratively. Iray is the mental-ray supported version while Vray RT is Vray’s equivalent.

**Activeshade GPU rendering:**

Since last year we started using this rendering technology to speed up our design visualization workflows. Much of our rendering workflow outlined in this class have been optimized and improved by the use of GPU fast and interactive rendering feedback as opposed to off-line CPU rendering.

*Activeshade - Camera exploration and natural lighting*
GPU Hardware:

- Graphic Cards
There is quite some useful information in Autodesk forums about which graphic cards work better for GPU rendering. Two things to look for are processing cores and RAM. RAM is even more critical since is not scalable as cores are. Scalability allows users to have multiple GPU units in one system or in even through different systems and be used simultaneously. There are a few certified graphic cards by Autodesk which have been designed and tested to perform this specific task. In our setup we equipped our 3D workstations with Nvidia Quadro 5000 and Tesla 2050 graphic cards.

For more info about GPU graphic cards compatible with 3ds Max’s ActiveShade:  
http://www.irayrender.com/#/systems/recommended-system-configurations  
http://www.bunkspeed.com/software/shot/techspecs
One tool that comes handy when using GPU rendering is a GPU monitor. These tools can not only display technical information such as RAM or GPU usage but can as well give access to overclocking setup which can improve considerably the GPU’s performance. EVGA Precision is one popular option.

http://www.evga.com/precision
III. Iterative Modeling

Our approach when working with Revit linked projects during the design process is to think creatively about what’s the most efficient tool available for the each design task. 3ds Max’s modeling versatility can be of great value when evaluating 3D design changes. 3ds Max can edit a linked Revit model by acting directly on objects’ faces and vertices which is completely in contrast to Revit’s parametric-based modeling. This could at first appear as a limitation but we see it a complementary tool that can find its application during design exploration.

The tips and techniques that follow are based on these two points.

- When a link update is avoided, changes can be done and even rendered interactively.
- Sometimes is faster to model simple iterations outside BIM rules.

Iterative Revit edits inside 3ds Max

In 3ds Max we use modifiers to apply model changes to objects, these appear listed in the Modifier dropdown List when objects are selected. These are modifications that can be turned on and off and stacked to one another in the object’s stacking list. There are a few modifiers that we find practical for design tests. To see their possible application these are addressed below through case studies.

Case Study: Bridge modifications
(Mesh-level geometry editing with Edit Mesh)

Edit Mesh is one the tools we use the most when modifications require moving, deleting or adding faces or vertices. A range of simple design studies can be tested with this tool.

We used Edit Mesh for instance to move and resize bridges between buildings.

The first step is to select the objects that are part of the bridge materials

An Edit Mesh modifier is applied to the group of objects. A number of modifications of size and location of the bridges are applied. Depending on the changes needed, vertex, face or element selection mode is used. Several modifications can be performed inside one modifier.
New Edit Mesh modifiers are applied as needed to create subsequent new sets of modifications, each new modifier will appear listed on top of the previous one in the modifier stack. A good practice is to rename each Edit Mesh modifier to document the changes as seen in the screen grab.

Apart from moving, scaling or rotating mesh elements, Edit Mesh has other capabilities that can have some creative uses to speed up some changes. For instance using the Extrude tool and setting the Normals set to Local can be handy when offsetting dimensions of architectural elements in one operation, like quickly testing curtain wall mullions sizes or sunshade louvers.

**Case Study: Creating a façade design option**

Similarly to what is the case for us when working in Revit, when modeling alternatives to a current design and keeping a history of them is important, in 3ds Max we make copies of the modified linked revit objects. These cloned objects (via Edit/Clone/Copy) are standalone meshes with no relationship to the revit link (as opposed to the original copies), and therefore unaffected with changes coming from link updates.

In the case of a façade, the objects that are part of the skin are selected and an Xform modifier is applied to move the objects out of the building to a new location. The Xform modifier applies a basic transformations (scale, move, rotate) to an object parametrically so no geometry changes are performed.

The selected objects are now cloned and moved to a new location using the Xform modifier already applied.
Now the new objects are ready to apply the modifications via Edit Mesh. Once the option is finished the new façade option and original can be switched in the project by turning their respective Xform modifiers on and off.

*The left image shows the original façade; on the right is the modified option via Edit Mesh.*

**Case Study: Adding sunshades**

Many of the situations where 3ds Max can provide a better environment than Revit for design decisions are when the iterative process can be combined with interactive rendering capabilities. GPU based rendering can provide some real value not only in the rendering process but in the design process as well. In other words, an iterative design process can be sped up and optimized for those cases where visual feedback of materials and lighting is more convenient interactively as the design changes are made.

In a particular area of the project, where the façade is 100% glazing is very important to look for a sun shading solution that would perform well but at the same time that can offer the right aesthetics and functional qualities.
The first approach was to consider vertical sunshades. To create them the exterior face of the millions to receive the vertical sunshades were selected using the Mesh Select modifier. Following, a Face Extrude modifier was applied to the faces to parametrically define the width of the sunshades.

Setting up key camera locations inside the space and animating the time and day of the year through the Sun and Sky system the effect of the sunshades on the interior spaces can be studied while sunshades dimensions are adjusted.

Some screen captures of the process of interactively changing the sunshade width and adjusting sun location to evaluate light/shadows inside space.
Translucent sunshades were tested as well to evaluate effect on aesthetics and shadows.

Other additional camera angles were used in the exercise to evaluate effect on views and privacy issues as sunshades were tested.
IV. From Iterative to Final Rendering

During the design process, architects benefit mostly from having quick and iterative rendering feedback of their design ideas as opposed to finished imagery. The focus shifts once the design process is completed, a time when more traditional 3d visualization takes place by enhancing rendering quality and adding the artistic elements needed to successfully market the design to a client.

As explained in the Iterative Rendering section, during the design process much of test renderings of lighting and materials are already generated. This gives us a good head start towards the work for presentation renderings.

The tasks take place in 3 stages, before, during and after the render is generated:

View framing

Before setting up a render and process an image there are a few tasks left. Here’s a general image improvement and composition checklist we go through at this stage.

Compositional elements:

Many popular compositional rules of thumbs in photography are more demanding for a photographer than it is for a 3D visualizer, still we not always find a place for them in architectural 3D visualization. Camera, lighting and staging are very much linked together by a unifying composition. Some compositional concepts to look for:

- Rule of thirds: Intersection of quadrants interesting things may happen (subjects). The right quadrant is more important, gives a better balance to the image sometimes. 
  Example: Use of top or lower third placement of the horizon – need to be decided what is more interesting.

- Foreground, middle ground and background: incorporate foreground through staging or building elements, middle ground is the subject and background could be the context and sky.

- Positive / Negative space
  Negative Space: Empty or void space, space around an object or form. Makes the eyes move around the image and read it properly. For instance when trees frame a building may create a positive negative river.

- Directional elements: keep us moving around the image
  Physical lines: shapes of power station, ocean or lines of cars
Spatial lines: positive & negative rivers - wide open and shadow areas.
Highlights and shadows: shadow mask that has a shape that leads to other part of the image.
Highlight with an arrow or a pointing shape that makes us to move another part of the image.
Spatial futures with people: directional gaze, intended movements.

- **Anchors:** Stop at certain parts of the image; cement us on a area a millisecond or two,
  Static objects with detail, the main subject
  Highlights and Shadow masses: eyes tend to go bright areas to avoid shadow areas.
  Color Masses and Splotches: for instance an accent wall or furniture.

**Lighting:**

We use sun placement in artistic terms with sun orientation just as an approximate guideline.

- **Selecting time of day:** Sunrise to 10am and 3pm to sunset as a general guideline. Views with
  direct sun exposure result in lively exteriors and subdued interiors. Shadows tend to project
  longer and add depth and contrast to the image. As the sun hides behind context and direct
  lighting subdues there is more opportunity for lighting up and showcasing interior spaces.

- **Image Based lighting:** Using HDRI maps in the Environment map slot adds more possibilities
  to the daylight quality and its potential to create moods beyond day or dusk lighting. Many of
  the HDRI sky packages have range of sky maps with varying hues for that effect.

- **Artificial Lighting:** We may add photometric lights if necessary but not much additional
  interior lighting work is added for final renderings as we prefer a non-photo-realistic (and
  faster) approach of adjusting lighting in post.

**Entourage staging:**

- **People:** 3d people proved to us to be the most efficient method (as opposed to 2D images) to
  populate large spaces in a tight schedule. We rarely and selectively use 2D people for this task
  when possible.

- **Vegetation:** As addressed in previous sections. We see 3D trees and vegetation in most cases
  more convenient that the 2D alternatives. Light and shadows interacting with the vegetation
  can be more efficient and results are better. We use specific scripts to randomly populate
  areas with large number of plants and trees.

- **3D libraries:** There are excellent libraries for vegetation, furniture, office/household items,
  etc. and they provide a great quick way to add detail and variety to your staging. Additionally
  3D Warehouse is a great source of free SketchUp models that can be imported and used in
  your scenes.
- **Proxy Meshes**: Proxy Meshes are mostly used for high-res entourage such as trees and furniture.

**Rendering**

**Upgrading settings for final renderings (V-Ray):**
These are our suggested material, light and render Settings using V-Ray renderer.

- **Material and light sample settings.**
  Material reflection/refraction glossiness subdivs and VrayLight sampling subdivs may be set higher than their (8) default value where more detail is needed.

- **Global Illumination engine**
  One option is to improve the Irradiance Map/Light Cache settings to higher final quality but when more lighting definition is important a slower Brute Force solution is used as shown.

- **Image sampling settings**
  The values below are the preferred for final production images, Noise threshold may be higher in very complex scenes.
- **Render passes and masks:**
  We always set up multiple material masks (via Material IDs) and entourage masks (via Objects IDs) to have precise control of key elements in post. Additionally, we generally create render passes mainly to adjust reflections and highlights.

- **Output format**
  The RGB image and render channels are saved as EXR 32-bit EXR format to allow for greater color range in post production.
Post-Processing

We create our post processing in Photoshop as an additional opportunity for final adjustments to the image. The process goes beyond overall color corrections though tasks don’t focus on hyper-realism and instead target on believability and on conveying design features.

32-bit images give great flexibility at adjusting color and lighting even of overexposed or underexposed areas of the image without need of re-rendering. We use non-destructive image modifications with adjustment layers so final images can be replaced easily even after last-minute design changes. These layers are divided in general tasks:

1- **Overall color corrections:** Exposure, Tonality, Contrast, Saturation, when applied to the entire image can quickly enhance the overall impact of a rendering.

2- **Materials and Objects Color corrections:** through use of rendered masks, design adjustments of materials can still be addressed to some extent in post. Also useful for color corrections applied to entourage objects.

3- **Material and Lighting properties adjustments:** through render passes, some properties of materials and lights can still be tweaked in post for final adjustments.

4- **Area-based Color corrections:** Areas of the image can be fine tuned to improve lighting, add hierarchy or add compositional balance.

5- **Artistic effects:** Selective use of effects such as glow, glare, lens flare, etc are used to enhance lighting and mood. Sometimes an artistic approach to lighting can add ambiance and take away some of its realistic edge.
3ds Max & Revit Workflow for Iterative Design – Recap

As seen in our project examples, 3ds Max can host and manipulate a scene where a range of design tools can be used to better assist the iterative design process.

As a result of applying our Revit & Max workflow the following 3ds Max’s design tools can be complementary to Revit’s BIM approach.

- **Revit link**: A powerful and iterative-friendly direct link to a Revit project.

- **Interactive and Interactive rendering**: Fast and interactive 3d visualization with physically accurate daylight and artificial lighting, and materials.

- **Iterative and Interactive design modeling**: fast and iterative approach to design changes with mesh editing tools.

- **Advanced production rendering output**: Advanced settings, 32-bit output format and complementary image data can improve presentation renderings with simple post processing.