Attendee Questions: Virtual Reality is not a Toy

Q: Does your staff model the medical equipment or are you getting 3-D files for the equipment?
Callum: Whenever possible, we try to reuse equipment provided by a vendor, but what we have found is that often vendors have a low-fidelity model intended for Revit. If our goal is a high-fidelity model, we will often have to remodel the equipment based on vendor drawings. Remodeling equipment in the scene ends up being a major factor in the cost of producing VR models. As more vendors invest in and provide high-fidelity models, VR development will continue to become less expensive.

Q: What program did you use to make the booms "move" to understand the conflicts better? Most VR software seems to have the user go through static environments vs moving ones?
Callum: We primarily use Unreal Engine in our VR workflow for moveable or customizable interactions. The visual scripting language in Unreal Engine is far more approachable than the coding languages (C++, C-Sharp, etc) required by other software packages. Unity is another excellent software application for simulating boom movement, but it requires some coding know-how to be used effectively.

Q: From your experience, are there specific affinity between the modality of the VR and type of user groups, i.e., nurses, administrations, patient representatives, housekeeping staffs, and communities, to best facilitate the design review and approval processes?
Deborah: We have not seen any correlation between user type and VR modality. However, what we know from prior research is that while VR can be an extremely effective way for garnering clinician insights, clinicians prefer the use of physical mock-ups to test how well the environment will support their work.

Q: How do you use VP to simulate a code blue?
Callum: In scenario simulations, our office historically has created the environment at an appropriate level of realism, with all scenario-critical elements positioned as they would be in the final environment. We then give a nurse or clinician the headset to put on, then run through the simulation based on common scenarios in the field. Hospitals have found this valuable because their staff are familiar with an environment prior to construction completion, which allows clinical staff to move into the space very rapidly, without some of the inherent staging and initial issues associated with opening a new unit or facility. It is not a perfect facsimile, but it expedites the learning process for staff members and provides familiarity in a new environment, which improves clinician comfort.

Q: How you seeing VR being used during COVID? We are hesitant to ask people to put on VR headsets.
Callum: COVID-19 has really slowed aspects of VR development and adoption. Regardless of sanitation practices when offering VR demos, our clients have resisted VR headsets during the pandemic, so the majority of our efforts have focused on identifying the individual who is the most critical to testing a space. We then provide the headset to that individual (assuming they are even willing to use the headset), then ask the remainder of the clinical staff to provide commentary and feedback while viewing the clinician's experience on a large monitor. If a clinician is not interested in trying the headset, then we fall back on providing a 2D traditional demonstration of the space and attempt to gather feedback from that experience.

Q: We all know the possible benefits. What are your lessons learned that you would like to improve in your next projects?
Callum: VR is a tricky extension of architecture. Mastering the visual representation of the space is an involved process, requires a great deal of technical expertise, and once the environment looks perfect, we then focus on the difficult task of providing an intuitive experience, which tends to be the area where we continue to improve. User Interface development is a complex process and finding methods of instructing and guiding participants in an intuitive and natural way remains a struggle for our team. Individuals who grew up with computer technology tend to take to VR very quickly, while some individuals struggle with the most basic interactions. Repeatedly, our largest area where we could stand to improve is discovering the right combination of explanation and presentation that makes VR more intuitive for some of our less tech-savvy individuals.

Q: As we face the "new normal" of remote working and virtual meetings, has VR aided in communicating design intent in any of your recent projects? It seems like VR would be the PERFECT solution to the virtual design meetings we all find ourselves in these days!

Callum: It would be the perfect solution if the technology were a little more seamless in its integration with the customer experience. We always seem to struggle on the technology side, where sending a headset to a client often turns into remote tech support. In the long run, the technology will be self-contained within the headset itself, and experiences will be seamless straight out of the box. For the time being, many of our models require a connected laptop to run the experience, which results in us working with a client to get drivers, software updates, and software installations managed. Schematic designs tend to be the perfect fit, since they are often light weight enough for a self-contained VR headset, and as a result, tend to run out of the box, allowing for a seamless VR experience.

Q: Does the decision to add VR as another tool in sharing/ reviewing design with the client have to be decided at the very onset of the project, does it dictate how, for example, the Revit model develops? Or can the decision and effort to add the VR experience and "plug-ins" be made, for example, during the DD phase?
Callum: Revit models are often inappropriate for 'Presentation VR', in that they are lacking the definition and realism which clients expect. As a result, we end up remaking many of the objects and equipment needed for high fidelity models in 3DS Max or Rhino. As a result, you can add VR as a service later in the process but be aware that the time to develop VR-quality models can be very significant for a visualization expert, so this development time will need to be accounted for in your project schedule. For lower visual quality environments, this becomes an easier lift, since many of the Revit model equipment elements are high enough quality to stand in.

Q: Question: Has VR and real-time rendering become more integral to your workflow due to COVID?
Callum: The head-mounted displays have become less integral, while the overall visualization workflow has become more integral. We are no longer in the same room as our clients as we work through design decisions, so being able to walk through and visualize the space has become a critical component to our workflow, but the headsets themselves make people uncomfortable in the COVID era, so we are relying heavily on walkthroughs to convey design intent and discuss design decisions.

Q: Some drawbacks we've found is finding three dimensional models of specific medical equipment. Do you have advice on where to find 3D models? Or are a lot of the models made in house?
Callum: Unfortunately, a lot of the models must be made in-house. We continue to advocate to equipment manufacturers that providing those models is incredibly useful and timesaving, but generally we end up making them in-house.

Q: Which software platform have you used that is most ideal for multi-user conceptual design?
Callum: I personally have used Unreal Engine for most of my multi-user design collaboration. It required some visual scripting to get it to work, which in turn requires a fair amount of technical know-how. There are other multi-user platforms enabled, but all of them have varying degrees of collaboration and fidelity. IrisVR is another application with this functionality built in, but the user experience is really only a schematic-level fidelity.

Q: Have you ever considered using VR to experiment with patient-provider eye contact during a visit? Would that involve two users in a single environment? Or one use and a dynamic avatar?
Callum: This is not an aspect of VR which we have had the chance to experiment with. Eye-tracking technology is limited and still in the development stage, so we would need to look at AR Applications to get a better sense of eye contact during a patient visit. Our firm has experimented with AR, but we still view it as an emerging technology, with limited commercial applications for the time being.

Q: How do you determine the appropriate furnishings for VR early in the design process? Does that depend on input from the interior designer on the project?
Callum: Furnishings depend primarily on Interior Designer feedback. We will also often populate our models with stand-in furnishings when we are not evaluating specific furnishing and fixtures. We never like to show incorrect information in a model, so we will often dial back the specifics of a piece of equipment or furnishing to clearly illustrate it is a stand-in. We will do this through the textures applied to the model, or through the model detail.

Q: Do you have any experience with Augmented Reality such as in an existing space getting partially renovated?
Callum: We have dabbled in AR, but the substantially higher price point, and the development nature of existing AR headsets has kept us from fully investing in the technology. In the next 3-5 years AR technology will reach commercial viability, and we intend to invest heavily as that technology continues to develop.

Q: Do you see potential for VR experiments to inform architectural program requirements and real estate standards?
Callum: The technology offers the opportunity to illustrate requirements, but any simulated scenarios must be programed into the VR experience. As a result, it can be difficult to explain a scenario that is not predictable through VR, because all of the parameters and results have to be included in the initial simulation as options. I believe the tools themselves are fantastic for representing space and simulating scenarios, but the analytics and simulation aspects of the software need significant refinement to get to the point where we can start to inform program and real estate standards.

Q: Walk Throughs vs. Virtual Reality Sessions have a wide range of cost differences, how receptive have clients been to pay higher fees for the VR technology
Callum: Generally, we receive push back from clients when VR is offered as an added service, because it can be tough to quantify benefits project to project which the clients are willing to sign off on. Typically, we will offer VR to clients during initial discussions, and if accepted, we include the cost as a component of our base fee.

Q: Do you see VR services as an additional service which can allow additional fees to cover the overhead of creating the capability?
Callum: When clients are receptive to the idea, absolutely. If they are not, we will explain the value to clients, push to highlight the reduction in change orders and expedited timeline, and rely on clients to make the right decisions. Regardless, our office takes advantage of the benefits of a schematic-level VR experience internally to assess our designs and make revisions regardless of whether a client asks for these services, because we internally find value in this process.

Q: How much time do you typically allocate to effect clients' understanding of the envisioned environment at the VR simulation level? How about from VR to design approval and sign-off?
Callum: As much as needed. Typically, a simulation or presentation VR environment is trying to accomplish something very specific. We will devote as much time as is needed to convince the client, or garner feedback from him/her using the environments we create. Presentation VR may take 5x the effort or more when compared to a schematic-level environment, so whenever possible we look for schematic-level solutions to address client concerns.

Q: Can you talk more about how you might use VR with multiple people simultaneously?   Also, how do you make clients comfortable enough to wear the headset?
Callum: Multi-user collaboration is most beneficial when simulating workflows or multiple roles in a complex environment or procedure. Users work through the various aspects of a procedure together, and then can provide specific feedback regarding what worked and what didn't in the environment during a particular case or scenario. With regards to making clients comfortable wearing a headset, this is typically up to the individual client. Some clients refuse outright, but we often know this beforehand since these individuals won't ask us to produce a VR experience, so we design our experiences around that fact. If we discover a client is uncomfortable while presenting, we will often take time to demonstrate the VR headset ourselves. A large part of the comfort factor stems from comfort in their environment, or comfort in front of their peers. Allowing us to demonstrate the headset beforehand helps make the experience feel more approachable and removes some of the silliness that some clients feel putting the headset on. A little humor goes a long way as well.

Q: Have any stakeholders and end-user been dazzled by the technology to the point of not focusing on evaluation task at hand?
Callum: Absolutely, which is a real risk in the review process. We have had 30-minute review sessions run over an hour long because staff were enjoying the experience so much. Plan to spend some extra time with your clients when showing them VR – If they are enjoying it, then they are engaging with you and the design, which is as valuable as almost any other experience with a client.

Q: Have you had any experience in leveraging the capabilities of VR with other technologies like CFD to use AI to predict and visualize airflows is an operating room depending on light/boom placement, staff movement etc. and then creating "libraries" of knowledge that can be built upon?
Deborah: We have not utilized VR with technologies like CFD. Although, it sounds like that would be a very interesting application.

Q: Do you know of any developments in the technology that will bring other senses into the VR environment? (Smells, sounds, etc.)

Callum: Sound and tactile sense are already available through a variety of technologies commercially available now. We tend to avoid both of these for different reasons – Sound, because we are often trying to actively communicate with the individual, and tactile feedback because the learning curve is often steep, and the benefits, although great for immersion, do not address the questions at hand.

Q: Reduction in schedule? - mostly construction schedule? vs design schedule?

Callum: Primarily design in our experience, since our clients tend to be the individuals who engage us to produce the environments. In instances where we have used VR during construction, it was clear from our discussions that the entire project team benefited from the clear representation of the space, and coordination of the elements within that space, but we have not had enough opportunities to quantify that benefit.

Q: Can you give us some ideas of what these models cost, VR typical ranges of internal costs?

Callum: Its difficult given the range of scale and scopes of projects. We've had half-million-dollar simulations developed which our client has used as part of a major marketing initiative, and we've had small mockups where our internal development costs for the project likely totaled a few thousand dollars (20-40 hours of work). It really depends on client needs, project scale, and model fidelity.

Q: Are your AI technical staff/teams internal or do you outsource? Who do you outsource to?

Callum: Our office has always relied on internal technical staff members. Individuals with a background in visualization, programming, and detailed CG modeling tend to excel in VR Development. The skillset is somewhat unique and finding individuals with the existing skillsets can be difficult.