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Academy of Architecture for Health
an AIA Knowledge Community

Virtual Reality is Not a Toy

February 9, 2021

Deborah Wingler, PhD, EDAC
Callum Vierthaler, AIA, EDAC, LEED AP BD+C

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Healthcare Essentials/NextGen Committee

As part of the Academy's multi-channel, on-line approach, these sessions provide millennial members starting out in healthcare-centric practices exposure to healthcare design fundamentals and a refresher course for experienced healthcare architects and planners.

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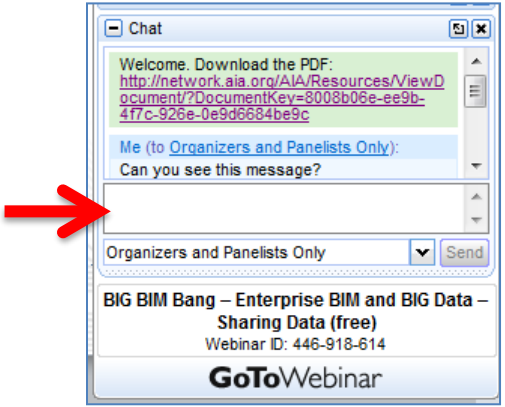
Questions?

Submit a question to the moderator via the chat box.

Content-related questions will be answered during the Q&A portion, at the end of the presentation, as time allows. Any questions not answered during Q&A, will be answered and posted online within two (2) weeks.

Tech support questions will be answered by AIA staff promptly.



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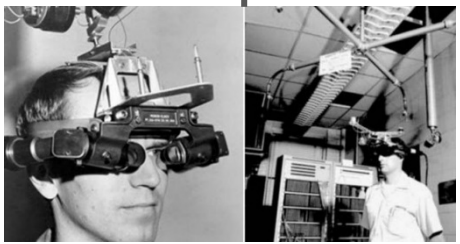
Deborah Wingler, PhD, EDAC
HKS

Callum Vierthaler, AIA, EDAC, LEED AP BD+C
Pulse Design Group

HISTORY OF VR

1940s 1960s 1990s 2013 2015 2016 2019 Present



FORCES DRIVING VR ADOPTION

- Increasing awareness
- Beyond experiential evaluation
- Improved decision making
- Support prototype development

TYPES OF VR EXPERIENCES

Types of VR Experiences

HEAD MOUNTED DISPLAYS	
Passive:	
Active:	
Individual:	
Group:	Limited
Onsite expertise:	High
Cost:	$$$

360 FLY THROUGHS	
Passive:	
Active:	
Individual:	
Group:	
Onsite expertise:	Low
Cost:	$

VIRTUAL INTERACTIVE SESSIONS	
Passive:	
Active:	
Individual:	
Group:	
Onsite expertise:	None
Cost:	$$

EFFORT VS. IMPACT

REALISM & ECOLOGICAL VALIDITY

Spectrum of Applications

VIRTUAL REALISM

The extent to which graphics in simulated environments replicate real world graphical expectations.

BEHAVIORAL REALISM

The extent to which an observer responds to a virtual environment in the same way that they would respond to a physical environment.

CONTEXTUAL REALISM

User and environmental characteristics that may modify the ecological validity of a simulated environment (e.g. sociodemographic factors, cultural backgrounds, past experiences, presence/absence of built/natural features)

FIDELITY

ADDRESSING THE RIGHT QUESTION

What are you trying to understand?

- What type of information do I need?
- Is a control group necessary?
- How many stakeholders do I need?
- How many environments will users experience? What level of fidelity do I need?
- What type of stakeholder engagement do I need? What is the final deliverable?

COMMON VR INDUSTRY APPLICATIONS

- Conceptual design
- Presentation VR
- Marketing VR
- Simulations

CONCEPTUAL DESIGN

Diagrammatic VR models

BENEFITS

- Quick modeling
- Assess adjacencies
- Minimal investments

LIMITATIONS

- Low graphic quality
- Low immersion

SOFTWARE APPLICATIONS

- Enscape
- IrisVR
- Revizto

PRESENTATION VR

Photorealistic VR models

BENEFITS

- Evaluate finishes & equipment
- Validate design decisions
- Executive leadership & end – user signoff

LIMITATIONS

- Significant investment to develop
- Most software pipelines do not support backward compatibility or linked models

SOFTWARE APPLICATIONS

- Unreal Engine
- Unity
- Vray

VR rendering

Final photography

VR rendering

Final photography

MARKETING VR

- VR models can double as the base for renderings and flythroughs
- Expertise in VR indicates to clients that a firm is forward-thinking and tech-savvy
- Firms without VR are placed at a disadvantage competing with firms that have it
- Many firms claim to provide VR as a service but there is a wide range of VR capabilities in the marketplace

VR SIMULATION

Expand upon the out-of-the-box functionality

- Requires a program that allows customization (Unreal Engine or Unity)

Generally, requires custom scripting and interfaces

- Must have an expert on your team for this to be cost-effective

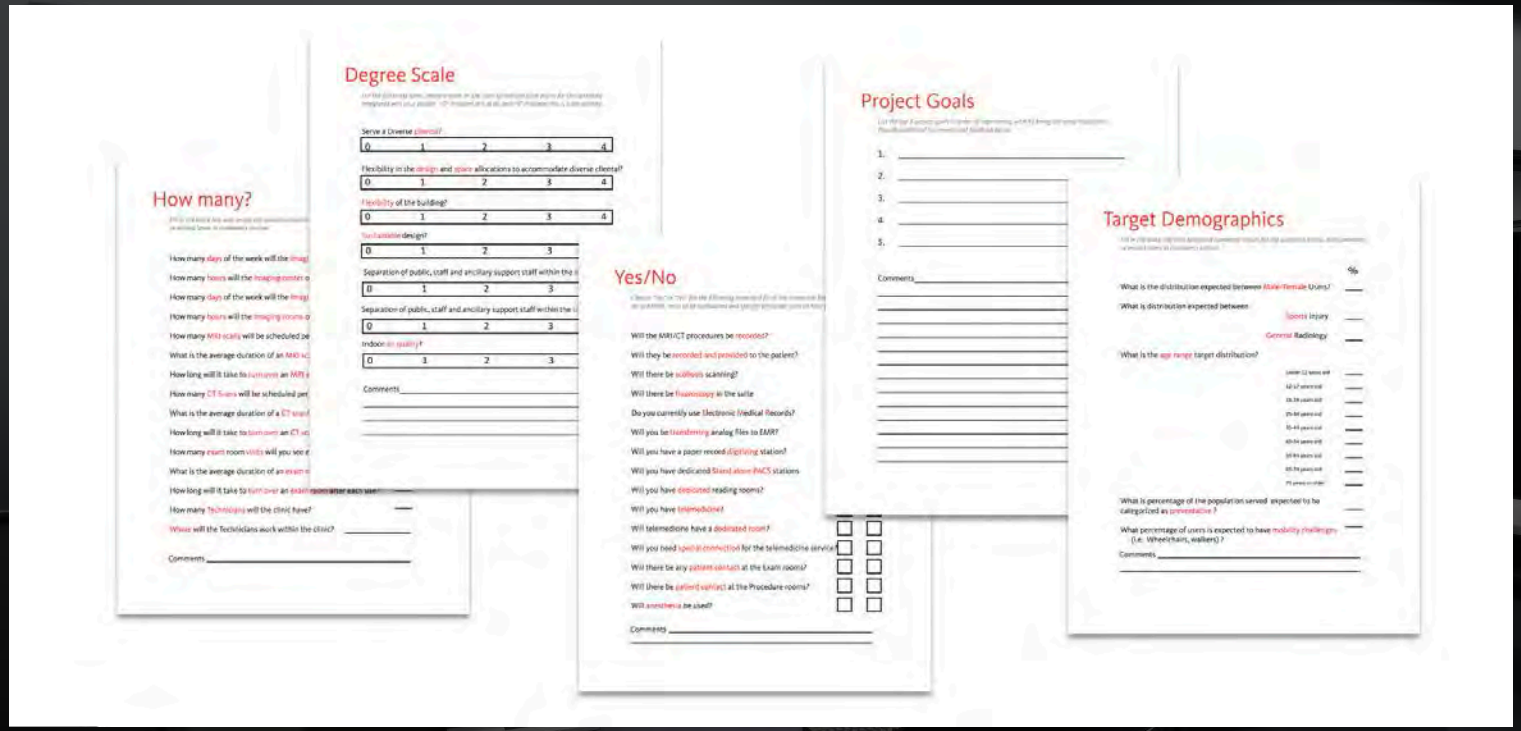
Often existing digital modeling pipelines do not support clean workflows

- Limitations are established by pipeline and workflow

Simulations may result in duplicate work due to single-direction pipeline

- Lack of backward compatibility prevents live edit or prevents changes made in the VR model from being pushed back to the documentation models (Revit)

SCENARIO BASED VR MOCKUPS



SCENARIO BASED VR MOCKUPS

7:30 – (10) introduction 6 avatar's and what we will be doing

7:40 (10) running ***Peter***

7:50 (5) minute warning

7:55 STOP

PETER
NEW TO THE TEAM
STAFF

Male, 32
Starts shift at
6:30 AM

7:55 running ***Betsy***

8:05 (5) minute warning

8:10 STOP

BETSY
CELEBRATING LAST CHEMO!
PATIENT

Female, 28
Chemo appointment at
9:00 AM

8:10 running ***Jose***

8:20 (5) minute warning

8:25 STOP

JOSE
YOUNG PROFESSIONAL
PATIENT

Male, 46
Chemo appointment at
7:00 AM

8:25 running ***Matthew***

8:35 (5) minute warning

8:40 STOP

MATTHEW
MR. SOCIAL
PATIENT

Male, 32
Chemo appointment at
8:00 AM

8:40 running ***Frank & Gracie***

8:50 (5) minute warning

8:55 STOP

FRANK & GRACIE
FIRST TIMERS
PATIENT & WIFE

Male, 65
Chemo appointment at
8:00 AM

8:55 running ***Rachel***

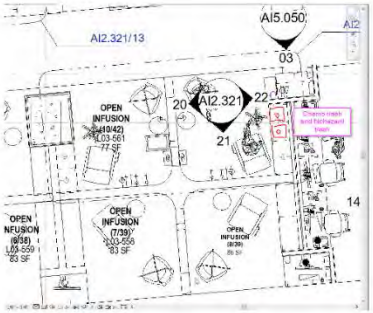
9:05 (5) minute warning

9:10 STOP

RACHEL
ROUTINE CHEMO
HIGH ALERT STATUS
PATIENT

Female, 38
Chemo appointment at
9:00 AM

SCENARIO BASED VR MOCKUPS



JOSE

YOUNG PROFESSIONAL
PATIENT

Male, 46
Chemo appointment at 7:00 AM

hide trash and sharps

Profile

- Working professional that does not want cancer treatment to get in the way of the job he loves
- Early in the chemo process
- Takes the early morning appointments in hopes to get to work afterwards
- Selects semi-private to stay connected and to have have privacy if he wants to work

Checklist

1. Semi-private Infusion Bay
   - Medical Gas: A,O,V,S (1) mounted at 2'-0"
   - Casework - half open shelving for personal storage, half closed cabinet w/ adjustable shelving
   - Full height cabinet w/ adjustable shelving
   - USB/pwr outlets above casework
   - TV mounted above casework
   - Furdown w/ light above casework/TV
   - Coat/Purse hooks (2)
   - Guest Chair
   - Side table
   - Infusion Chair
   - IV stand & pump
   - Shelf/Ledge at 2'-6" with USB/pwr outlets above
   - Sharps - wall mounted v. floor v. built-in?

Journey:

1. Did all lab work and Dr appointment day before
2. Parked in garage on level G2
3. Did not wait, came straight back
4. Selected semi-private room closest to nourishment to be able to grab coffee more easily

TUCK N TRASH (BIO & CHEMO), WALL MOUNT SHARPS, REGULAR TRASH IN CHARTING ALC

MATTHEW

MR. SOCIAL
PATIENT

Male, 32
Chemo appointment at 8:00 AM

Profile

- Always wants open infusion - waiting on his chemo buddy to come so they can chat about the latest headlines
- Likes that he gets to see all the action and does not mind the cute nurse either
- Usually cheerful, but glad he can tuck himself back into the 1/2 wall if he wants to take a nap

Checklist

1. Open Infusion Bay
   - Medical Gas: A,O,V,S (1) mounted at 2'-0"
   - Casework - half open shelving for personal storage, half closed cabinet w/ adjustable shelving
   - USB/pwr outlets above casework
   - No TV in open infusion bays
   - Coat/Purse hooks (2)
   - Guest Chair
   - Side table
   - Infusion Chair
   - IV stand & pump
   - High point of wall behind infusion chair at 4'-0", sloping down to 1'-6" on corridor side
   - Does this provide sufficient privacy should the need arise?
   - Sharps - wall mounted v. floor cart v. built-in?

Journey:

1. Ubered to the appointment and dropped off at the cancer center door
2. Went straight to blood draw
3. Reception to check in
4. Selected an open infusion with an open spot next to it for his buddy

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Question Reminder

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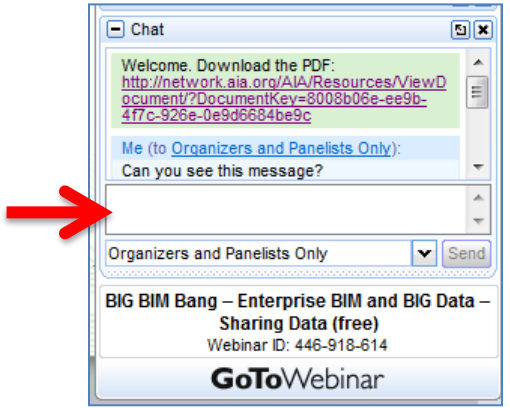


CASE STUDY – ADVENT HEALTH

Hybrid Operating Room

- VR Platform: Unreal Engine
- Fidelity: High
- Method: Head Mounted Display
- Design Phase: Design Development

STERIS
PHILIPS

CASE STUDY – SCENARIO BASED VR MOCKUPS

- VR Platform: Yulio (white box)
- Fidelity: Low
- Method: Screen Sharing
- Design Phase: Schematic Design/ Design Development

CASE STUDY - SPATIAL RELATIONSHIPS & CRITICAL ADJACENCIES

- Platform: Yulio (with Revit textures)
- Fidelity: Medium
- Method: Screen Sharing
- Design Phase: Pre-design/ Schematic Design

02 Support
Corridor
Navicent Childrens Hospital NNICU...
01 NNICU Unit Entry

CASE STUDY – COMPARING DESIGN ALTERNATIVES

- Platform: Enscape (with interactive features)
- Fidelity: High
- Method: Individual HMD
- Design Phase: Schematic Design

WHERE VR EXCELS

CONCEPTUAL DESIGN

- Validate design decisions, compare options, get a real sense of scale, mockup spaces that are otherwise too large/ expensive to mockup with minimal effort

PRESENTATION DESIGN

- Foster's end-user & executive engagement, compare finish/ fixture/ equipment configurations, validate decisions made throughout the design process

SIMULATION

- Simulations & multi-user collaboration give clients & designers the opportunity to experience & discuss the space, make (limited) changes in real-time, & work through scenarios relevant to the final functionality of the space

LIMITATIONS & COMPLICATIONS

- All interactions have a learning curve
  - First time users often do not take advantage of VR functions
    - Walking through the digital model
- Poorly optimized models can run poorly or cause simulation sickness in participants
- VR is not the right tool for all situations
  - Some users resist VR
    - Uncomfortable/ motion sickness/ hesitation to put on the headset
- VR has a significant development time/ cost associated with it
  - Firms must be selective & efficient in implementing VR

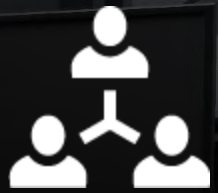
BENEFITS

Reduced project schedules

Value of Consensus

Reduction in change orders

Transition Planning

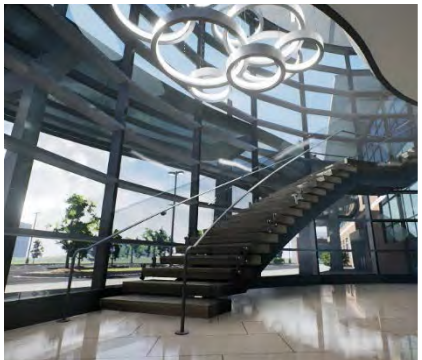


Improved communication

Scalability for Communication

FUTURE OF VR

- *Complications due to COVID 19*
- *Emerging technologies*
  - *Eye-tracking*
  - *Hand-tracking*
  - *AR/ VR glasses*
  - *Wireless HMDs*
  - *Interactivity*
- *VR/ AR convergence*



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Time for Questions and Comments

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Upcoming Webinars

Date	Series	Topic
3/9	**Case Study**	Hybrid OR Design at the Cleveland Clinic Heart and Vascular Institute
4/13	**Outside the Box**	Community-Based Health Center
5/11	**Beyond the Basics**	Clinical Research Lab Design

Dates & topics are subject to change