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Virtual Reality (VR) Training Module Development and Maintenance Process (Webinar Series Session #6)

June 16, 2020

Presented by Ray Deatherage



Webinar Series Overview – 8 Sessions

- Session #1: VR Users Committee Introduction (April 9)
- Session #2: Industry Training Challenges and VR Benefits and Use Cases (April 21)
- Session #3: Hardware Equipment, Software, and Network Requirements (May 5)
- Session #4: Control Center Overview* (May 19)
- Session #5: Scoring Manager* (Authoring Tool) (June 2)
- Session #6: Module Development and Maintenance Process (June 16)
- Session #7: Current and Future VR Training Modules (June 30)
- Session #8: Technology Integration and Support Services (July 14)



Presentation Agenda

- Recap Session #5
- Introduction of VR Users Committee Members
- VR Training Technology in the News
- Training Module Development and Maintenance Process
- Group Discussion
- Next Steps



GTI VR Webinar Presentations and Training Information

GTI Website (<u>https://www.gti.energy/</u>)





Session #5 Recap: Scoring Manager (Authoring Tool) 1072

- The Scoring Manager allows VR training content users to author the scoring of the learning objectives to their specific O&M procedures.
- The data driven content initially coded into the training module can be turned on/off or changed to meet the specific needs of the content users.
- Currently, the Scoring Manger is updated by the VR developer (e.g., PixoVR) pre-deployment of the training module to a new user (e.g., LDC). In the future, content users will be able to make updates to the Scoring Manger through the Control Center on their own.
- After the initial development and deployment of a new module, user input is collected and added to an enhancement log. This enhancement log is reviewed semi-annually by the developer and the VR Users Committee to identify the necessary updates required for the module.



Scoring Manager Overview (Authoring Tool) 2012

- The Scoring Manager tool has the capability of managing the data driven content for the listed learning objectives and elements of the training module.
 - Abnormal Operating Conditions (AOC's)
 - Personal Protective Equipment (PPE)
 - Procedural Steps
 - Safety Hazards
 - Communication
 - Tools and Equipment
 - Scoring
 - Time Manager
 - Environmental Interactions

1	В	c	D	E	F	G	H	1	J	P
1	Name	Learning Objective	Client	Target	Target 2	Target 3	Timing	Feedback - Correct	Feedback - Incorrect	Notes
2	Name of the Item	Which Learning Objective Does this apply to?	If Not client specific list as General	Who the communication will be sent to. Again, drop	Who the communication will be sent to. Again, dron down	Who the communication will be sent to. Again, dron down	Should this be sent now, EOD, etc.	Text displayed if the task was performed correctly	Text displayed if the task was performed incorrectly	
3 F	Report Main shutoff	Communication	NJNG	None	None	None				Turn off this option. NING does not tu
4	Dispatch Gas	Communication	GTI						When you're the first on the scene of an emergency situation like this you must contact dispatch first to get support crews mobilized as soon as possible to assist in the response.	
5	Dispatch Fire	Communication	GTI						When you're the first on the scene of an emergency situation like this you must contact dispatch first to get support crews mobilized as soon as possible to assist in the response.	
6 F	Report Blowing Gas	Communication	Atmos	Company Dispatch	Supervisor	v				
7 F	Report Blowing Gas	Communication	GTI	One-Call Center	None	None	Immediate		You need to report blowing gas leaks to dispatch to communicate the need for proper support crews	
8 F	Report Centerline Leak	Communication	GTI	Supervisor	None	None	Immediate		You forgot to contact dispatch about the hazardous gas volumes located in the centerline area. This communication is required as part of this protocol.	
9 F	Report Service Valve Shutoff	Communication	GTI	Company Dispatch	None	None	Immediate		You forgot to inform dispatch that you turned this service line off. They should be informed of any service shut off	
10 F	Report a structure was evacuated	Communication	GTI	Company Dispatch	None	None	Immediate		You forgot to contact dispatch about this evacuation. They should be notified of any structure evacuation.	
F 11	Report to Incident Command	Communication	GTI	One-Call Center	None	None	Immediate		You forgot to check in with the incident commander. This is essential to good communication in an emergency situation. Your presence on the scene must be reported.	
12	Sreeting when Occupant answers	Communication	GTI	Customer	None	None	Immediate		When fielding a leak call, always make contact with the customer to gather information and verify details.	Looking at just the error string, this is co greet house A1 in the centerline scenar houses in centerline, and all houses in e the next error if missed. Probably a bug currently set up.
13	Greeting when Occupant answers	Communication	GTI	Customer	None	None	Immediate		Occupied buildings should be contacted during a gas leak investigation involving dangerous levels of gas. This allows for proper communication to be delivered and life to be protected.	See above. Each house will provide it ov Task Object
14	Correct Action - Evac House	Evacuate and Ventilate	GTI	Customer	None	None	Immediate		· ·	Each house will provide it own ID (Hous HouseB1, HouseB2) as the Action Task
15 I	ncorrect ction - Evac House	Evacuate and Ventilate	GTI	Customer	None	None	Immediate		Not every leak requires you to evacuate a home. This evacuation was not required.	
-		TION MARKING	AOCs	HAZARDS	IDENTIFICATIO	ON TOOLS	PPE		▲ · · · · · · · · · · · · · · · · · · ·	



VR Users Committee Members

Members for the VR Users Committee have been identified and the committee's first meeting is on June 17th. Please contact GTI (Ray) if your organization has any interest in participating on this committee now or in the future.

	Organization	Role	Member	Co-Member #1	Co-Member #2	
1	Atmos Energy	OTD Member	Tristan Murray	Jerod Williams		
2	Black Hills Energy	OTD Member	Daniel Huebner			
3	GTI	Design, Development, and Integration	Ray Deatherage	Vanessa O'Neil	Joe Carlstrom	
4	Intermountain	OTD Member	Hart Gilchrist			
5	National Fuel	OTD Member	Dale Halverson			
6	National Grid	OTD Member	Jamie O'Donnell	John Mead	Elizabeth McLaren	
7	Nicor	OTD Member	Lance Roberts	April Ragland		
8	NiSource	OTD Member	Michael Ray	Praj Deshpande		
9	New Jersey Natural Gas	Non-OTD	Joe Morello	Connor Wells		
10	New York State Electric and Gas/Rochester Gas and Electric	OTD Member	Carrie Berard	Joe Kinney		
11	Peoples Gas (Chicago)	OTD Member	Mike McGrath	Laura Budzinski	Jake Wilken	
12	PixoVR	Technology Developer	Cate Boskee	Alena Bogar		
13	San Diego Gas and Electric	Non-OTD	Scott Hazlett	Teresa McCarron		
14	South Jersey Industries	Non-OTD	Brad Kienzle			
15	Southern California Gas	OTD Member	David Lauterio	Scott Dreger	Sean Meehan	

*Note: The Operations Technology Development (OTD) is a not-for-profit collaborative led by 28 natural gas utility companies focused on developing advanced technologies for the industry. To learn more about this collaborative, visit <u>http://www.otd-co.org</u>

VR Training Technology in the News

Virtual reality will be a big part of Boeing's Starliner astronaut training

Astronauts will get some next-gen training before they ride Boeing's next-gen spacecraft. Crewmembers preparing to fly on ...

Space.com | 4d

Pico Interactive Announces Availability of its Neo 2 and Neo 2 Eye Virtual Reality Headsets

May 27, 2020 09:00 ET | Source: Pico Interactive, Inc. SAN FRANCISCO, May 27, 2020 (GLOBE NEWSWIRE) -- Pico Interactive, a global tech company that develops innovative virtual reality (VR ...

GN GlobeNewswire | 19d

The future of immersive training is here. When should you invest?

Virtual reality and artificial intelligence are combining to offer learning leaders unprecedented opportunity.

D HR Dive | 6d







8



Today's Topic - Training Module Development Process



Non-Technical Training Module Development Process

Creation of design document which will include:

- Environment details
- Interactive tools
- PPE
- Learning objectives
 - Communication
 - Procedures
 - AOC's
 - Others
- Training scenarios
- Types of randomizations



Let's Examine this Screenshot More Closely



Let's Examine this Screenshot More Closely



Examples of Development Assets





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VR Asset Development Trivia – Real or Computer Generated?





Example of Randomization Development – Outside Leaks

Grade 1 Leaks							
	Customer Leak Complaint	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
1	Customer smells gas in their front yard	Gas at foundation wall		-			
2	Customer smells gas in the back yard	Gas leak on line to gas lamp	Gas leak on line to fire pit	Gas leak on line to pool heate	r		
			Leak at nearest water service	Leak at street sign post/Fire			
3	Customer smells gas near the sidewalk	Leak at nearest gas valve box	valve box	hydrant/power pole, etc.	Centerline sewer	Stormdrain	Cracks in street
			Leak at nearest water service	Leak at street sign post/Fire			
4	Customer smells gas near the street	Leak at nearest gas valve box	valve box	hydrant/power pole, etc.	Centerline sewer	Stormdrain	Cracks in street
		Gas service line at entrance to		exhaust vent from furnace,			
5	Customer smells gas near their meter	ground	gas service line in yard	PVC vent			
	Customer smells gas on side of house,	On neighbor's service line at	On neighbor's service line in	Neighbor's exhaust vent	Neighbor's bug		
6	opposite side of their gas meter.	entrance to ground.	yard	from furnace, PVC vent	vent (Inside meter)		
			Leak at nearest water service	Leak at street sign post/Fire			
7	Passerby smells gas at intersection	Leak at nearest gas valve box	valve box	hydrant/power pole, etc.	Centerline sewer	Stormdrain	Cracks in street
			Leak at nearest water service	Leak at street sign post/Fire			
8	Passerby smells gas in front of house #	Leak at nearest gas valve box	valve box	hydrant/power pole, etc.	Centerline sewer	Stormdrain	Cracks in street
Grade 2 Leaks		Scenario 2	Scenario 3	Scenario 4			
						Neighbor's bug vent	
1	Customer smells gas in their front yard	Leak at gas valve box	Leak at water service valve box			(Inside meter)	
2	Customer smells gas in the back yard	N/A	N/A	N/A			
			Leak at nearest water service	Leak at street sign post/Fire			
3	Customer smells gas near the sidewalk	Leak at nearest gas valve box	valve box	hydrant/power pole, etc.	Centerline sewer	Stormdrain	Cracks in street
			Leak at nearest water service	Leak at street sign post/Fire			
4	Customer smells gas near the street	Leak at nearest gas valve box	valve box	hydrant/power pole, etc.	Centerline sewer	Stormdrain	Cracks in street
		Gas service line at entrance to		exhaust vent from furnace,			
5	Customer smells gas near their meter	ground	gas service line in yard	PVC vent			
	Customer smells gas on side of house,	On neighbor's service line at	On neighbor's service line in	Neighbor's exhaust vent	Neighbor's bug		
6	opposite side of their gas meter.	entrance to ground.	yard	from furnace, PVC vent	vent (Inside meter)		



Example of Randomization Development – Locating

				Percentage of		
	Locate Ticket Scope		House #	Occurrence	Single Locate	Multi Locate
1	Work Being Performed:	Home owner installing mailbox near curb and street	1, 2, 3, 4, 5, 6, 7, 8	10%	10%	
	Scope of Locate:					
2	Work Being Performed:	Homeowner planting tree in front yard	House #			
	Scope of Locate:		1, 2, 3, 4, 5, 6, 7, 8	10%	10%	
3	Work Being Performed:	Landscaper planting tree in front yard	House #			
	Scope of Locate:		1, 2, 3, 4, 5, 6, 7, 8	10%	10%	
		City contractor installing street signs all four corners of				
4	Work Being Performed:	intersection, Maple St. and Main St.	2, 3, 6, 7	8%		8%
	Scope of Locate:					
		City contractor installing new water main northside of Main				
5	Work Being Performed:	St. between Elm St. and Maple St.	1, 2, 5, 6	4%		4%
	Scope of Locate:					
		City contractor installing new water main northside of Main				
6	Work Being Performed:	St.between Maple St. and Cherry St.	3, 4, 7, 8	3%		3%
	Scope of Locate:					
		City contractor installing new water main southside of Main				
7	Work Being Performed:	St. between Elm St. and Maple St.	5,6	4%		4%
	Scope of Locate:					
		City contractor installing new water main southside of Main				
•	Mark Poing Porformad	St. hotwoon Manla St. and Charny St.	670	2%		2%



Training Module Development Process – Computer Generated

- There are seven (7) Phases to developing a computer generated training module with different scenarios and randomization encounters.
- With the new Control Center and Authoring Tool, development timeframe of a new training module is approximately 12 weeks.
- Resources required for development training materials (e.g., presentations, handouts, assessments, etc.), O&M procedures, SME's (e.g., supervisors and potentially end users of training), photos and videos of tools/equipment/work activity being performed, CAD drawings, etc.
- The content users identify the learning objectives (e.g., communication, AOC's, procedure steps, etc.), the training environment, the tools/equipment, etc.



Seven (7) Phases of Training Module Development

- Pre-Production (2 weeks): Discovery call, storyboards, flow charts, gas design document, technical design document, scope sign-off.
- Production (1 week): Project kick-off, grading system created, multi-user implemented.
- Prototype Production (1 week): Greybox art, backend manager system, rough story points, rough functionality.
- Alpha Production (3 weeks): Menu scripts, art optimizations, grading metrics, character scripts
- Beta Production (3 weeks): Implement art and test, audio finalized and implemented, grading finalized, tutorial finalized, etc.
- Final Production (2 weeks): User manual created, QA testing, bug fixes, module launch
- Post Production (+1 week): Backlog, maintenance

Example of Project Plan for New Module Development

	A	8	C	D	E	F	G
1	PROJECT NAME:						
2	PROJECT DELIVERABLE		PROJECT MANAGER				
з	START DATE		END DATE				
4							
5	MILESTONE	Т-	ASSIGNED TO	START DATE	END DATED	STATUS	NOTES
6	PREPRODUCTION						
7	Discovery Call	T-12					
8	Storyboards	T-12					Sent to Client, Marketing
9	Flow Charts	T-12					Sent to Client, Marketing
10	GDD	T-11					Sent to Client, Marketing
11	TDD	T-11					
12	Project Estimation	T-11					
13	Wire Frames UI/UX ?	T-11					Sent to Client
14	Enviornment Blueprint Created	T-11					Sent to Client
15	Project Plan	T-11					
16	Formal Signoff by Client	T-11					Of GDD, Storyboards, Flowcharts, Wireframes, Enviornment
17	PRODUCTION						
18	Project Kickoff	T-10					
19	Project Repo Created	T-10					
20	Grading System Created for Database	T-10					
21	Multi-user System Implemented	T-10					
22	PROTOTYPE PRODUCTION						
23	Greybox Art	T-10					
24	Backend Manager System Integrated	T-10					
25	Rough Story Points	T-9					
26	Rough Functionality	T-9					
27	**Prototype Due	т-9					Sent to Client, with scheduled review call. Notify Heather, Sales
28	ALPHA PRODUCTION						
29	Menu Scripts Finalized (signed off by client)	T-8					Requires partnering with Client
30	UI/UX Finalized (signed off by client)	T-8					Requires partnering with Client
31	NPCs Implemented	T-8					
32	Art Optimizations	T-8					
33	Create Grading Metrics	T-7					Requires partnering with Client
34	Start Scripts: Character and Tutorial	T-7					Requires partnering with Client
35	Character and Tutorial Scripts Finalized (signed off by client)	T-6					
36	Send Audio/VO Out	T-6					
37	Art Finalized (internal signoff)	T-6					
38	**Alpha Due	T-6					Sent to Client, with scheduled review call. Notify Heather, Sales
39	BETA PRODUCTION						
40	Implement Art and Test	T-5					
41	Audio Finalized and Implemented	T-54?					
42	UI/UX Finalized and Implemented (internal signoff)	T-5					
10	Constant Constant (stand off loss stant)	- E					

Example Production Planning Schedule

Estimated timeline subject to change											
<u>_</u>		Q2			Q3			Q4			
PROJECTS	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	PM	Time
Facility Locating and Marking										Cate	~2.5 months
Outside Leak Investigation										Cate	~1 month
ERS Rebuild										Jordan	~1 months
Rebuild Project 1 - appliance inspection		DIS/15th	N-iX 3/Prod	22nd?						Oleg	~3 months
Rebuild Project 2 - pipeline patrolling/bridge	DIS	Brendan/Prod								Stacey	
Rebuild Project 3 - inside leak investigation		DIS	N-iX 1/Prod							Oleg	
New Project 1 -gas handling		DIS	N-iX 2/Prod							Oleg	~ 3 motnhs
Rebuild Project 4 - inside meter inspection			DIS	N-iX 3/Prod						Oleg	~ 3 months
New Project 2 -valve inspection				DIS	N-iX 1/Prod						
New Project 3 -leak survey					DIS	N-iX 2/Prod					
New Project 4 -meter sets/change						DIS	N-iX 3/Prod				
New Project 5 -residential regulator inspection							DIS	N-iX1/Prod			
UNSCHEDULED PROJECTS											
New Project 6 - industrial meter set inspection											
KEY											
N-iX 1 = Team 1											
N-iX 2 = Team 2											
N-iX 3 = Team 3											
DIS = Discovery (4 weeks)											
Prod = Production Starts											
Gray Box = Delivery Month gather client feedba	ick										
All modules built for Quest/Multi-user and then	converted to Wind	lows and Desktop	1								



Example of Master GTI/PixoVR Development Document

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A	В	С	D	E	F	G	
ODULE	ITEM NEEDED	DATE ADDED	NEEDED BY	INFORMATION	REFERNCE IMAGES	RAY ANSWER	PIXO AG DUE
RS	Wind Direction and Compass	06/12/2020		Is implemented, shows wind speed, and directions		Track implementation and progress - update Ray when this is implemented. Got confirmation at moment task created, no action needed.	
l	Central Heating Units	05/29/2020		Central Heating Units - Says 4 types in GDD, only list high and 80%. Ray will need to provide images of each one labeled with the proper name.		Sent images of furnaces to Pixo team. There are three types of furnaces 1) Atmospherically vented with draft hood, 2) Power vented without vent hood, 3) high efficency with PVC piping.	
I	Ovens	05/29/2020		Gas Ranges (stoves/ovens) - Not clear on the 4 types listed in the origina GDD. Ray will need to provide images of each one labeled with the proprint name.	 Electronic igniton (25%) - clicks to start - top does not open, sealed burner (nothing can get underneath the top), has window in oven - has control valve (step down regulator for reducing pressure) Pilot Type Range - Top Opens, has regulator (mandatory safety device), non modern version, has flue back top of stovetop (25%) Super old double oven, show up 50% of the time, and sometimes has flex connector and sometimes not Uncoated brass flex connector, missing regulator are AOCs for super old double oven and pilot type 	Sent examples of 3 ranges. 1) Electronic ignition 2) Pilot type - modern, 3) pilot type - old. Let's plan to discuss these examples during our weekly catch-up call. We have three, no reference of the back or connectors for the old double oven. Need reference or need to consider not doing this version. The three we have are 2x pilot type, 1x electric ignition	2
l	Dryers	05/29/2020		Dryers - Electric (no inspection) - Need images of an electric heater		The only difference with an electric dryer is there is no gas piping going to it, there is a 240 volt outlet. See image at link provided	



Scoring Manager (Authoring Tool) Development

	В	С	D	E	F	G	н	I.	J	Р
1	Name	Learning Objective	Client	Target	Target 2	Target 3	Timing	Feedback - Correct	Feedback - Incorrect	Notes
	Name of the Item	Which Learning Objective	If Not client	Who the	Who the	Who the	Should this be sent	Text displayed if the task	Text displayed if the task was performed incorrectly	
		Does this apply to?	specific list	communication will be	communication will	communication will	now, EOD, etc.	was performed correctly		
			as General	sent to. Again, drop	be sent to. Again,	be sent to. Again,				
2				down.	drop down.	drop down.				
3	Report Main shutoff	Communication	NJNG	None	None	None				Turn off this option, NJNG does not turn
4	Dispatch Gas	Communication	GTI						When you're the first on the scene of an emergency situation like this you must contact dispatch first to get support crews mobilized as soon as possible to assist in the response.	
	Dispatch Fire	Communication	GTI						When you're the first on the scene of an emergency situation like this you must contact	
5									dispatch first to get support crews mobilized as soon as possible to assist in the response.	
6	Report Blowing Gas	Communication	Atmos	Company Dispatch	Supervisor	. •				
7	Report Blowing Gas	Communication	GTI	One-Call Center	None	None	Immediate		You need to report blowing gas leaks to dispatch to communicate the need for proper support crews	
8	Report Centerline Leak	Communication	GTI	Supervisor	None	None	Immediate		You forgot to contact dispatch about the hazardous gas volumes located in the centerline area. This communication is required as part of this protocol.	
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15	Incorr act Action - Evac House	Evacuate and ventilate	GII	customer	None	None	immediate		Not every leak requires you to evacuate a home. This evacuation was not required.	
		MARKING	AOCs	HAZARDS	IDENTIFICATIO	DN TOOLS	PPE (Ð		



Keys to Development Success

- Access to training material and procedures.
- Visuals and videos of tools, equipment, and activities being performed.
- Input by and access to multiple SME's (Content Users).
- Immediate responses to questions by designers and developers.
- Ability to test Alpha and Beta module releases (e.g., Oculus Quest)

VR Training Module Maintenance Process

- VR training modules are edited semi-annually based on user's feedback.
- This feedback can be a result of new industry regulations, new industry lessons learned, enhanced training scenarios, new industry tools and equipment, new scoring requirements, user experience, etc.
- A backlog is created to collect user feedback throughout the year for each training module. This backlog is then reviewed by the VR User's Committee to rank the needs for programming purposes.
- Edits are made as required to the training modules and then an updated version is published to the Control Center for downloading by all users.
- Depending on the edits required, this process will take between two and four weeks.
- The development expense for updating modules is funded by an annual maintenance fee content users pay for accessing the VR training platform.

Development Team Photos



Development Team Photos



Development Team Photos



Stages of Development



Stages of Development



Final Product





Development Scenes



gl

Development Scenes







Questions?

Ray Deatherage <u>rdeatherage@gti.energy</u> (847) 768-0942



Next Steps

- Invite the necessary company stakeholders to participate in Session #7 on June 30th VR Training Library Content Overview. During this session, current and future VR training library content will be reviewed. This will include an overview of the learning objectives for each module, live demonstrations (remotely) for some of the modules, and how to gain access to the training modules.
- Continue to collect VR questions from your organization and submit to GTI (Ray).

Thank you for attending today's webinar.



Presenter Biography

Ray Deatherage – Senior Program Manager with GTI

- 27+ years experience in the natural gas industry
- 25+ years experience with a gas distribution company
 - Operations, Standards, Materials, Failure Analysis, Quality Assurance, Compliance, Training, and Operator Qualification
- 15+ years experience developing, delivering, and maintaining training and qualification programs
- 4+ years experience evaluating and developing VR training technologies
- VR/AR Association Member Chicago Chapter
- VR/AR Energy Committee Member
- MEA Technical Training Committee Member