Learning Objectives
1) Gain experience through applying lessons learned on this project
2) Learn how to apply practical techniques for implementing BIM on a construction project
3) Understand methods that encourage a positive work environment and better communication
4) Develop an overall approach to implement BIM tailored to your company’s needs

Riding the Giant
Construction by its very nature is like riding on the back of a giant. Trying to stay ahead of an ever-changing dynamic environment schedules, lead times, contracts, personnel changes, logistics, weather, all of these variables and more are in constant flux during a construction project can become overwhelming. We will cover the lessons learned from applying BIM Technology for the Intermodal Terminal Facility Construction Project at the Orlando International Airport, which is a part of the 3.1 Billion Expansion. We will review how BIM application cut costs and increased productivity in the field, where BIM application fell short of expectations and the lessons learned from those experiences. We will then review how these lessons where applied to revised BIM Plan on the next phase.

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Speaker
Phil Nower – BIM Manager - Turner Construction
I started in 1989 working as a mechanical drafter in New York who thought that 3D modeling was the coolest thing I have ever seen. Now it's 25 years later and I'm still in love with 3D modeling, from machine design, process piping, fabrication, mechanical design, process plants, plumbing, residential, commercial, industrial, construction and even some civil thrown in there just for general principal. I've must have done something right because I'm currently a VDC Project Manager at Turner Construction. It's amazing to think about where this technology was 25 years ago, and where it is today... and where it might be 25 years from now.
Project Overview: Greater Orlando Airport Authority Expansion Projects

Automated People Mover (APM)

The South Airport Automated People Mover complex consists of approximately 200,000 square feet, including the station for the APM system which will connect passengers to the North Terminal via 7,500 feet of dual-lane guideway, similar to those that connect the existing gates areas to the North Terminal, as well as a 2,400-space parking garage. The South APM is scheduled to open in Fall 2017.

Intermodal Terminal Facility (ITF)

The Intermodal Terminal Facility (ITF) consists of approximately 1.3 million square feet of terminal space accommodating the South APM and up to three regional rail systems (SunRail, Brightline, and possibly a magnetic levitation system serving the International Drive area). It will also support ground transportation activity including taxis, shuttle buses and public bus operations. The ITF is scheduled to open in 2018.

https://www.orlandoairports.net/getting-around-mco/intermodal-terminal-facility/

The South Terminal Complex

Orlando International Airport’s (MCO) new South Terminal Complex, a $1.8 billion milestone expansion project that will encompass approximately 300 acres and 2.7 million square feet. The Greater Orlando Aviation Authority (GOAA) Board unanimously approved the multi-year construction and enhancement plan that will improve operational efficiency, accommodate future growth and expand accessibility.

The design phase, led by Fentress Architects, HNTB and Schenkel Shultz, is nearly two-thirds complete. Once the final design benchmarks are met, groundbreaking on the terminal is scheduled to begin with a completion date of 2020. The new terminal layout will include 16 gates with a flexible configuration to accommodate both domestic and international flights, with space allowing for narrow body, jumbo and super jumbo aircraft. A 6-story, 5,000-space parking garage will also be available for passengers.

There are two Construction Management companies on these projects. Turner/Kiewit and Hensel Phelps.

The Turner/Kiewit Team own the ITF building on the first phase of this project and the Landside Terminal Building on the second phase of this project.

The Lessons Learned are based on the experience constructing the ITF Building.

Implementing the lessons learned will be on the LST building, construction for this project has begun.
Having the Right Mind-Set and Culture
People are Everything, Software is Nothing

Usually people don’t look to the Mind-Set and the Culture as the first step in developing a VDC/BIM department. If we could start and finish our careers in a bubble, technology could solve most of our challenges. However when applying VDC/BIM Technology in any business environment nothing could be further from the truth.

Providing leadership, guidance, earning trust, developing relationships are the keys to applying VDC/BIM technology, and it’s trying to achieve these goals where Mind-Set and Culture become your greatest assets. Shown below are some sayings, slogans that have helped me to develop the mind-set/culture that aided in applying VDC/BIM Technology.

A BIM’ers primary job is to take-away headaches, not give them. The Supers, The Foremen, Field Engineers all work 12 to 14 hour days, and answer approximately 200 to 300 emails on a daily bases. If the BIM’er on the job is smart enough to learn VDC/BIM Software then you should be smart enough to listen to their needs and their concerns.

For example; having Supers, Foremen and Field Engineers learn a new set of software programs as a requirement to implement VDC/BIM may not help you out. These people are already spending an incredible amount of time on the job, now along comes VDC/BIM and they need to spend more time on the job. VDC/BIM is now giving headaches to the rest of the team not taking them away.

A better approach would have been not to make any additional demands on the team to implement VDC/BIM. To relay BIM Data to the team communicate in a file format that they already know will allow the team to build up trust to become a reliable tool for construction. Deliver 2D plans and sections in PDF Files to the Supers, Foremen and Engineers.. In the meantime provide classes in additional VDC/BIM software such as Navisworks Freedom Viewer, to the people that want to learn it. Applying this type of approach will allow VDC/BIM technology to develop a reputation that it can meet and exceed construction challenges and while planting the seeds to apply advanced VDC/BIM software as the project progresses.

Backing Up High Tech with Low Tech. Establishing an understanding that anything seen in 3D Model can produce accurate 2D Plans and Sections that the team can build from and rely on will provide value and weight to all other VDC/BIM tasks, like Clash Detection, 4D, etc…

The Project is the Giant Not You. An Adversarial Relationship is one of the easiest traps to fall into in a work environment. When I’m running coordination meetings, I want my directions to be followed, for files to be submitted on time, to make forward progress on a regular bases. If I start out with a mind-set of “I gotta get these people to do their jobs” I’m setting myself for an Us vs Them working environment. I might get the project coordinated, but it will be a tuff road and the end product will be half of what it could have been.

A better approach “mind-set” is to have respect for what the other people are going through. “If you work with me, I’ll do anything it takes for you to make money.” I don’t have to the Giant, the project is the Giant. The contract that they signed is the Giant. My job is to help in anyway I can for the contractors make money and have a good experience on the project.

Having this “mind-set” will help you to make a personal connection that will make your life easier and produce better results.
Lessons Learned Implementing BIM on the Job Site
The Good, The Bad and The Ugly

The Good

The screen captures on the right and the left are from a shear wall that contained a large majority of the MEP systems for the building. The MEP systems in the shear wall ran from the underground utilities to all of the upper levels of the building.

Challenge: Due to the aggressive construction schedule the Turner/Kiewit Team was forced to deal with coordinating all of the MEP Systems prior to any of the MEP Trades signing contracts. The TK Team provided the MEP Contractors options with clear clash free paths for their trades. We kept the Level of Detail “LOD” at 300 which made editing the layout easy. Not going to LOD 400-500 made it clear to the contractors that the TK was not directing them but offering direction and guidance.

Result: The areas that this effort was made there was a surprisingly small amount of troubles in the field. The construction in these areas went a lot smoother.
The Bad

The screen captures on the right probably don’t seem like much of a clash or a problem to most of you, and when you look at the clashes themselves you’re 100% correct. These clashes arose several weeks after the areas were fully coordinated and signed off.

What Happened? We have tons of procedures and protocols to follow to ensure that this very condition didn’t happen. Now the question becomes, why weren’t they followed?

The Answer: An almost 100% change of personnel for the CM Team as well as the Contractors. Many of these new people either didn’t know about all of the procedures in place or weren’t told. Enabling shop drawing being submitted never fully checked.

The Ugly

The screen captures above shows ductwork that spans two buildings and the structural steel for each building. The connecting ductwork and the structural steel for both buildings were not coordinated when the coordination process started.

There was a considerable amount of meetings with all parties concerned about this location. Screen shots, plans and sections were made and sent out the entire team to properly communicate the conflicts. After several months the ductwork between the buildings was still not coordinated and was now holding up construction.

Solution: All full team was called, rectangles were drawn on the CMU Blocks that the mechanical contractors were to use to locate their ductwork. Despite the time, effort, 3D Technology our coordination was reduced to gathering the tribe to be lead by prehistoric cave paintings.

Lesson Learned: The more companies, contractors, design teams there are the need to start off 100% increases.
Getting to Know Your Giant

In order to develop a plan to improve applying BIM we need to identify some of the common variables that some of the lessons learned. Listed below are the results from a brainstorming session.

We then looked for a common thread… something that linked most of these elements together. We found that there were two distinct groups. Things we have no control over and Things we have control over.

**Things we have no control over**

- Contracts - “nothing goes smoothly"
- Changes in Executed Contracts
- Contracts affecting Construction Schedule
- Change in the Construction Schedule
- Changes in Personnel
- Changes in Software Platforms used by the Contractors
- Da Weather!!!

**Things we have control over**

- Equipment Submittals creating clashes in coordinated areas
- Field revisions not being communicated to the BIM Team
- Drawings, Information not getting to the right people
- Model Accuracy
- A better defined BIM Coordination Schedule

  Communicate exactly what coordination drawings will be required and when.

After looking at these it became clear that the better organized you are to deal with the things you “do have control over” the better position you’re in to handle the things you “don’t have control over”.

*Now all we had to do was to write a BIM Execution Plan that does exactly that. That shouldn’t be too hard, right?*
To meet the needs of the next phase of work and to avoid relearning the lessons learned, we decided that it was time to question everything, to revisit everything. Work flows, the coordination process, drawing submittals, etc, etc...

Instead of providing the contractors a BIM Execution Plan, Coordination Meetings that will somehow get a set of uncoordinated files coordinated and signed off to meet the construction schedule.

What if we gave the contractors a set of files that were organized as much as possible, clashes close to zero, maintenance clearances already present, coordination drawings embedded within the Revit files. Providing the team with a solid head start to make the coordination effort more manageable and make everyone’s life a bit easier.

**Turning the Standard BIM Coordination Process Upside Down “a Little”**

Providing to the Contractors Two Sets of Files

- **Design Teams Untouched Revit Files**
  - To Be Used as Reference Material

- **Turner-Kiewit’s Organized Revit Files**
  - To Be Used for Coordination, the Coordination Sign-Off Drawings are contained within these Revit Files

All Coordination is done with the Revit Template Files LOD 300

- All BIM Data is checked and maintained throughout the BIM Coordination Process
- Once the Coordination Drawings are signed-off the Contractors will use these files as a guide for Producing Their Fabrication Models in LOD 400-500. These files will be checked against the signed off files prior to being released for construction.

At the end of this process will have three files.

- **Design Teams Untouched Revit Files**
- **Contractor Clash Free Revit Files BIM Data**
- **Fabrication Files No BIM Data**

This method seemed to meet all of our requirements, added control, better organization, more transparency in what was excepted by everyone on the team. However this is a new approach to Implementing BIM, and just like all new ideas they always don’t get meet with open arms. Now it had to get approved by the rest of the team.
Pitching the Idea...
The Positives of Using this BIM Coordination Method

Just like any new idea, this new approach had to be accepted by Turner-Kiewit, The Owner, The Design Team and by the Contractors who are going to be bidding on the project. Listed below are some of the responses, general comments and the approaches that won them over.

**Turner-Kiewit**
Turner-Kiewit’s main concern was, “Are we stepping over our bounds and doing the Contractor’s work?” Once it was clearly communicated that Turner-Kiewit was not telling the contractors what to, doing their work, or dictating how work should be done. By applying this new approach, Turner-Kiewit was providing improved leadership, additional guidance and being more proactive with the sole goal to make the VDC/BIM Coordination Process a better and more productive experience.

**The Owner**
What excited the owner about this new approach was the idea of finally being able to get as close to as built files that have maintained the BIM Data from the Design Team. Having well maintained BIM Data throughout the life cycle of the project can have a tremendous positive impact on Facility Management.

**The Design Team**
The biggest concern that the design team had was this approach was different. There was some confusion with the idea that they were required to do more work. When it was finally well communicated that this method will reduce the amount of useless RFI’s, due to the fact the a large amount of coordination issues can be solved by means and methods. The Design Team was on board. Their main request was that we shared, on a regular bases, what has been done to the model. We were happy to oblige their request.

**The Contractors**
The biggest factor was the effort that this method requires. All construction is tuff and people respect and appreciate someone who is willing to pick up a shovel and help them out. So when they realize the quality of model they will be starting with along with the organization and direction inherent in the revised BIM Plan the reactions from the Contractors ranged from “This is great” to “Do you have any idea just how much time and money this is going to save us.”