



## A. EXECUTIVE SUMMARY

On Thursday, October 13, 2005, I had the privilege of attending *PACE Roundtable* conference at the Penn Stater Hotel and Conference Center. The title of this year's event was C.L.I.M.B: Changes in Leadership, Innovation, Markets, and Business. The event was appropriately divided into two morning sessions and two afternoon group discussions. One of the goals of the event is to help current students develop research topics by discussing construction issues with current industry members.

Before attending the *Roundtable*, I had an idea that I wanted to research the area of building information modeling (BIM) relating to the construction industry. By attending two morning sessions relating to technology within the industry, *Frontiers for Innovation I: Promoting Innovation* and *Frontiers for Innovation II: Developing Innovative Capacity*, I immediately realized that BIM is an important discussion for industry members. The following discussion will:

- Summarize key topics discussed in each session I attended.
- List the current industry members that have shown an interest in the attended sessions.
- Evaluate the initial method and goals of applying BIM to my thesis project, Medlar Field at Lubrano Park.

At the time my research concludes, I hope to further educate the industry on BIM and answer as many questions as I can that were proposed during the *Roundtable* sessions.



## **B. PACE ROUNDTABLE: SESSION I**

### ***Frontiers for Innovation I: Promoting Innovation***

The discussion began with the topic of building information modeling (BIM) and its use in the industry. Many questions were asked in regards to this topic:

- What is it?
- How will it help?
- What projects is it useful for?
- How can it be implemented?
- How much does it cost?
- How do you train people to understand this type of modeling?
- How do you integrate these models with a renovation project?
- Can BIM modeling help with a safety analysis on a project?
- Can these models be integrated during the close-out document phase and also as a way of tracking systems within the building?
- How can this type of model contribute to the life cycle data for the project?
- How do you sell owners on BIM and get them to use it?
- Is there an information flow chart for the implementation of BIM modeling?

The overall feeling with BIM modeling is that it is not currently a knowledgeable subject and more explanation about it is needed, but there seemed to be an overall feeling that BIM can improve construction building techniques. There was an adamant feeling in the room that it is the owners/developers responsibility to make the implementation possible. The owner must set ground rules up front and enforce them for the project to be successfully modeled. The implementation of this model also reflects the delivery type for the project; a design-build or CM agency project would allow for a model to be constructed easier or more effective. The value of an accurate BIM during the operation of the building could be endless. If implemented, accurate documentation of all building systems and installation items can be easily found.

Furthermore BIM can be used for estimating and scheduling procedures. Using the model for assistance during the bid phase could allow for more accurate bid results and proper verification of bids.

If a BIM is made for projects within similar markets, this model can be used for future planning of similar projects. The use of this modeling technique will also allow and require a commitment to the project design. BIM could also result in eliminating the design of the MEP systems twice.



### Summary of Session

- Where do we go from here with building modeling in the industry?
- Are there other industries we can use to help the construction industry with the transition of technological models?
- Are there certain projects that these virtual models are useful?
- How best to structure projects to succeed?
  - What are the impediments/SOP/delivery types?

### *Industry Attendees:*

Mark Bodenschatz	PSU OPP
Jack Brown	Skansa USA
Kenneth Catlow	Pentagon Renovation Group
Marilyn Juban	Gilbane Building Company
Charles Yetter	Trammell Crow Company



## **C. PACE ROUNDTABLE: SESSION II**

### ***Frontiers for Innovation II: Developing Innovative Capacity***

The goal of the session was to discuss how do we get around impediments and take advantage of new relationships of doing business. Current impediments associated with BIM are:

- People not wanting to change
- Capitalization
- Short term focus
- Liability/vulnerability concerns
- Knowledge of technology
- Practical use of technology
- Convincing others
- Proof of Profitability
- Understanding limitations
- Owner acceptance
- Interdependence

An intriguing item that was discussed during the session was that currently Holder Construction is constructing many data center projects and they are using BIM on these projects. The interesting fact with these projects is that two (2) full time on-site CAD operators have been employed for these projects. These CAD operators assist with any coordination or design errors that are discovered daily on the project and they are able to update the BIM immediately to avoid further confusions. The use of modeling with the data center projects shows that BIM might slowly be incorporated into the industry. It is important that the model is useful to each player for project. An architect, construction manager, engineer, superintendent, foreman, etc. must all understand the model and the value associated with the model. Within this session, there were also several questions that were asked and are worth noting:

- Can technology reduce contingency?
- Will the BIM method follow the initial hardships presented with LEED projects? (initially difficult and eventually second nature)
- Should construction manager monitor the technological model?
- How does the architect/engineer help with the model process?
- Who makes the model?
- Who manages the model?
  - Possibly another entity?
- Does BIM help with design coordination?

By making a BIM and incorporating model review meetings and on-site implementation, it is apparent that a project could be more successful.



Furthermore, we currently develop schedules off of two-dimensional (2D) drawings, whereas with a BIM, a schedule could be developed off of a three-dimensional (3D) model and viewed for all parties to understand in the fourth-dimension (4D). A more thorough 4D model can be generated from a BIM and can allow for a constructability review that the owner, architect, contractor, maintenance staff, etc. can all understand. One of the most important items to effectively implement a model is to find the proper means of communication to all parties involved, mostly subcontractors. The underlying belief is that the value of a BIM in terms on productivity and coordination could be endless.

*Industry Attendees:*

John Bechtel	Turner Construction Company
Jack Brown	Skansa USA
Benjamin Gerald	Holder Construction Company
Katie Lynahan	Barton Malow Company
Priya Varadan	Gilbane Building Company
Richard Willie	Alexander Building Construction
Charles Yetter	Trammell Crow Company





#### **D. PACE ROUNDTABLE: WHAT'S NEXT?**

The sessions I attended should reflect that I am interested in the innovation of technology within the construction industry and how the new technology can be implemented. The discussions proved that the emerging technologies are a concern / “hot topic” with any companies in the industry. As expected the industry does not fully understand BIM and the usefulness of such a model.

The goal I have with the Medlar Field at Lubrano Park project is to be able to develop a BIM of the project and analyzes various subjects relating to a BIM. The subjects include:

- Owner/architect awareness/understanding of designed spaces.
- Compare quantity take-offs results performed by subcontractors to the design quantity take-offs.
- Design of the MEP systems in the building information model and allowing the subcontractors to comment on the designed. This might allow for the elimination or more useful coordination process.
- Develop a 4D model of the project which will be used to describe the project to the subcontractors and obtain their understanding of the construction schedule.
- Compare the usefulness of the architects “block” 3D model created in AutoCAD versus the value generated by a BIM.
- Evaluate the accuracy of design coordination with a BIM over 2D drawings.
- Compare MEP shop & coordination drawings to the BIM design of these systems.
- Inform an educated owner, Penn State University, on the value and possibilities associated with this type of building modeling.
- If possible, determine a way that this type of model could be incorporated into the close-out phase of a project.

Over the next few months, I will generate a BIM for Medlar Field at Lubrano Park and use this model as a case study to answer the questions listed above and incorporate any other issues I find as I continue my research.