Sponsoring organizations, fellow ASHRAE members, colleagues and friends.

We are rapidly moving toward a zero margin, global economy that becomes more competitive every day.

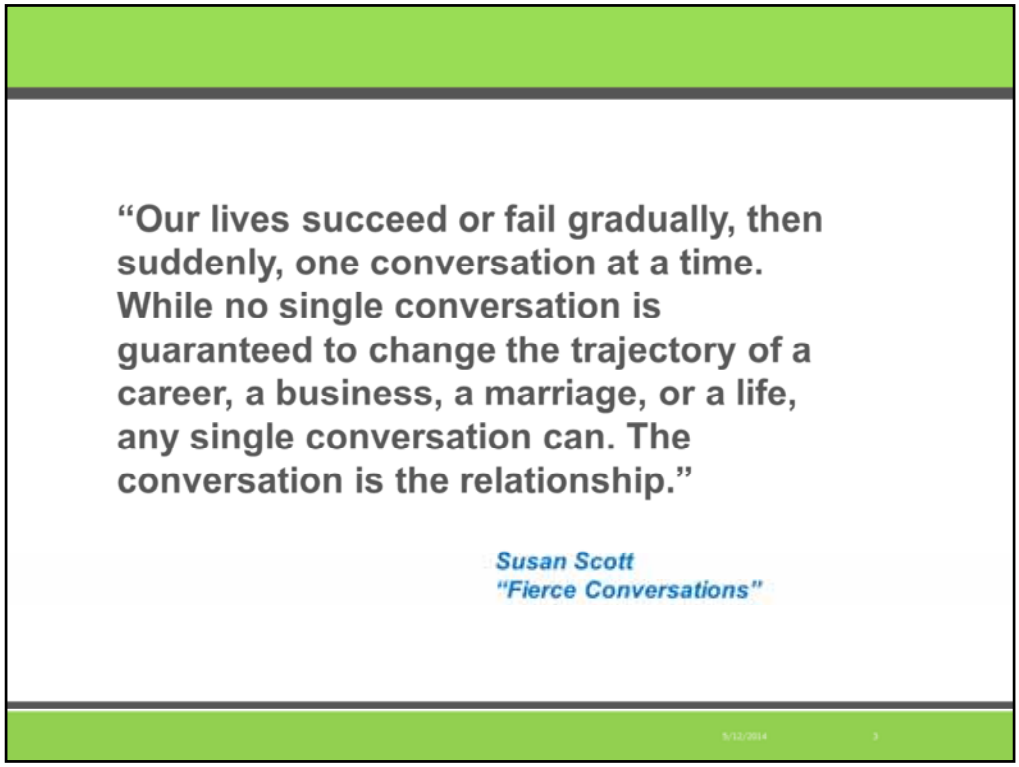
Instant access to information and the computer scientists' (the numerate) that have the ability to gather big data and analyze it are providing consumers and our competitors with the tools they want to negotiate ever more aggressively with respect to the cost and quality of our products and the time allowed for their delivery.

I hope by the end of this presentation you will agree with me that our industry must adopt and implement these tools and processes that I'm about to discuss in order for us to remain relevant, productive and profitable in the future.

Ever have a day like this? Fill in the blanks.

How many of you went to work last week with a goal to make as many mistakes as possible?

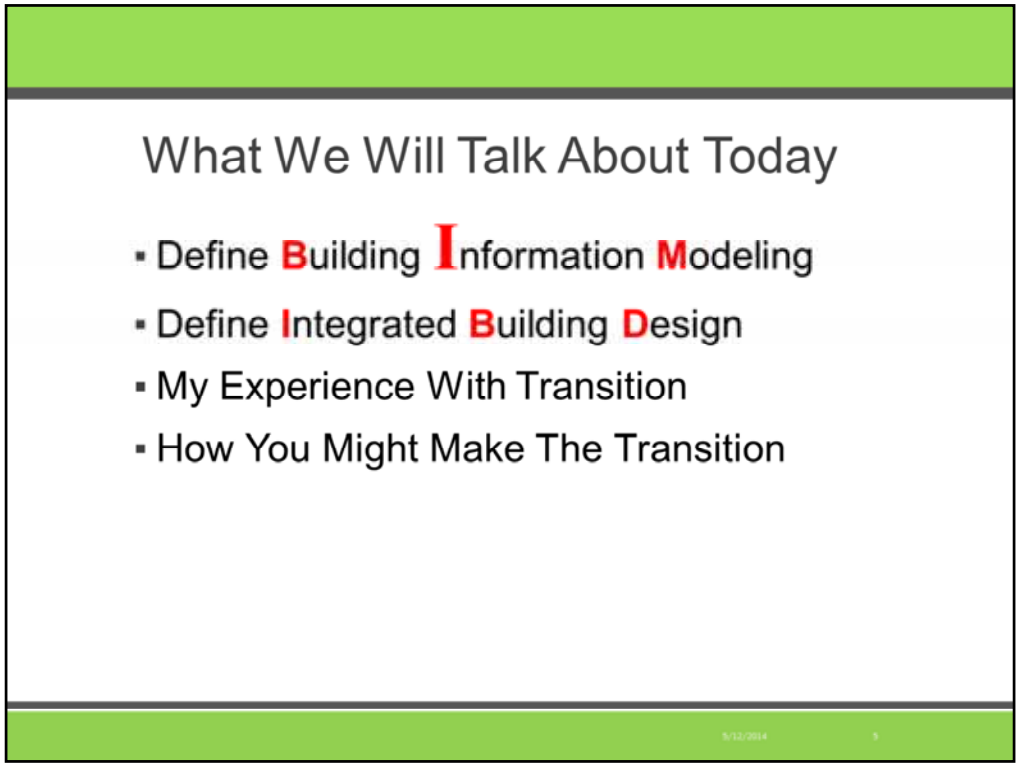
We are AE's, Owner's, Contractors – better buildings, fewer mistakes, higher profits



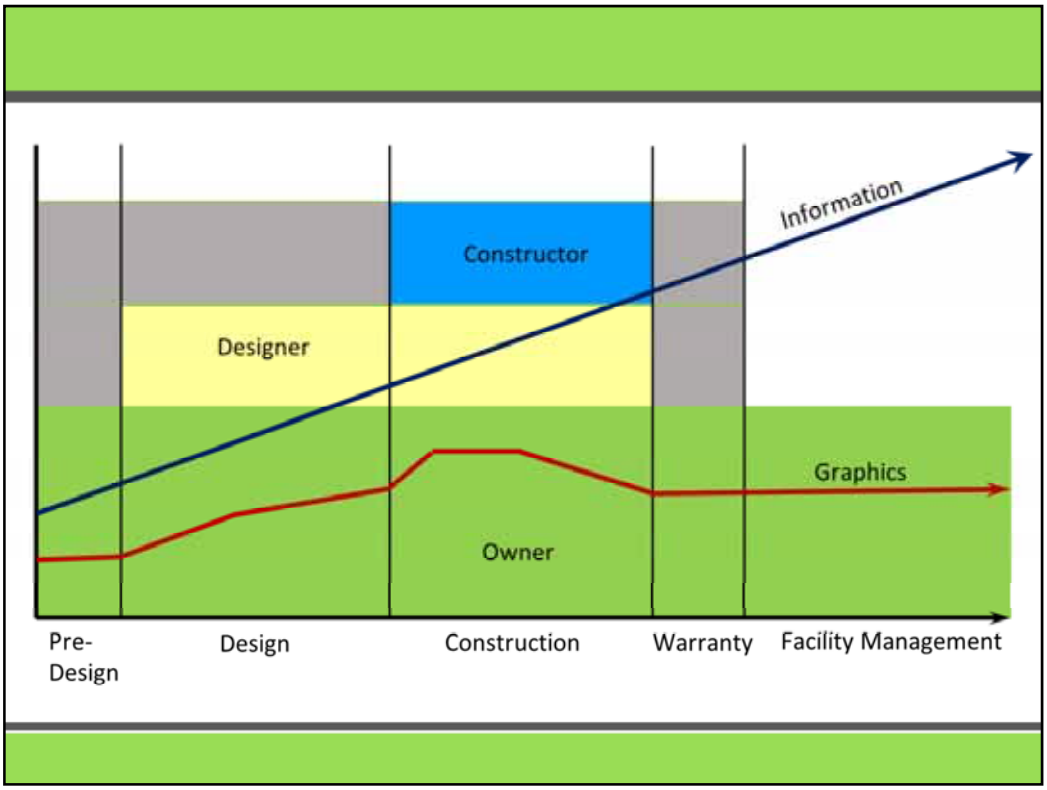
I like to start with this quote. Powerful.
Everyone's an expert – at something
Social Capital – we are all a part of it
Why our organizations are important - consensus
Inspired by Hemingway – How did you go bankrupt?

Stand Up For Just a Minute
Give yourselves a round of applause
Great – thank you – I'm glad we got that over with
You never know how these things will turn out

Already using a BIM tool or tools and processes?
To What level? Drawing, coordination, Other, Multidisciplinary?
McGraw Hill - 71% of the industry has adopted BIM. What do you think?

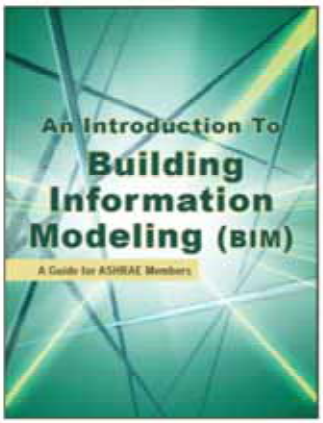


Learning Objectives for today
Take away
Tell someone what you plan to do
Do it



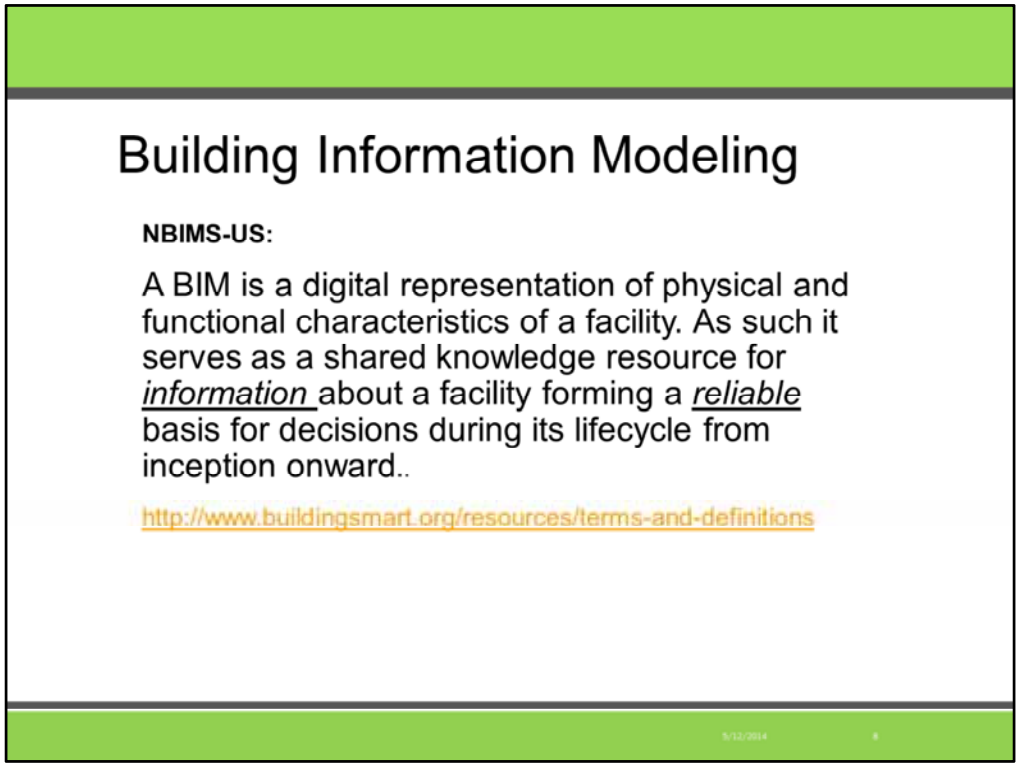
Did you ever hear the expression Information is Power? Ever wonder where it came from?
A spin-off quote Sir Francis Bacon written in one of his essays in 1597 (over 400 years ago) that says “Knowledge is Power”.
I believe that to be true.
Most of the disappointments we encounter throughout our lives are often due to decisions we make due to a lack of knowledge or an asymmetry of information between us and someone we are exchanging information with for some purpose such as obtaining a job, securing an income, applying for a loan, buying a car, negotiating a construction contract or change order – etc – you name it.

ASHRAE Introduction to BIM



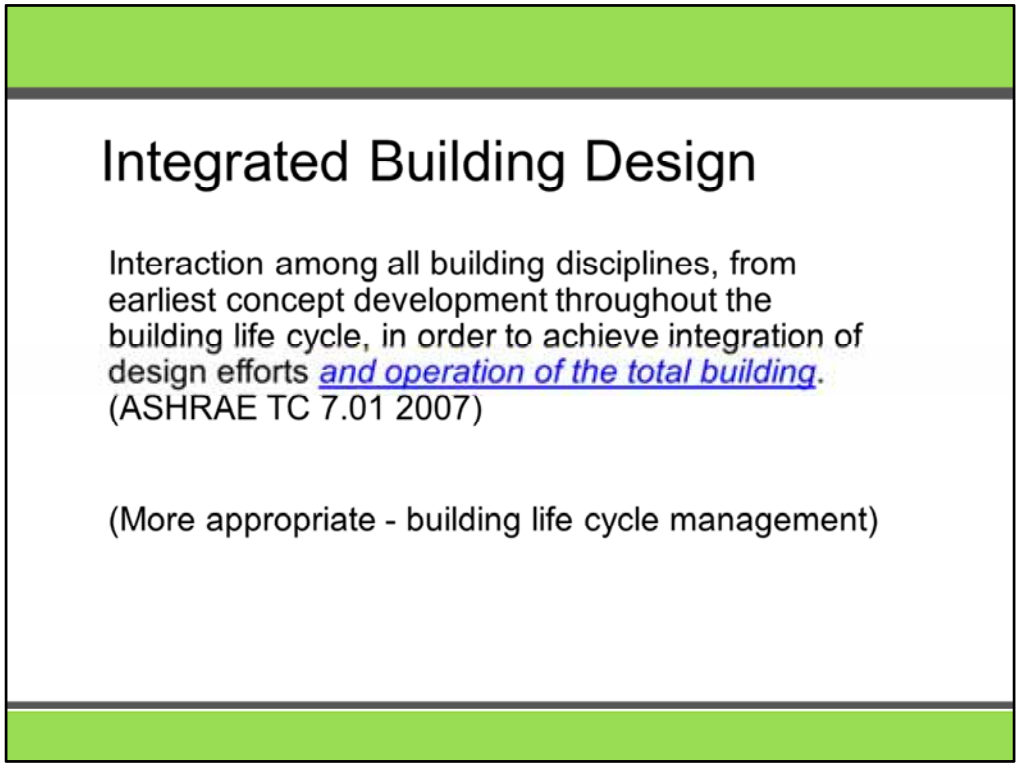
- Terminology
- Benefits
- Early Collaboration
- Getting Started
- What Others are Doing
- How to Get Involved
- The Future
- Additional Reading

Get a copy – Its Free - ASHRAE ALI course by Tim Dwyer
Put together by ASHRAE volunteers and with input from most of the major BIM authoring tool and energy modeling software vendors.
The advice and processes covered in the Introduction and many of the resources cited are still relevant.



Two key words again – Information and Reliable

7 Times 7 Ways/Formats



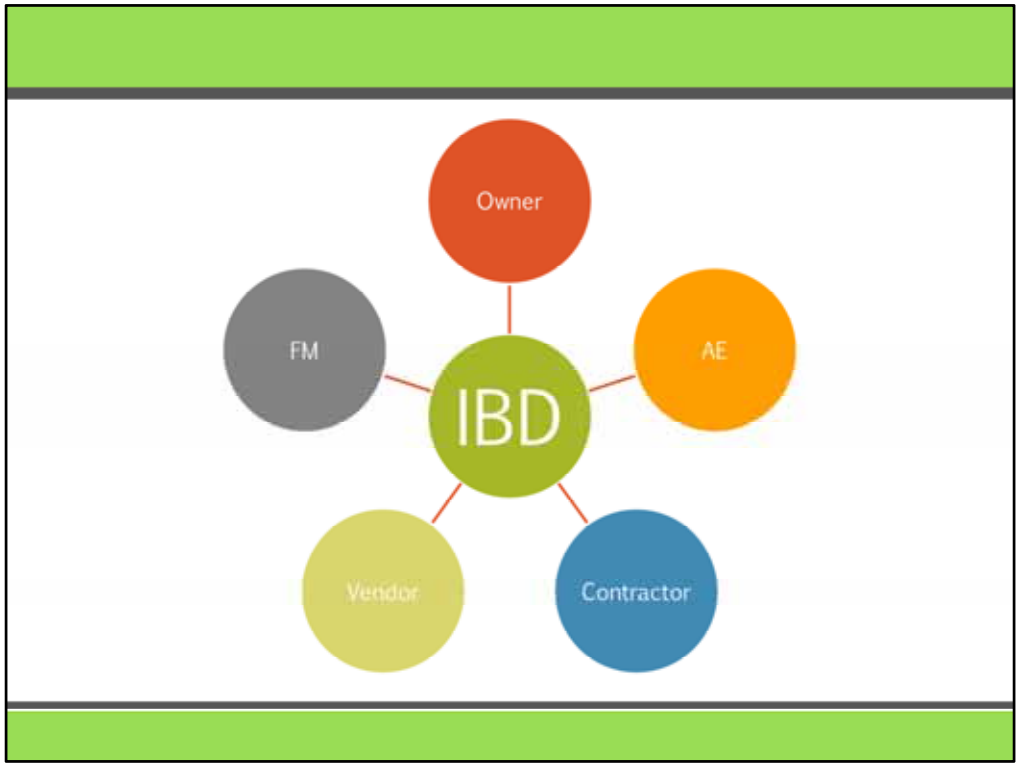
Would prefer Life Cycle Building/Asset Management

Most definitions and process stop at the end of construction – CO or final inspection.

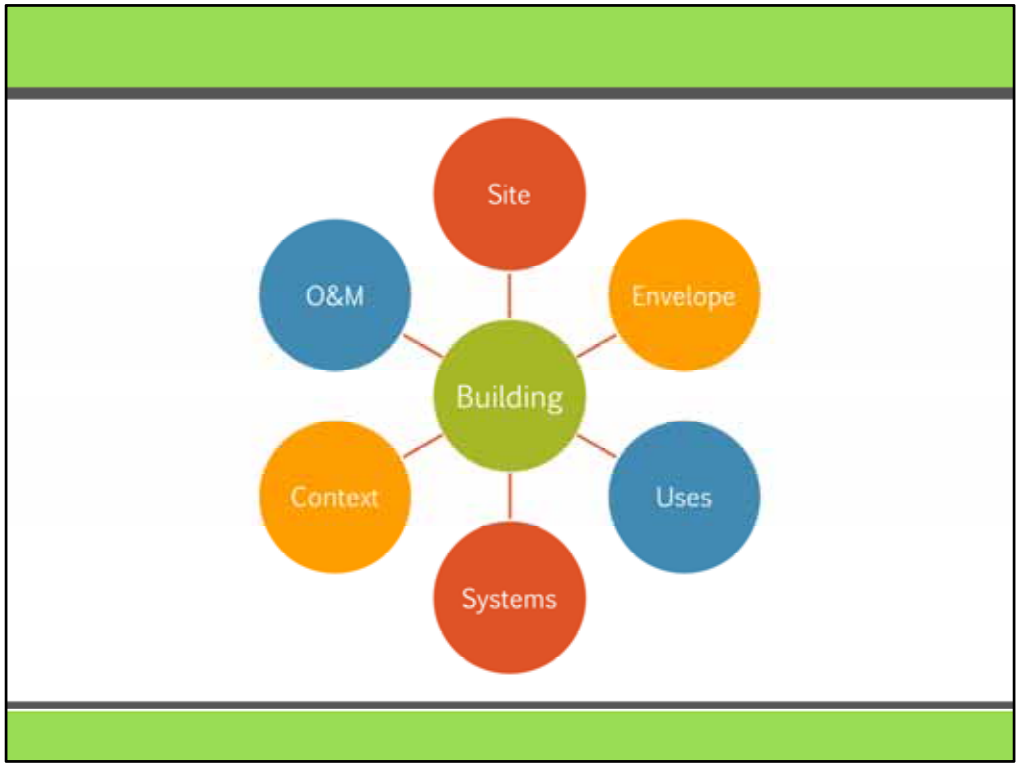
85% after occupancy

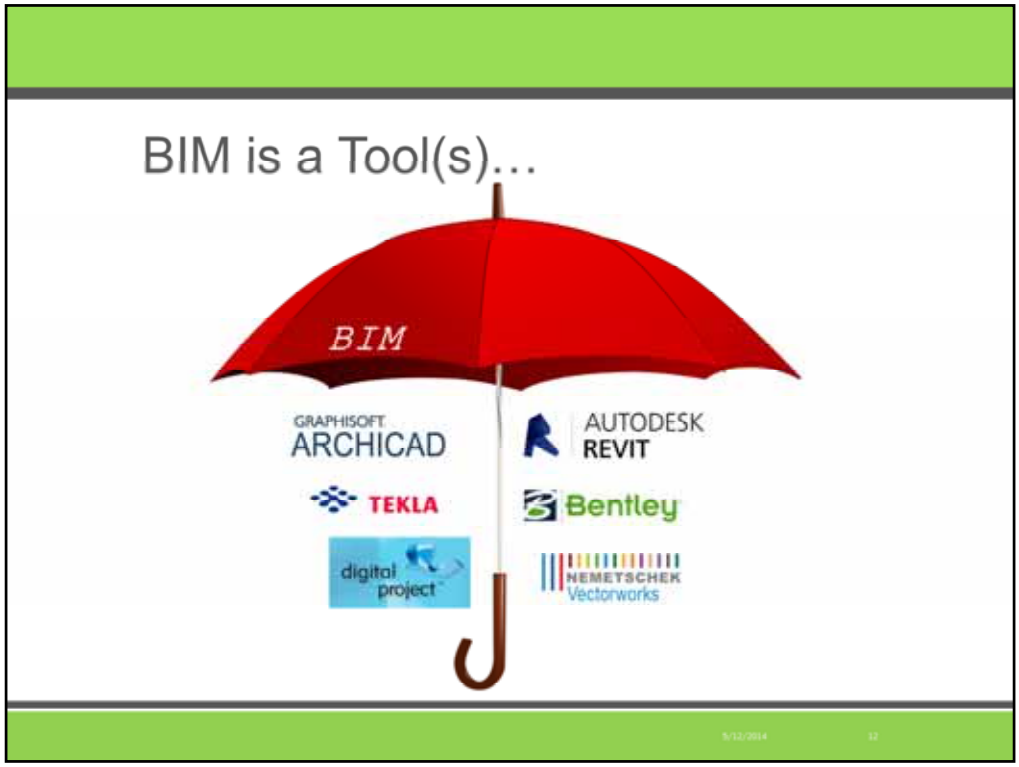
Long time to get it -

Key to sustainability, achieving energy and emissions targets is as much about operation and users and behavior/awareness

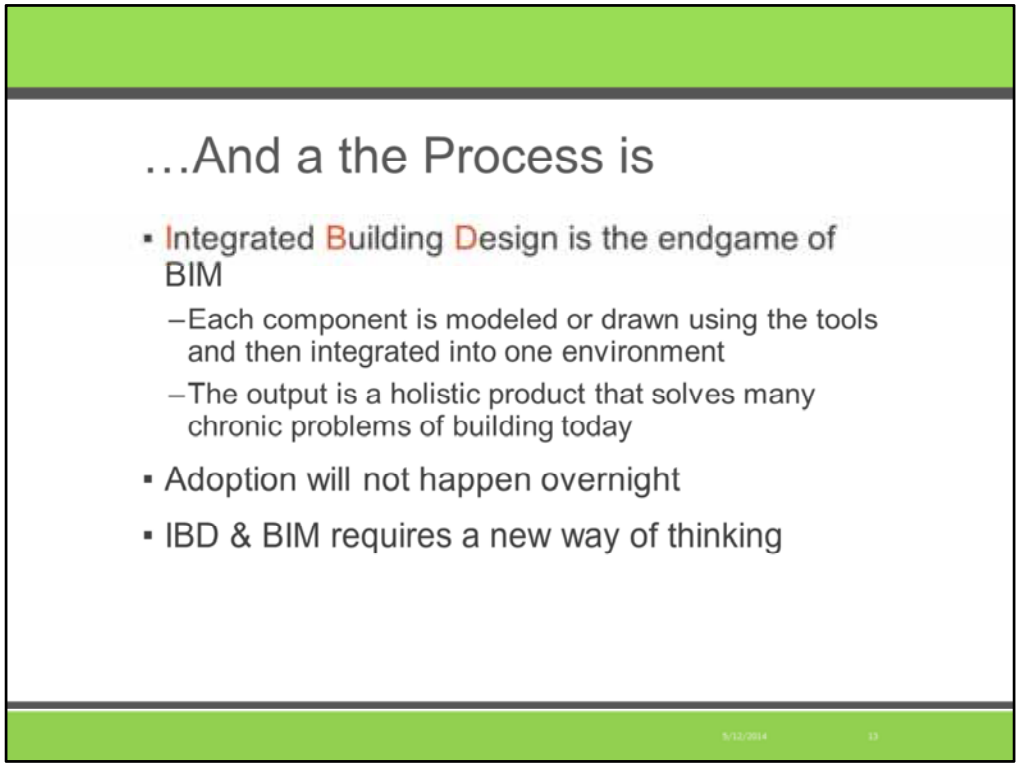


Involves all disciplines and stakeholder
Each team involves even more stakeholders

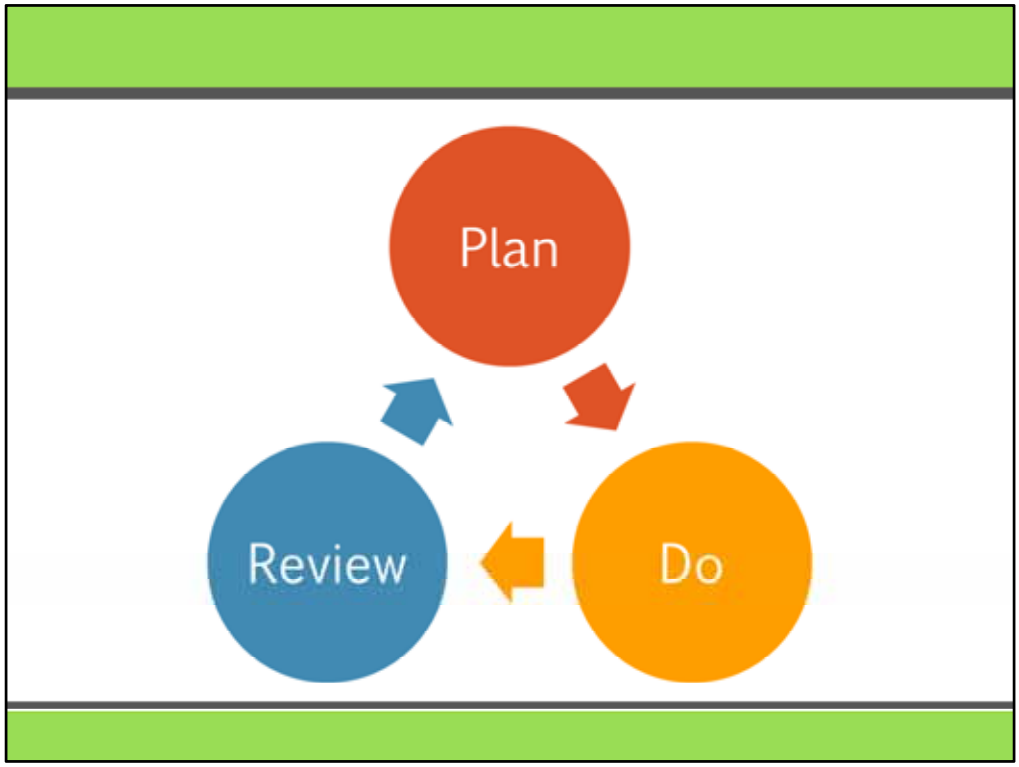

Site
O&M
Envelope
Building
Context
Uses
Systems



This is not meant to be proprietary – lots of tools

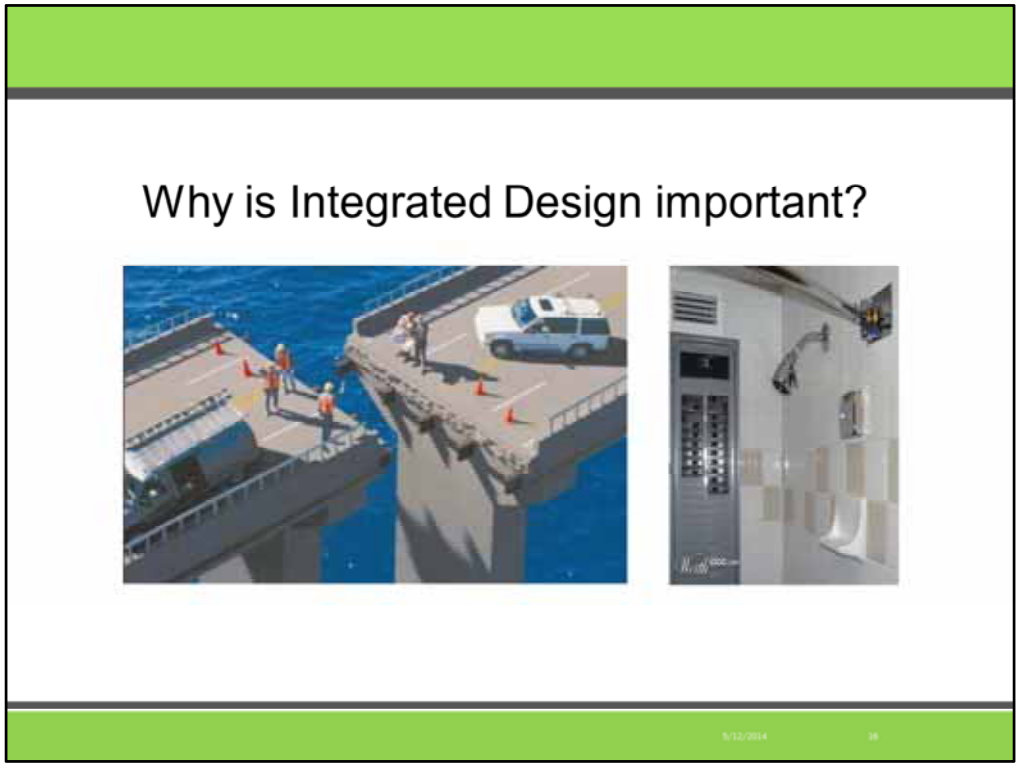


It's all about better buildings,
Happier clients
Happier users
Parametric analysis – how things interact



The Continuous improvement process
Better with ever iteration

Its holistic
Life cycled based



Three ways: Past, Present, Future – to solve conversation must turn to the future

Forensics Old model – study the sick – never get well – I'm going to do a little of that today

Psychologist/Therapist – In with 1, leave with 10, come back over and over

Need to study the well – accentuate the positive

BIM/IBD is trying to perfect the process that real high performing buildings have used – good design, good operation, good maintenance

The Current Process

- Key stakeholders work in silos
- Work flows are contained within silos
- Handoffs are poorly coordinated
- Change orders, value elimination, budget and schedule overruns are common practice
- The entire Life Cycle Cost of a building is not thoroughly vetted early

5/12/2014 17

This is key to understand. For BIM to be effective and provide the greatest benefit, it must be applied in an integrated team based environment. BIM can eliminate the silos that exist in our business today and bring many of the fragments and disconnected processes together into a single, cohesive, integrated and optimized work results. The days of getting the architects or designers drawings or CAD files at the CD phase and inserting some structure, MEP, etc into them and hoping for the best will be behind us.

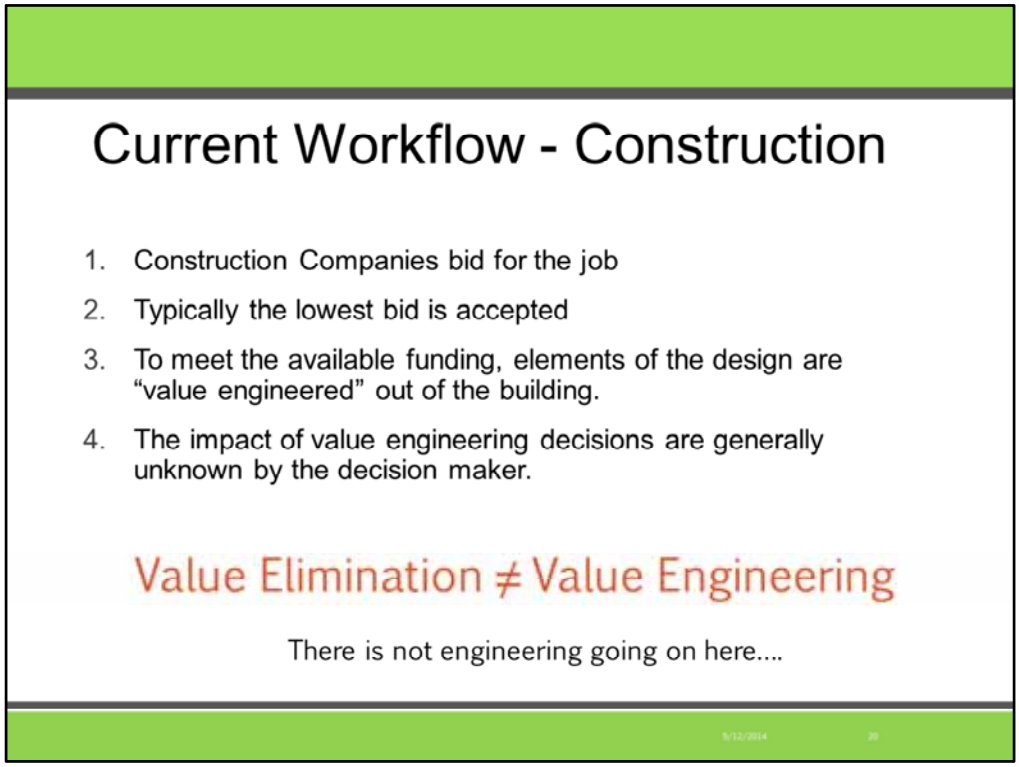
The Current Workflow - Owner

- Need for a facility is identified
- Feasibility study conducted
- 80% major decisions in 10 minutes

Project budget is determined based on available funds and/or limited cost analysis

Current Workflow - Design

- The Owner informs Design Team on project requirements
- Initial building design exceeds the project budget
- Building is re-designed to meet project budget

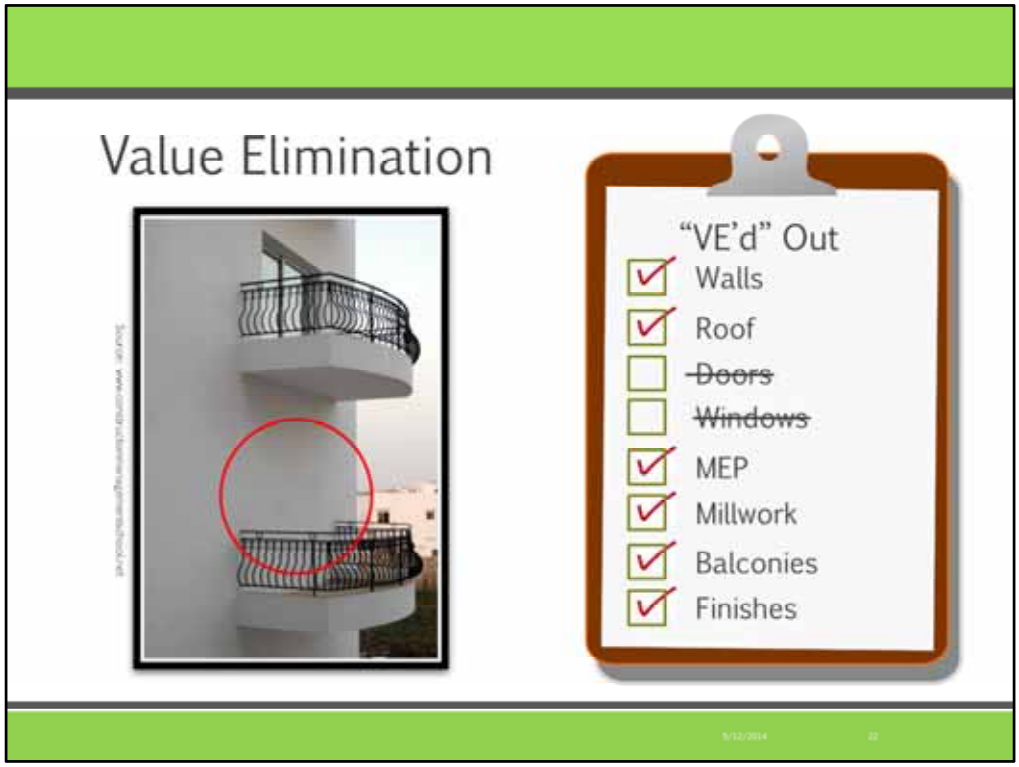


Information and knowledge analogy again - Assymetry

Current Workflow – Facility Management

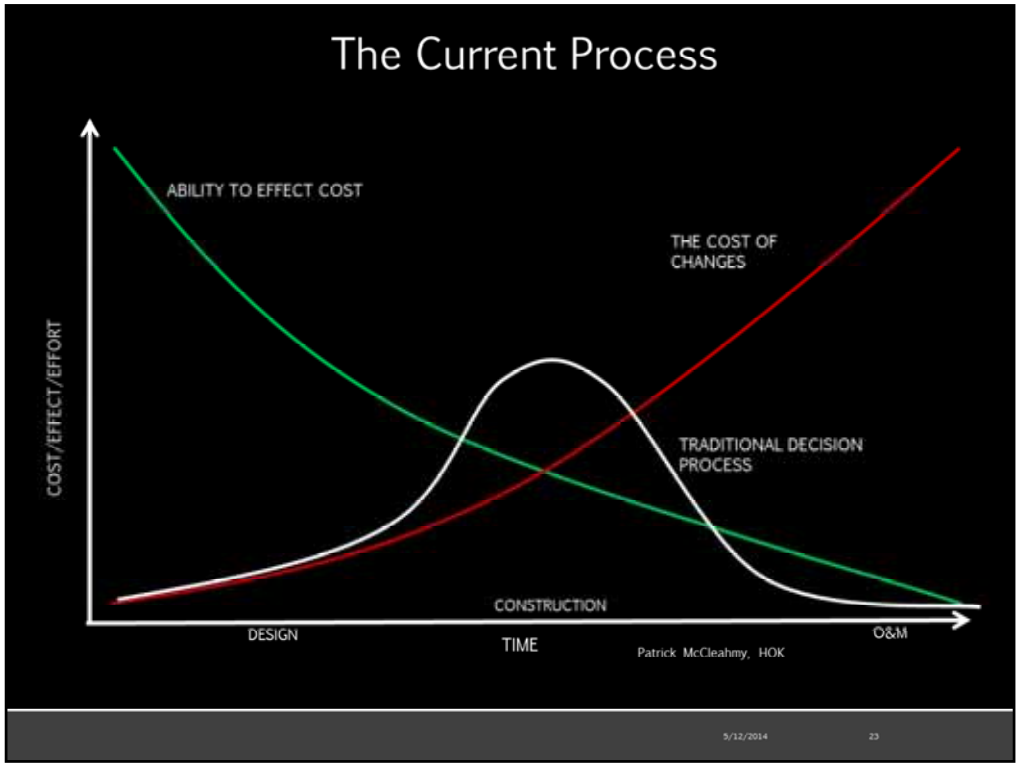
- Not currently a well thought out consideration in the work flow
- LCCA is not conducted → resulting in operation costs that are not tied to a predetermined metric
- Buildings consume more energy than necessary
- Owners pay far more in energy costs than necessary

The environment pays the price



VE often takes a more subtle approach and the implications are often not considered or thought to be irrelevant other than the immediate first cost.

Give a couple of examples – controls, interfaces, etc



Lets look at this graphically

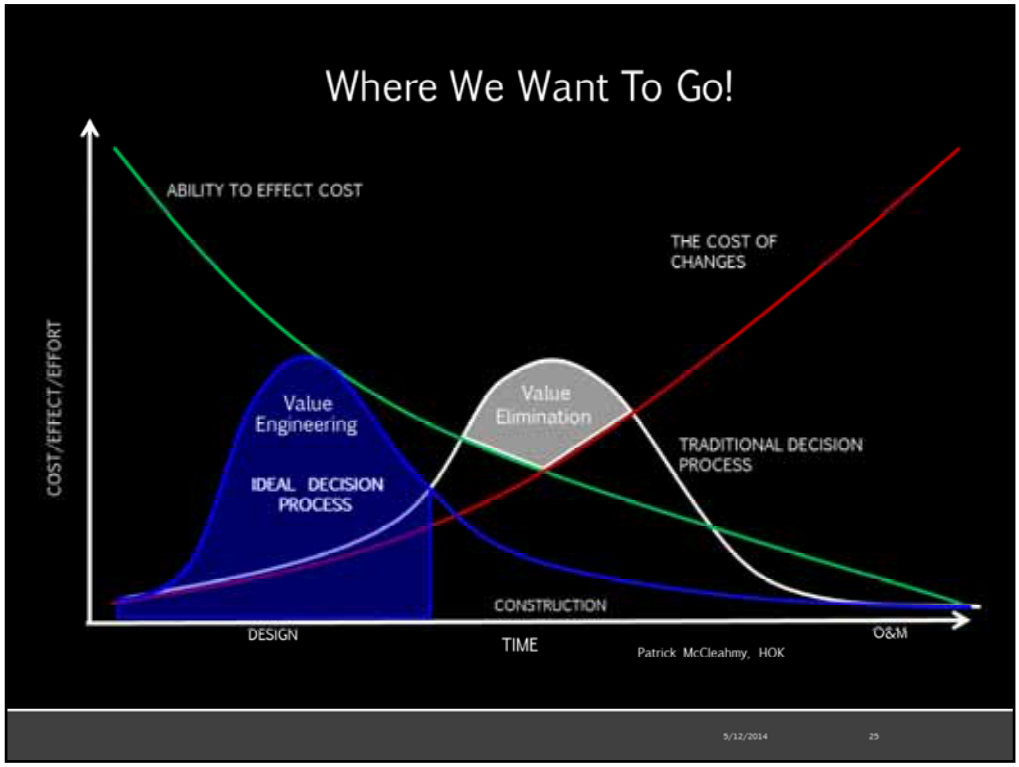
Value Engineering

- Value Engineering should be about making informed decisions
- This is where BIM/IBD adds tremendous value to the PROCESS
- Iteration of Design to meet budget AND owner's requirements must happen earlier in the process
- LCCA is key to inform VE decisions over the entire life cycle of the building from design through operation

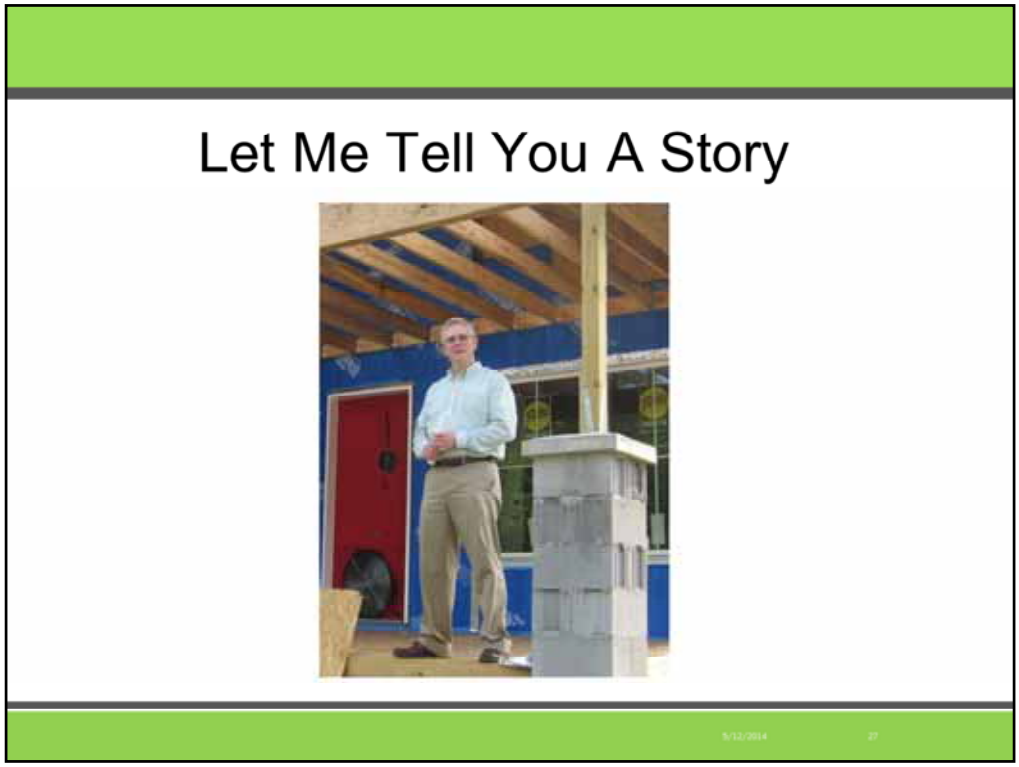
Slide 24

A210 This is where we need visual of BIM - 3D model

Author, 11/15/2013


Where We Want To Go!
ABILITY TO EFFECT COST
THE COST OF CHANGES
COST/EFFECT/EFFORT
Value Engineering
IDEAL DECISION PROCESS
Value Elimination
TRADITIONAL DECISION PROCESS
CONSTRUCTION
DESIGN
TIME
O&M
Patrick McCleahmy, HOK
5/12/2014
25

According to UK study March 2011, 46% of design professionals still using hand drafting.
What is driving this transformation?
Clients: construct buildings faster, cheaper and better.
AE's: better design decisions faster; eliminate or reduce errors and omissions; deliver more accurate work results.
Contractors: build buildings faster; less waste, fewer coordination problems; fewer call backs and warranty claims.
Finally Owners: O&M their buildings such that they continue to operate and peak efficiency and at reduced energy cost.



Second largest firm in state – still small firms on a budget
9 years ago – 25 seats of cad – 14 seats of bim tool
Pulled plug,
Largest project in the office,
56 year old standards
5 team members one week of training,
One month to setup templates,
Whole office shut down one week to get trained by team leaders and consultant
Consultants invited to sit in – show direction we we headed – to set the standard
Biggest argument was with principals who did not draw at all over maintaining the 56 year old look and feel of our 2D deliverables – one hold out bubble for section and detail titles

What We Did

- Made our decision based on emotions
- We had a strong desire to be an early adopter
  - 14 Network BIM seats replaced 25 CAD seats
  - All new 64 bit hardware
  - Remote offices shared network via remote desktop

We pulled the plug on CAD except for one client.

The slide and bullet points are self explanatory

One major benefit was that we needed fewer seats of the software which eased the pain of upgrading and for annual maintenance

Hardware was a major expense we did not anticipate – we struggled with 32 bit machines for a while

We had two major offices and two small offices. The two major offices worked together and provided production support between them on projects. We kept two client machines in each office that could access the network servers in each office via remote desktop and run the software.

We first obtained 5 seats of the software and sent our team leaders to training and had them come back and set up templates for each studio about two months before we pulled the plug. Then we had the reseller come in over a weekend and upgrade all of the software.

We closed the office the following week and did a total immersion training session with real projects. Each team focused on getting their current projects into the tools format and becoming comfortable creating the 2D sheet views that would be needed to produce construction documents.

We allowed our consultants to come into the office during the training and observe the process. We did not switch to different consultants – we tried to bring everyone along and encourage them to adopt the technology.

What Happened

- A lot of frustration initially – but in the end
- Increased production by roughly 15% the first year
- Lowered our utilization rates slightly
- Improved our marketing efforts
- All consultants converted to BIM within 2 years
- Were seen as a market leader

One economic advantage to the firm was that we now were doing the same production with just 14 network seats of software in lieu of 30 standalone seats before.

First – I'm kidding a little with the first bullet. It's just fun to say – kind of like talking with your children before they go off to college.

Each firm will find its own path to some extent. A lot has to do with the office culture, if you have been an early adopter of previous technologies, have a desire to push the envelope with your design tools, are very technology driven, etc.

Large projects take some thought – will the project be developed in one large master file or several smaller files, how will the worksets be set up, how will the files be accessed, how often will the master file be update and distributed to other team members, how will the work of other disciplines be integrated and coordinated? Worksets allow large portions of a model to be "turned off" if you are not working in it to speed up processing time.

The new mindset for Bim is that you design a building the way it is constructed – in 3D from the ground up. This is much different from drawing in 2D in order to try and convey to a contractor or an owner what the final built product should look like. This is a much more fluid and intuitive way to design.

When multiple disciplines are using the same tool – conflicts and clash detection is made easy and can be automated. If use a third party clash detection tool you can even set up hard and soft clashes. Soft clashes are things like clearance space for maintenance access

Other things to consider is when to stop modeling and what old process to stop and leave behind.

So lets put the decision making process into Perspective:

This is very similar to any other engineering economic analysis you may routinely already provide for your clients. Most of us do this every day for our clients then don't even think about apply the same process to our own internal decision making challenges.

First – define your goals (define your problem so to speak) – what are you going to use BIM for? Do you plan a fast transition or a slow transition? Are you considering making the transition on your own or is the transition being driven by clients and the market? Will you use it for Coordination? Design analysis? Construction Document preparation? Construction project management, cost estimating, scheduling, etc.

Next - Gather your data: Get the names and points of contact from the major BIM authoring tool representatives in your area. Research each product on the web. Find other users or user groups in the area and attend a couple of meetings and read their forums and blogs.

What are your feasible alternatives? Full transition, partial, what software vendors are you willing to consider, etc?

What is your selection criteria? – What is the cost? Can you try the software for free? For How long? What are the limitations? What is the ease of use, similarity to your current software, training availability, subscription fees, etc.

One important thing – is the vendor willing to let you try the software for three days and help you do a demo project.

Take an average project that your firm does – could one of your experienced CAD users take the software and create a product you would be comfortable putting in front of a client after using the software for only about three days?

What May Be A Better Way

- Construct a selection matrix or decision tree
- Don't forget the hardware!!
- *Think about what you can eliminate from current workflow*
- Analyze each option against your goals
- Choose your best alternative

Develop a matrix or spreadsheet of selection criteria, features and software vendors you are considering. Similar to what you might see on a comparison chart on the back of a software package or internet rating site.

Check off or rank each vendor in each area of the selection criteria you have established for your firm.

Choose the best alternative to adopt.

What May Be A Better Way

	BIM Tool 1	BIM Tool 2	CAD Tool 1	EM Tool 1	EM Tool 2	Daylighting Tool 1	Cost Estimating Tool 1
Already Own	N	N	Y	Y	N	N	Y
If Don't Own Initial Cost	$$	$$			$	$	
Annual Subscription	$	$	$	$	$	$	$
Energy Modeling	Y	N	N	Y	Y	NA	NA
Daylighting	N	Y	N	NA	NA	Y	NA
Load Analysis	Y	N	N	Y	Y	NA	NA
2D Construction Documentation	Y	Y	Y	NA	NA	NA	NA
Clash Detection	Y	Y	N	NA	NA	NA	NA
Can Import from BIM Tool	NA	NA	N	Y	N	N	Y
Can Export to BIM Tool	NA	NA	N	Y	N	N	Y

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Choose the best alternative to adopt.

What We Are Doing Today

- Looking closely at what we can automate
- *Determining what software we no longer need*
- Discussing what level of detail required at each phase
- Helping clients determine what to ask for in contracts
- Looking 5 to 20 years out – stay at the table longer

Develop a matrix or spreadsheet of selection criteria, features and software vendors you are considering. Similar to what you might see on a comparison chart on the back of a software package or internet rating site.

Check off or rank each vendor in each area of the selection criteria you have established for your firm.

Choose the best alternative to adopt.

What You Might Do To Start

- Try several packages
- Get a viewer
- Ask for some BIM files
- Master schedules (there are two types)
  - This is key to access information – (Parameters)

Develop a matrix or spreadsheet of selection criteria, features and software vendors you are considering. Similar to what you might see on a comparison chart on the back of a software package or internet rating site.

Check off or rank each vendor in each area of the selection criteria you have established for your firm.

Choose the best alternative to adopt.

The Future Is Already Happening

- Integrated Building Design
- Integrated Project Delivery
- Integrating Specification Writing
- Automated cost estimating
- Advanced clash detection and model checking
- BIM to Fabrication
- BIM to SIM: Advanced Analytics
  - Energy Modeling
  - Daylighting
  - Computational Fluid Dynamics

- Integrated multi-discipline design is the perfect use of the tool.
- Specification writing, cost estimating, clash detection, scheduling, code checking and model checkers, are already available both integrated in some tools and through third party interoperable tools.
- BIM to BEM and SIM
- Early analysis
- BIM servers
- Clash detection
- Daylighting
- Energy

Future Trends – BIM Tools

- Cloud based BIM authoring tools
- Cloud based BIM servers and storage
- Increased interoperability
- More integrated applications
- Increased focus on Owner benefits beyond design
  - O&M
  - Property and portfolio management
  - Energy management
- BIM to Manufacturing

- The fastest growing segment of the market seems to be in cloud based BIM for integrated project delivery
- IFMA, buildingSMART, COBie (Commercial Operations Building Information Exchange)
- Research is vital to continued improvement
- Standard data exchange formats are needed for interoperability
- There is a need for parametric capabilities between third party analytic tools and BIM authoring tools
- Object databases with standardized manufacturer's data are absolutely needed
- Current objects are all over the place from having too much data – almost manufacturing level drawing and detailing to no analytic data available at all

Call to action
That's where you all come in – gotta use it to improve it – get involved – become engaged
ASHRAE, ASPE, buildingSMART, ISO, vendors, conferences, forums, blogs,

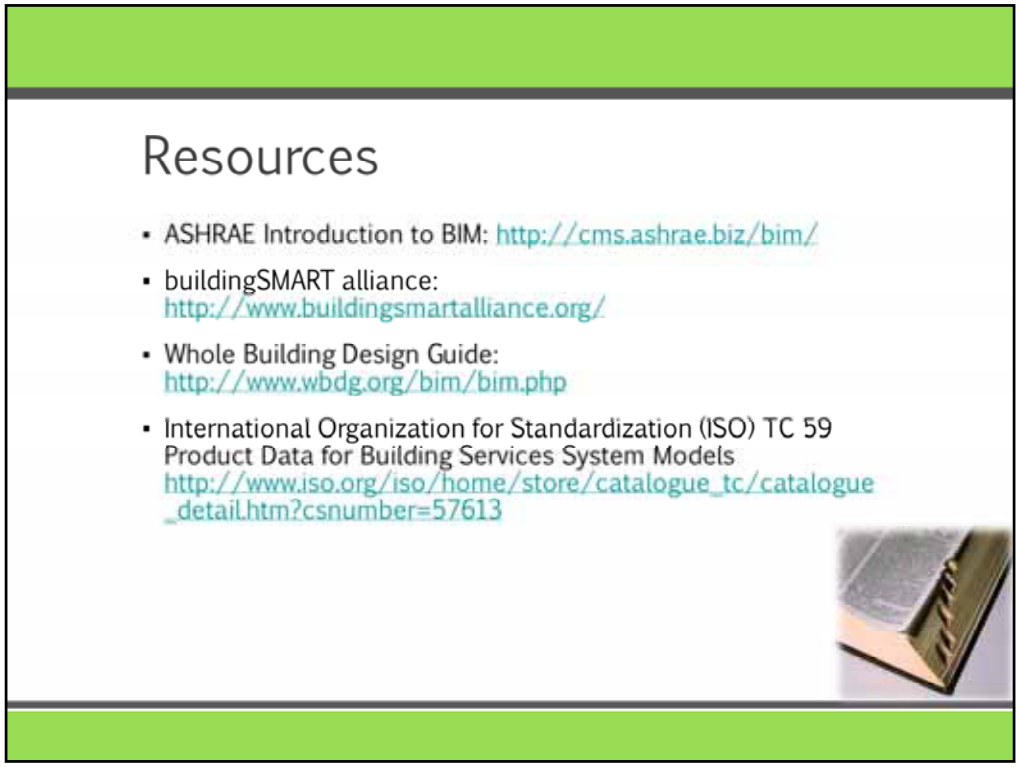
Current Barriers to Success Beyond Geospatial Design

- Lack of Interoperability
- Limited Parametric Design Features
- Integrated Engineering Design Technology
- Handling of Information and Data
- Investment in New Technologies
- Consistent Application of Technology Throughout the Design, Construction and Operational Process

Impact on ASHRAE

- Development of SMART Documents
  - –Smart XMLs, Rules Sets, Common Terminology
- Resources
  - –Handbooks, Standards, Guidelines, Manuals
  - –Data Dictionary
- Liaisons to TCs, GPCs, SPCs
  - –TC's: 1.5, 1.6, 4.1, 4.2, 4.7, 7.1
  - –GPC 20
  - –SPC's: 140, 183

LIST OF TC's and SPC's
TC 1.5 Computer Applications
TC 1.6 Terminology
TC 4.1 Load Calculations Data and Calculations
TC 4.2 Weather Information
TC 4.7 Energy Calculations
TC 7.1 Integrated Building Design
GPC 20 XML Definitions for HVAC & R. Data Dictionary
SPC 140 Standard MOT for Building Energy Analysis
SPC 183 Methods and Procedures for Performing Heating & Cooling Load Calculations



Before I close the session and begin to take questions I want to say that we are just beginning to realize the potential of BIM. I have intentionally not talked much about that today because I know the other speakers are focusing on the features and benefits of BIM. I do want to offer some encouraging words to the young engineers in the audience. On October 1st through the 3rd, 2012 I had the pleasure of Chairing ASHRAE's Energy Modeling Conference in Atlanta, Georgia. We had around 190 energy modeling professionals and software vendors represented. The conference focused on the hands on day-to-day work practices of producing high quality energy models. The conference had the largest percentage of young engineers of any ASHRAE conference I have attended. That conference was our second specialty conference on energy modeling. Much of the conference and the case studies presented involved an integrated approach to building design and much of the discussion involved the future of BIM and interoperability with third party analytic tools. In my closing remarks I asked the audience to just think for a minute just how far we've come in the last 30 years (roughly the length of a career). Then I asked every young engineer who made a presentation during the three days to keep a copy of the presentation and some photos of the tools and technology they are using today. I also asked them to jot down some of the key challenges they each hope to have solved by BIM and energy modeling. Then I asked them get involved and to put themselves in my shoes 30 years from now, closing a conference, and to look back and recap all of those challenges they were instrumental in helping to move forward and improve.

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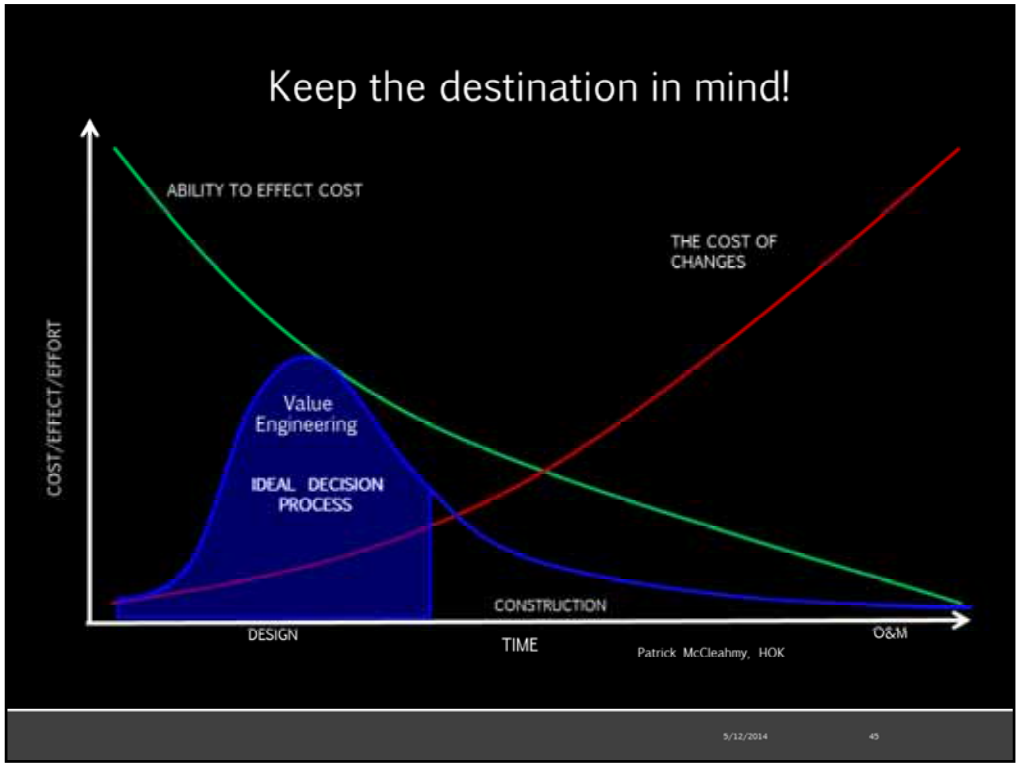
Keep the destination in mind!
ABILITY TO EFFECT COST
THE COST OF CHANGES
COST/EFFECT/EFFORT
Value Engineering
IDEAL DECISION PROCESS
CONSTRUCTION
DESIGN
TIME
O&M
Patrick McCleahmy, HOK
5/12/2014
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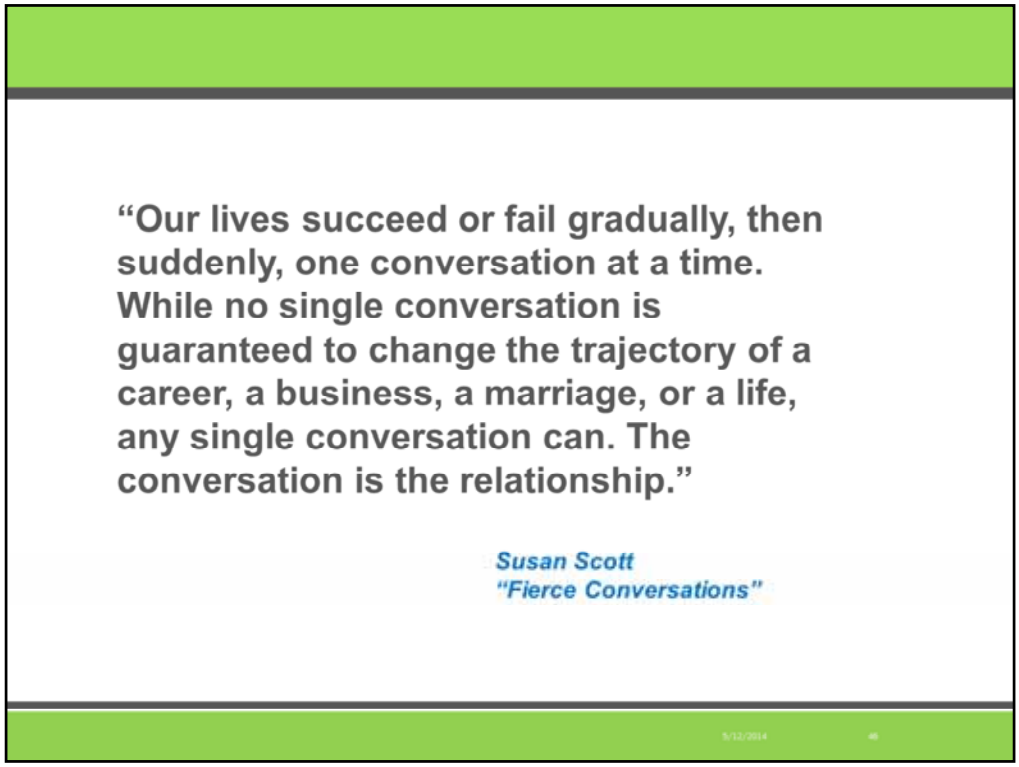

Keep the conversation going
Contribute to the body of knowledge
Be a part of the future – participate – share – question = learn
What do you want to be remembered for?

Questions