Getting Real with GeoDesign and BIM

At the 2011 GeoDesign Summit, Kimon Onuma delivers his keynote presentation on mashing geospatial models with facility models.

http://video.esri.com/watch/176/getting-real-with-geodesign-and-bim

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Video Transcription

00:01 I'm going to introduce a guy that I've known for seven or eight years, Kimon Onuma, who's an architect, digital guru...

00:08 ...evangelist for BIM, and the integration of BIM with GIS...

00:12 ...and he's going to blow your minds and knock your socks off. And that's going to be an understatement.

00:17 So I had lunch with some folks earlier today, and I said, Okay, here's where we are with geodesign in our minds...

00:24 ...and here's what Kimon's going to show you at 4 o'clock.

00:29 Now take that differential and project it ahead and multiply it by 10, and that's where we're going, right?

00:37 And a little about Kimon. Kimon is very soft-spoken, very modest, very quiet...

00:43 ...until you see his work and then he's quite provocative, quite attention-getting...

00:51 ...quite stimulating, and I think you're going to enjoy the hour.

00:54 What's he's going to do for you is, he's going to redesign Hong Kong in an hour, live.

00:59 Kimon Onuma, thank you.

01:05 Thank you, Bill, and thank you very much to Esri for having me here. I'm very excited to be presenting.

01:12 So the title of my presentation is Getting Real with BIM, getting real with geodesign and BIM.

01:17 How many of you know what BIM is? Okay, everybody, just about, at a different level.

01:23 Mashing up geospatial models with facility models.

01:27 Just a little bit of background. We've been using BIM since 1993...

01:31 ...before it was even known as BIM, but it's essentially the same technology. It's advanced obviously since then.

01:36 A lot of our clients were working with GSA and Corps of Engineers and school districts...

01:42 ...so it's been getting pretty exciting in the last couple of years. I though it was going to hit like in 1995.

01:47 It took this long to finally kind of kick into gear and I think this year it somehow seems to be right.

01:51 And this convergence that's happening and things that are connecting with the geospatial world with BIM...

01:58 ...is a very exciting place to be and I think this...it's a great place to be.

02:02 So here's some early BIMs that we were doing in 1993 with the navy and the army.

02:06 We weren't telling them that we were using BIM.

02:08 We were delivering paper basically, and an interesting thing about it is we were using ArcCAD at the time, and we still do.

02:13 We use ArcCAD and Revit as well. But a lot of that kind of overlapped a little bit conceptually with GIS.

02:18 We had a 2,000 housing unit navy base for example, in 1993, with the technology back then.

02:25 And we had to get pretty creative about how we managed the model...

02:28 ...because it was obviously...the processing power back then was a little bit less than it is today.

02:33 I always like to start with this slide.

02:35 I say, today the technology exists to get on the Internet and to make a reservation, real time.

02:41 Ask a question, it gives you the price of a ticket in a simple interface.

02:45 There's no BIM training or GIS training or anything. Basically, ask it a question, it gives you a bid in real time.

02:51 It doesn't say, How much fuel would you like on the plane? It doesn’t say, Would you like the pilot's seat?

02:57 It actually is intelligent. It says, Would you like a hotel to go with that?

03:01 Simple. Simplicity is key. And that's what's driving everything that's happening in the last few years...

03:06 ...as we notice on the Internet and with the smart devices and everything.

03:10 So how do we get there? The building industry is not there today.

03:14 And I'd like to just flip to a present...animation real quickly here.

03:20 Oops. I thought I had it open. Sorry. Let's go back to...okay.

03:35 So here's to architecture. I'm an architect, that's my background, so I look at it from that

perspective, architecture.

03:43 We learn from the past, we dream about the future, we design it, we build it, we imagine it, and then we construct it.

03:53 Some think we're crazy. We're doing crazy things with our environment.

03:59 We're legends. We're teachers. We're dreamers. We think outside the box. We create poetry with gravity and light.

04:07 We build. We inspire. We design everything from chairs to iconic buildings to entire cities.

04:19 We move civilization forward, but there's a problem.

04:26 Henry Ford once said, "If I ask my customers what they wanted, they would have said, 'A faster horse.' " Henry Ford.

04:35 The building industry's pretty much still stuck in the nineteenth century.

04:38 We're using processes and tools stuck in the past, even with BIM.

04:43 We're not there yet. There's a huge gap still, so there's a lot of potential.

04:47 The twenty-first century train is leaving the station.

04:53 The US Coast Guard says the data about our facilities is more valuable than the physical facility itself.

05:00 The buildings are just containers for their business. Life cycle, buildings are just boxes.

05:05 The information of BIM is what drives everything. We are in the information age, and that's what drives everything.

05:12 How do we get information and knowledge connected together? It's not about the tools.

05:15 There are a lot of tools out there, and open standards and integration between these different processes is critical.

05:21 It's incredibly complex, but we need to keep it simple. If we don't keep it simple, we'll never solve the complex problems.

05:28 So back to Expedia. Expedia is simple. Anybody can use it. You can make a decision, real time.

05:34 You don't go and print out every schedule out there today in a PDF...

05:38 ...and save it, and say I'll come back to it tomorrow. It wouldn't work.

05:41 BIM can be simple. This is a BIM in our world. An Excel file that says, Here are the spaces I need...

05:47 ...here's the size of the space, drive it into a model server, and you'll see a little bit more of this later actually.

05:52 Model Server on the web, real time, service-oriented architecture, cloud computing, BIM, and

GIS connected.

06:00 This has been going on for years for us. BIM storms have started about three years ago.

06:03 This is Penn State involved in a BIM storm with 140 teams from around the world in 24 hours, designing 420 buildings.

06:11 Crazy, right? It's not a real project, but this is how we drive our real projects...

06:15 ...having geospatial data connected all the way from the world level to the city level to the building level...

06:22 ...to the inside of the building, the piece of equipment in the building, to that light that's on in the room...

06:26 ...and it's connected to a sensor. Everything has a latitude and longitude connected together.

06:30 So the intersection between BIM and GIS is where the explosion's happening.

06:34 When you connect the two, information absolutely explodes in value.

06:38 There's two different perspectives obviously, but...and there's no clear-cut line through this. It's really an overlap.

06:44 BIM storms, if you go to bimstorm.com, you can participate in BIM storms. They're open to anybody to participate.

06:50 We had one in Washington, D.C., a few weeks ago.

06:52 Here's a client requirement for a site. Here's a site I want to put 300,000 square foot.

06:56 Here's an Excel file that says 300,000 square feet, several hundred units of housing, Excel file...

07:02 ...import to this model server, this Onuma system. It automatically creates a block that says here's your building.

07:07 Nobody's touched the design on this building yet. It's automatically generated from Excel, having all the spaces.

07:14 You can start having discussions. Is this a good idea or a bad idea? We call this a train wreck.

07:17 Is this a good train wreck or a bad train wreck? Bad train wreck; throw it away. Keep moving.

07:22 Configure the spaces online. Because you're online and this is in real time...

07:26 ...I can start interacting with others and saying, What do you think of this arrangement?

07:30 When they say that's a good idea, then we move back out again. This is within minutes.

07:34 You basically get another version of this first design model, which usually takes hours or weeks sometimes.

07:39 Then you say, Okay, now let's take this out to SketchUp.

07:41 Automatically generated SketchUp model that originally data started in Excel, now in SketchUp.

07:47 Same thing out to Revit. Interoperability. You want to move it to any tools. You don't want to re-create the data.

07:52 Now in Revit, this is a requirement model to give the design team, saying...

07:56 ...here's what the owner wants, now go fulfill that requirement.

08:00 Once you get into the life cycle, the "I" of information, the value of information kicks into high gear.

08:05 If we can't manage information about our built environment, we won't be able to tackle all the problems that we have.

08:10 So real time is what drives us. Cloud computing is what we use.

08:15 Connecting people. It's really about connecting people and connecting decisions.

08:20 Nothing about the tools again. It's the tools are just paper and pencil in the background.

08:24 Owner being able to visualize the data on their BIM in a simple way, without BIM training, saying, here's your equipment.

08:29 Here's a webcam to attach to that. Multiple servers starting to talk to each other.

08:34 Cloud computing is about mashups. Mashing up BIM in GIS and visualizing it on any platform at any time and any place.

08:41 Color coding things from databases. Visualizing a BIM, this is a BIM.

08:45 It's one room on the 33rd floor, but it's still part of a BIM...

08:48 ...but it's simple enough that I can look at it in a tool like Google Earth and say, there's a sensor...

08:52 ...live sensor data connected to that in a mashup, saying, here's your temperature of that piece of equipment on that room.

08:57 I don't have to download a 200-megabyte model to go and look at that. Then that's part of the city.

09:04 The city obviously is part of the world and this all connects together.

09:07 This is what our view of geodesign is. It's really about connecting the information.

09:11 So what we're going to do...and here's Google Earth again.

09:14 You click on things, energy use of the building, so kind of a portfolio-level view of thousands of buildings.

09:20 We need to get past this building a faster horse. It's about the next level.

09:25 We are the ones, as an industry, that are going to answer these questions.

09:30 So let's actually...I wanted to try an experiment here, and this is kind of...we just decided this last night.

09:36 I do this once in a while and decided, well, let's go ahead and do this.

09:38 We're going to do a...actually, PDAs, Androids, connected laptops, open them up. I'd like you to participate in a BIM storm.

09:48 Everybody is going to build a BIM in a few minutes.

09:52 So...and I'll get to that slide in a second, but I'll start explaining.

09:56 As an architect, I've constantly been frustrated with these lists of CAD files.

10:01 You open up a file and it's all kind of a file-based system. Here's a third-floor plan, a fourth-floor plan.

10:05 File-based exchanges just don't work in this world. You can't get to real-time data on there.

10:10 Same thing with BIM. If we look at BIM as stand-alone stovepipe files, we're not going to be able to make transactions.

10:16 We have to extract the data that's valuable with these type of exchanges.

10:22 So, I'm part of the buildingSmart alliance. So I'm very much involved with open standards, OGC.

10:28 We were part of OWS for a test bed. buildingSmart alliance, they have their own standard called IFC.

10:35 I've struggled with this over the years. I fully support IFCs, but I also feel that it's taking a long time.

10:39 Fifteen years is kind of a long time to implement a standard.

10:42 We need to keep things simple and have the bigger picture in place, as well as this longer-term vision.

10:47 BIM can come from many different places and it's not one model. BIM is not one model.

10:52 It's impossible to think that BIM is going to be one bucket where we're going to put everything into it and it's going to give us answers.

10:57 It's about connecting things. Just like the Internet is not one database.

11:02 Location and geography and BIM connected. This is a JBIM magazine.

11:08 Actually we have some magazines here we're going to hand out. I don't think I have enough.

11:12 I might have enough for half of you here. You can also download this through the buildingSmart alliances.

11:16 Great articles in here from others as well, relating to GIS and BIM.

11:22 So here we go, bimstorm.com/mobile. It works from Androids, iPhones, iPads, Firefox, Safari.

11:32 IE is not perfect for this, so I would suggest trying...the interface is a little different.

11:36 So you don't need to put a user name and password in yet.

11:39 But if you try that, and I have it written up here for those that don't...can't type this in quick enough.

11:43 So it's bimstorm.com/mobile, and later on you'll use the user name and password.

11:48 And I'll walk you through what we're going to do.

11:52 So I'll keep this open on the side here and you should get an interface like this.

12:05 [Unintelligible audience comment]

12:08 Yeah?

12:10 [Unintelligible audience comment]

12:12 Pardon me? Oh, I'm sorry. This is from a previous...it's MOB, yes. Sorry. Human error there.

12:22 Okay. We simplified it. So it's bimstorm.com/mob.

12:29 You don't need a password, and at the very top I want you to type in "Hong Kong Convention."

12:35 We're going to go to the Hong Kong Convention Center. And you should get this.

12:42 There's a red dot on the map. You can grab that and move it anywhere.

12:45 What we're going to do, there's an area in Hong Kong here...we're not very familiar with what's going on here...

12:49 ...but it looks like they're reclaiming land and building a lot of stuff here, so we've decided to focus on this harbor here...

12:55 ...and the waterfront...actually, there's no more...if I put that there, there's no more water actually.

12:59 There's land there right now. So if you choose a spot somewhere between these two points.

13:03 Just move your red dot there, and on the first line it's going to say Project Name. Put your name.

13:10 So I'm going to put my name, and I'm going to call this Residential...

13:16 ...or just any kind of building name, whatever kind of building you want to put.

13:19 And Hong Kong has some pretty tall buildings, as you all know. This is the site in Hong Kong.

13:26 These buildings are all like, you know, 30, 40, 50 stories high.

13:30 As an architect, I know that a 50-story building, a typical floor plate might be between 15,000 and 20,000 square feet...

13:36 ...so if I make a, like a 300,000-square-foot building...

13:40 ...I put in the square footage in next, and I'm going to type the number of floors.

13:44 I'm going to make this a 20-story building. You can put in whatever you want. And then choose the facility type.

13:51 I'm going to choose a residence and that's all you really need and then it's the Upload button.

13:55 There's a lot of other optional data you can put in here. What this is doing, imagine an owner saying...

14:00 ...I want you to design a building for me in Hong Kong that has 300 residential units, or x number of square feet of office.

14:06 That's a typical kind of request and then design, the team has to figure that out.

14:11 You'll see later on where I'm going with this.

14:13 This is obviously not going to create a final design, but what's happening here, this is collaboration...

14:17 ...kind of a swarming and social media and BIM kind of all tied together...

14:23 ...and if you hit Upload on this, you should get a confirmation right here.

14:30 And you can go back and say, I want to upload another scheme.

14:32 If you go back, you can keep on doing multiple buildings if you like.

14:36 So that's the first step, and we'll keep this up here if you want to keep on adding later, that's fine.

14:42 The next step I'm going to do is actually, it says, Log in to the Onuma system.

14:48 If you log in here, and this is where the user name and password comes into play.

14:55 You don't have to do this step, but for those who like to see the result of what you put up there...

14:59 ...you basically log in, hit the Login button at the very bottom here...

15:07 ...and I gave you the wrong information here. It's not sandbox, I'm sorry. Viewer and password is Onuma.

15:17 So the user name is Viewer and the password is Onuma.

15:23 This is an open sandbox model server that we use for demonstrations like this and that will get you into this next view...

15:32 ...right here, and you'll see a button that says Sandbox.

15:35 If you open that up, you'll start seeing...Oh, there's a lot going on here actually.

15:40 We just had a list of about 10 earlier on, so this is from you guys right now.

15:43 These are your buildings, basically that you submitted.

15:46 So Bill submitted a residential building. This just happened right now. I don't know which Bill this is.

15:51 It might be...there's a lot of Bills obviously in the room, but if I click on that...

15:56 ...and scroll down, it's showing me how much it's going cost to build this building.

16:02 It's showing me what the shape...it's obviously a block.

16:04 There's spaces inside it, but it's showing me the cost...

16:07 ...and it's giving me some initial estimates of utility and operations and maintenance.

16:11 How much is it going to cost to maintain? So it's generating a lot of data with simple input.

16:15 Obviously, we still need to keep designing this. Now, real projects we continue to work to refine this process.

16:21 So what's happening now, the buildings that you guys submitted...I have teams standing by, outside of this room...

16:25 ...actually around the world, that are going to descend on this and move them into position and start designing the city.

16:30 So that's our goal. Our goal is to spend 15 million dollars in one hour here and fill in this part of Hong Kong.

16:35 I mean, crazy project coming, it's, why not, right?

16:38 Okay. So let's go back to this. So the Coast Guard case study.

16:49 Coast Guard from years ago as we were working with them, they were using Google Earth before it was called Google Earth.

16:54 These also used Esri very much too, so it's a combination of tools.

16:58 They used our tool, the one with the green background there, to configure buildings...

17:02 ...the same tool that you're using, a different interface. Now tools can have multiple interfaces.

17:06 When you're...when you're using the cloud and you're mashing stuff up from the web, you can have different views of data.

17:12 You can have a view of the Expedia data for American Airlines that no longer is there...

17:15 ...and I can go to Orbitz and find it again, or I can go to American Airlines, and still buy the same seat.

17:19 You're not duplicating data from one to the next.

17:21 You're going back to the source, the authoritative source that's going to help you make those decisions.

17:25 So the Coast Guard, we were building their existing facilities...

17:29 ...and quickly configuring new facilities and doing scenario planning.

17:32 What if? What if we do this? What if we do that?

17:35 And we did all that before we got into what we call the desktop BIM applications.

17:38 They're using ArcCAD, but it could be Revit, way on the right side.

17:41 Before you start creating the solution, you want to run the scenarios...

17:45 ...and now with the concept of geodesign, if we had access to geospatial data, that would have been incredible.

17:52 We had to pull some of this in manually, but now you'll see later on how some of this stuff starts coming in automatically.

17:59 So the concept of the value of the data for facilities management is critical, the "I" of BIM as we talked about.

18:06 The configuration of...this is a case study again, Coast Guard, 35 command centers.

18:10 It used to take them 10 months to configure and decide the design decisions for one command center.

18:17 They had 35 of them to do. They completed them in a little bit over six months.

18:20 So 10 months for one of them versus six months for all of them.

18:25 It was an incredible time savings and higher accuracy as well.

18:29 And the reason this worked is because they would go in from place to place, log into the system...

18:32 ...pull up the latest data, push it back into the server, and move to the next place.

18:35 Instead of going and spending...oh it was mentioned this morning...

18:38 ...it's true, it takes 50 percent of the time to find background data typically. It's a huge waste in a design process.

18:47 Integrated decision making, again, with the Coast Guard looking at different views of BIM.

18:50 We can use BIM for planning a facility. We can use BIM for security analysis. You can use BIM for doing command centers.

18:57 It's different again, different snippets of data all connected in the center to make decisions. So the simplicity is key.

19:05 And, actually, as architects, Frank Gehry even starts with simple blocks like this to create complex buildings.

19:10 So, simplicity for buildings is actually critical and it's actually very much about spaces.

19:15 And that's what I think is the huge opportunity here, as far as interaction between GIS and BIM...

19:20 ...there's a subset of a building that's critical for facilities management and for geospatial analysis...

19:26 ...and it's not the full-blown design and construction model.

19:28 We're going to get there eventually, but if we start at that simple level, there's a lot you can do with it at this level.

19:34 So, just a little overview of one of the tools that we use.

19:37 This is something that we created actually in the '90s and then we've been developing over time.

19:41 It's a web-based system. It's cloud computing. It's service oriented.

19:45 You log in from any PC or Mac and you have a view of a building. That building could have started in an Excel file.

19:54 On the upper left is an Excel file. So here's a bunch of spaces and equipment and number of floors.

19:59 It automatically creates a first version of the building.

20:01 You start doing a quick blocking and stacking and start having discussions of, what's the cost? What's the energy?

20:05 Does it fit on its side? Do we need to split it into two? Can a client afford it? Is this a bad idea? Good idea?

20:10 And you can also drill all the way down to the furniture and equipment level.

20:14 So, inside the room...inside each of those bubbles, there's furniture and equipment.

20:17 Everything has a latitude and longitude to it. You can start doing analysis at this level.

20:22 And then in the opposite direction, we were connecting to Google Earth at the time, and we still do...

20:27 ...and we also have connections to ArcGIS now, but you can start seeing how it fits on a portfolio level.

20:33 This is called a model server. It's very much different than storing a BIM model on an FTP site.

20:38 This is actual live data that's put into a server that I can pull just pieces of the data as needed.

20:43 When you go to Expedia, you don't download the Delta schedule. You go and find that flight

you want and you buy that seat.

20:49 That's why it works. You don't have to wait for that download, translate it, and put it into something else.

20:53 That live transactional kind of approach is what drives all of this.

21:00 So, connecting the dots. Here's Penn State involved in the BIM storm. This is again a 24-hour session.

21:07 A hundred thirty teams from around the world that had never touched a lot of these tools, were taught on the fly how to start interacting.

21:13 And this generation, as we all know, is already wired for this. This is natural to them.

21:17 Anything else would be ridiculous and they'd look at the way the industry is now and think, Why are we working like this?

21:21 But you notice each student has a different view of the data, and one has a site plan...

21:25 ...one has a building plan, and this guy has Facebook.

21:27 Everyone's doing their own thing here. They're...it's a social network. You're making decisions.

21:32 You're throwing things out there, even if they're bad ideas. Again, the train wrecks are important for us.

21:36 We want to create a lot of train wrecks very early on in the process before they out to the site and get into construction.

21:43 Make the mistakes early. How do you make mistakes and know you're making a mistake?

21:47 You have to have good data in the background feeding you, just like we saw this morning.

21:50 If you have data in the background, then you can make decisions...

21:54 ...and those decisions need to be pushed back out so others can see, Here's what I'm thinking, I'm putting this building here.

21:59 Okay, GIS analysts, what do you think from your perspective, from a zoning perspective, from a cost perspective?

22:04 That's what was going on here. They were looking at projects coming in. Four hundred and twenty buildings.

22:09 They're analyzing them and giving us cost and constructability input on those buildings.

22:16 So it can be simple. This is what we did several years ago at the AI convention and we did this today with you guys too.

22:22 If that that Excel file again, this is an automatically-created-in-Excel file.

22:25 It could have come from an iPhone too, if you'd typed in all those rooms.

22:28 Obviously, that would take a long time, but if you had a spreadsheet that's saying...

22:31 ...here's a 500,000-square-foot building, hotel's on the upper floor, offices on the lower floor...

22:36 ...nobody's touched the design other than in Excel.

22:39 This is sucked in from Excel through the Onuma system, out to Google Earth saying, Is this a good idea?

22:44 It's top heavy because we haven't imported the office spaces on the lower floors.

22:48 Then in 90 minutes...we had 90 minutes in Boston.

22:50 We had 130 buildings from the audience submitted. This was several years ago too.

22:55 So the concept of simplicity. Simplicity could be an Excel file. It could be a block model.

23:00 As you start heading up the chain and you complete a design and construction model...

23:04 ...then obviously that's a very important model for design and construction, but also it's a very heavy model.

23:08 You can't access it quickly, and a lot of our clients working with GSA right now...

23:12 ...and it's surprising these models and Revit and Bentley and whatever was being used, get incredibly heavy...

23:17 ...and they're very important for design and construction, but the client can't even open it.

23:20 If you can't open it and say, What's the square footage of my conference room?

23:24 Well, you have to know how to use Revit or ArcCAD, open it up, and have a computer powerful enough...

23:27 ...and it's...it's all important stuff, but if you can't get to it, it becomes less valuable.

23:34 So here's that same model now exported to Revit, automatically generated a Revit model. Los Angeles, 24 hours.

23:41 Well, actually, no, I'm going to take a break here. That reminds me, I have Google Earth running in the background here.

23:47 Let's see how Amber's doing. Let's see, okay, so there's a site. We should start seeing some models coming in here.

23:55 Let me just refresh this and see if something comes in.

23:58 So this is actually...the Google Earth site was already set up before you guys were submitting models.

24:02 We already set up this network link so the models should start assembling here as my team starts bringing them in here.

24:09 Okay. So, let's look at one building now.

24:13 These are the 420 buildings in Los Angeles, 24 hours, inverted pyramid is the total square footage of all the buildings...

24:18 ...the color coding's by use, so you can start having discussions about what impact...

24:23 ...is that going to have on transportation, for example.

24:26 When we did this several years ago, the City of Los Angeles did not have GIS data easily accessible.

24:30 We had to actually go and get a CD and bring it over here and put into the server.

24:34 But now, you'll see later on with the D.C. government and what was shown earlier with ArcGIS...

24:38 ...once this data becomes web enabled and through web services, you can start connecting to it in real time.

24:45 So here's that building now in about 30 minutes. You start configuring it and you say, Okay that looks good.

24:51 And then what we do, from our server now, we export to Google Earth obviously...

24:54 ...but then we also connect out to other applications through open standards again.

24:59 So some tools were pulling data from us in IFC. We also had city GML going on. We had a BIM XML format.

25:08 We had Ecotech through GB XML.

25:10 So all these open standards, you basically use...

25:12 ...different teams from around the world are pulling that tower into their tool...

25:15 ...doing their analysis, and pushing it back to us, and saying, Here's what we recommend from a structural point of view.

25:22 Revit obviously, and TEKLA Structure are desktop applications...

25:24 ...so they had pulled a model into that environment, designed it, and posted it back.

25:28 Another team was saying, Well, instead of a structural steel building, what if you go to concrete?

25:34 That's going to be shorter, floor to floor, it's going to be a shorter building...

25:37 ...it's going to be a heavier building, we need more footing.

25:38 So all those discussions were happening within the first 24 hours of the design.

25:43 Ecotech from the UK. So teams from around the world logging in, pulling their tool and doing their analysis.

25:49 And this was the result of that first BIM storm - 24 hours, 11 countries, 133 players, 420

buildings, 55 million square feet.

25:57 The equivalent of 2.8 million pages of documents that were never printed.

26:03 You don't print out every airline schedule there is out there today.

26:07 Everything is live. You access the data as you're making decisions, therefore it's lightweight so you can find the information.

26:12 You don't have to go find that binder or find that PDF or go to that FTP site.

26:15 It just becomes...you have to keep it at your fingertips...

26:17 ...so here's some of the interactions that happen with a lot of different tools.

26:22 And what this generated actually, teams that played in this environment actually started generating real projects.

26:28 Clients were starting to watch what was going on and saying, Can you do this for us?

26:31 And some of the projects we were involved in and other ones we were not involved with...

26:34 ...but it was a way to kind of showcase what is possible.

26:39 So again, connection of GIS to BIM.

26:42 If you come from the GIS side, there's concept of location and latitude and longitude.

26:46 But there's also information about, where's the source of that carpet or that material in that building?

26:51 How do you know there's carpet in that room? You know it because from the BIM side...

26:55 ...I'm saying I'm designing a building, therefore I need carpet coming from here.

26:58 Another very important concept, imagine if all the buildings in the world were in BIM and somehow we got them into GIS.

27:07 Okay, now what? What happens when the buildings are not static, they're changing every day.

27:12 As we were working with the Coast Guard, we're documenting a building.

27:15 They were tearing down part of the building behind us, as they were doing renovations.

27:18 So unless you can keep kind of a real-time cycle going on to update the building data as things are happening...

27:25 ...this data...information starts to rot. So that's another key thing to keeping it lightweight.

27:31 Keeping it lightweight at this level of detail, again, tying into GIS like we talked about earlier...

27:35 ...it's actually...it's achievable because it's not the full-blown design and construction model.

27:39 It's a lightweight model that says, Okay, now the building's complete.

27:42 Now we're in facility management mode. Does that floor plan look accurate?

27:46 You can start having discussions saying, Well turn...you know, that room no longer exists, turn it red.

27:50 At least you know what is going on if you can get input from the building itself...

27:55 ...either through people that say that no longer exists or sensors. Sensors are starting to come into play now.

28:00 So sensors that can start informing you, the lights are no longer on in this room because that room no longer exists.

28:06 That's a valuable piece of information.

28:08 Okay, everything I've showed you up until now is BIM storm and conceptual design...

28:12 ...but I'm going to show you an actual project.

28:13 I can't show you the actual data, but this is for the Homeland Security headquarters. This is not the actual data, again.

28:19 This is...but the concept was Homeland Security, 20 agencies spread around Washington, D.C.

28:24 They're going to build a new headquarters, complex project, bring them into a new location.

28:29 Each of the bubbles is a space. The lines are adjacencies between spaces.

28:34 Data collected and pulled in from, you know, even sketches, and Excel files pulled in...

28:40 ...and actually create that first version or model and start running scenarios.

28:43 How many floors is this building going to be? How it's a footprint.

28:45 Is it going to be three stories underground, two stories above ground?

28:48 What's the security level? What's the cost? What's the schedule? How do the people fit?

28:52 And the administration was changing and the people were changing throughout this whole time. It's a moving target.

28:56 Nothing stands still in a project like this. Client keeps changing their mind 'til the last minute.

29:02 If we can't change quickly, it costs a lot of money.

29:05 So what we were brought in to do was actually to represent the client, to keep that engine going.

29:10 So what typically gets handed off to design-build team or an architect is a stack of documents.

29:14 So here's what we need in this building. PDF files, thousands of pages, go read this, and design our building.

29:20 We didn't do any of that.

29:21 We kept it all live and what was handed to the design team was a database saying here's our requirement.

29:26 It's an engine that you can keep on turning and start doing what-if scenarios.

29:30 And they were actually already starting to excavate so we were in discussions with the construction team.

29:33 How big is the hole going to be? How much concrete do you need before the design was even very far along.

29:39 Same thing with equipment...furniture and equipment.

29:41 Excel file that was creating spaces...now furniture and equipment comes from the Excel file and populates a space...

29:46 ...and you can start saying, Is this all the furniture and equipment you need inside that space?

29:50 So conceptual models that start to solidify.

29:54 The more you start engineering and creating the final solution...

29:57 ...the more time you're spending, and it might be the wrong solution, so we keep it very kind of loose.

30:01 It's kind of like sketching with ideas and you keep on morphing until you get to that point where you say, That works.

30:07 I'm going to hand that model now to the design-build team. I'm going to hand them a model in BIM.

30:12 So from the model server, we output IFC or BIM XML, automatically create a Revit model.

30:18 This is an automatically created Revit model of all the furniture and equipment. The design team starts with that.

30:22 They don't have to interpret thousands of pages of text and say, Do we have the right piece of equipment in this room?

30:27 Meanwhile, client's saying, Oh we'd like to change something here. Everything's moving along.

30:32 So it's just like Expedia. You buy that ticket at the last minute or you pay and you buy that seat and that's it...

30:37 ...but you can keep on iterating as you run through different variations.

30:42 So in the opposite direction, if you imagine this type of approach to be used...

30:48 ...not for design and construction but for facilities management.

30:52 Data driving graphics. The graphics, by the way, on all these, are not static kind of JPEGs or CAD files.

30:57 They're actually driven from the database.

30:59 A database creates the graphics, which means that if you change the data...

31:02 ...it'll change the graphic, which is why we can connect this to sensors.

31:07 We also have this project with the Army Corps with PBS&J at Fort Belvoir. A hundred forty buildings, oops, 140, no, how many?

31:16 A hundred and seventy buildings I believe it was on this one, four-and-a-half years of construction time, let's actually turn this audio down...

31:26 ...and they were going through and trying to go to meetings every week with printed boards and saying...

31:31 ...Well, here's the status of the design and the road closure, and they were using GIS and BIM, and CAD in many ways...

31:37 ...but the output was being as paper. Going to the meeting saying, Here's the paper documents of what we're doing this week.

31:42 They couldn't keep up with the change though, 'cause it was moving so rapidly.

31:45 They had primavera scheduling and tables, they had CAD files, they had this...

31:49 ...so we pulled it all together, pulled it into Onuma system, used PBS&J's ArcGIS Server.

31:55 We're merging ArcGIS Server and Onuma system model server together to visualize things.

32:00 And one view was actually in Google Earth as well, too, so in Google Earth, the color coding is coming from a schedule.

32:06 So instead of a schedule saying, "Here's a construction schedule," we're color coding things red/green as things are changing.

32:12 So now they're going into meetings, and this is actually a very interesting thing from the army's point of view.

32:17 They couldn't get Internet access at the meetings...

32:19 ...so they came in with laptops with Sprint wireless cards to connect to the server live.

32:23 The data is lightweight, so you can pull it live.

32:27 You're not downloading the Delta schedule. You're accessing that flight that you want.

32:32 You're accessing the building schedule. You're accessing...

32:34 So the teams in the office were continuing to work while they were in a meeting with the Corps of Engineers.

32:42 This has actually a huge impact on clients, and we've actually worked with many different teams, just blowing people away...

32:49 ...'cause you walk into a meeting and you actually can start designing the project.

32:52 We've won several contracts just by being at a presentation like this.

32:55 I actually have an interesting story where I was watching my future client onstage presenting their project, saying...

33:00 Here's what we're doing with our project. And I was ready with a PowerPoint. I got up, while they were doing their presentation...

33:06 ...I just, on the fly, decided to design their project and present it to them as they got up on stage.

33:10 We got a five-year contract out of that. You have to think outside the box.

33:14 It's Henry Ford concept again. Move that horse forward.

33:18 So here's the Fort Belvoir project. It's a mashup of SketchUp, and the green and yellow buildings coming from our server.

33:23 SketchUp was landed inside this. So any way you can make it work...it doesn't have to be perfect.

33:28 If you wait for the technology to be perfect, it'll never get there.

33:31 It's just like the Internet's not ready yet and yet we use it every day. And that's why it evolves.

33:35 You just keep on mashing stuff together and keep on moving forward.

33:38 You can't talk about the theory forever. You just have to get down and do it.

33:42 So here's the result of that and there was a 40 VIZ tool that PBS&J created...

33:49 ...with ArcGIS in the background and our server pushing data into that.

33:52 So it was many different views from many different tools, but the same data.

33:57 And here's some of the conflict resolution that happened...

34:00 ...and kind of an overview of just a simplified diagram of what happened.

34:04 There's a lot of things coming into this system. There was the ArcGIS Server. There was Onuma server.

34:10 There was output from that in different formats, and there was this live interface in the middle.

34:14 A live interface, not only to view data but to move stuff around. So let's say, let's move this building over here.

34:19 Because it's live, I can be anywhere in the world...

34:22 ...and I can be interacting with somebody else that says, No, that's a bad idea, or that schedule doesn't work.

34:27 It completely changes the way that we work.

34:30 COBIE is another open standard for facilities management.

34:33 We're very much involved with that, Construction Operation Building Information Exchange.

34:39 With GSA, we're working on several projects where they want to be able to look at completed or existing buildings...

34:45 ...and say, What's going on in that building? So here's our interface on the left, Google Earth on the right.

34:52 Google Earth with data coming from our server, color coding coming from sensors...

34:58 ...data about aggregated totals and square footage coming from our server viewed in Google Earth...

35:05 ...webcams connected to those dots. Those dots are pieces of equipment.

35:08 There's no reason to have a beautiful 3D model of a pump if you're at this level of detail. It's again, a level of detail concept.

35:13 How do you...you churn data really quickly and then visualize what's the schedule of lighting, real-time occupancy sensors.

35:23 Another server. This is actually...again a mashup.

35:25 Our server is pushing out to Google Earth doing the 3D, doing other data.

35:29 Another server saying, I have temperature data for this room, you have the same room ID, common ID...

35:34 ...web services, boom, there's the temperature of the room. So these real-time charts are getting attached to the building.

35:40 Same data again, but in a different interface. Here's a real-time data now in the Onuma system, but at the same server.

35:48 Capturing design intent. This is actually a very interesting slide because when you design a building...

35:54 ...you're saying, Okay, we want to be lead whatever, so we want to have reduced energy and we want to do this...

35:59 ...and we're going to make decisions about what type of equipment to put in a building...

36:02 ...and we're going to design the building and give it to the owner.

36:05 What does the owner do with that building now, unless they know what that chain of events was...

36:08 ...what was the design intent of that room, and is it above or below temperature based on that engineering assumption?

36:14 For our GSA projects right now, they're working on three projects...

36:16 ...we're actually capturing the design intent into a database, not into a BIM, it's just a database, attached to a BIM...

36:23 ...and saying, This room was designed to be this temperature and it has this kind of requirement of airflows or whatever...

36:29 ...and then as you're running sensors through that...

36:32 ...then you can compare it against what was it designed to, what's it going on right now?

36:35 A Delta comparison, to color code what's out of range, and drill all the way down to a piece of equipment.

36:41 Notice that the graphics are kept very simple.

36:43 This is the lightweight version of the data to keep live on the web, and we're also connecting to Patchbay.

36:49 Again, we're just mashing up different tools on the web.

36:52 And then creating a standard...a standard of...there are standards out there to work with facility management and BIM...

36:58 ...but we're actually creating implementation standards. We're not talking in theory. We're saying the project is running.

37:03 How do we capture that data as it's going on?

37:05 So we're actually implementing this as these projects are going on, which is really the only way I think that it could work.

37:11 You really have to kind of hit the road and start doing it.

37:14 You can have a lot of theory and discussion about what is possible and what is perfect...

37:17 ...but unless you start doing it, you never get there.

37:20 So we're taking BIM data coming in for GSA for three different buildings.

37:24 We're saying, How do you keep it in a neutral format so you can pull it into any FM application in the future?

37:29 If you keep it in a neutral format, the data can come from a Revit model, it can come from another type of BIM model...

37:35 ...it could come from a list of equipment. It's not going to all be in one model.

37:39 That's a myth that everything can be in one model.

37:42 You look at any project right now that's running through BIM and you can't load everything in one model.

37:46 There's different consultant teams, so you have to figure out how to merge it together and bring it out there.

37:51 Okay, so let's...I think that was the end here, yeah. Let's go back to see what's going on here...

38:03 ...and actually open up...I'm in the Onuma system right now...

38:06 ...and I'm just going to take a look and see what's going on with it right here.

38:09 And I've logged in and I'm going to look at the BIM requests that came in from you guys.

38:16 Let's see if I'm still connected to the Internet. I think I am.

38:19 Yep, there we go. BIM requests...okay, so this is what came...wow, there's a lot. Okay. That's good.

38:28 So we had a lot of projects going on here and they're being moved.

38:32 I guess my team is probably frantically moving them right now to the right site.

38:36 If I open up any one of these, like Karen's building here...let's see what Karen's building's about.

38:43 This is one building that came from the audience.

38:46 It's just going to be a block, but inside the block, if I open up the block, it's going to show where it is in Hong Kong.

38:52 It's sitting there on the edge of the harbor there, and this has 18 stories.

38:58 If I go to the 11th floor, it's basically logging and pulling that floor plan of just that 11th floor...

39:06 ...instead of downloading the whole building again. And on the 11th floor, I see a block, where's the block? There it is.

39:12 And it has some elevators and I need two stairs out of a building, and obviously there's an issue here...

39:17 ...because the square footage that was put in just defined that small size.

39:22 So we have some talking to do about, Do you really want this skinny, tall tower, or where do you want that square footage?

39:29 You're probably going to have to make a lower tower or...you start getting a sense of scale immediately from this.

39:35 Let's look at another view of all this.

39:39 Back up to the project level and pull in Hong Kong Geodesign, right here, master plan B2.

39:51 Okay, so what's happening here is, I could actually see, Amber's editing the scheme.

39:55 We use these models as communication tools. We don't use e-mail.

39:59 We communicate through the model. We go in the model and we communicate to people.

40:02 Whoever's touching the model, I can start communicating to that person.

40:05 So we're having discussions about the design through the model. The model becomes an interface for e-mail.

40:12 We don't use e-mail for this kind of stuff. We just go straight to it, and there's Amber.

40:16 She's starting to line up some of your buildings on the waterfront.

40:18 This just happened in the last 20 minutes, so she's basically taken stuff that was probably stacked on top of each other...

40:21 ...because I told you guys just to place it anywhere.

40:24 But in a real project, we would actually start having assignments and say, You work on this, you work on this, and you work on that.

40:30 And I can say, Well, let's go and see what's going on with the report here.

40:37 Building comparison. So the point here is that, and I'm doing this with one hand while I'm talking to you guys...

40:44 ...so I might be missing some stuff, but it's about collaboration in real time.

40:50 This is kind of like...it looks like science fiction when we come into some of these meetings, 'cause most of the industry...

40:55 ...like I said, is still working in nineteenth-century mode, which as an architect, it's a bad thing obviously, but it's also a huge opportunity.

41:02 The opportunity is, even if we start incrementally making things better...

41:07 ...and I think the time is right this year with the concept of geodesign...

41:11 ...with the intersection of BIM and GIS, the technology is...

41:14 It's possible to do this today. It's very exciting what is possible with all this.

41:19 So let's do a quick export of this and see what's going on, Google Earth, I'll just do an export from here.

41:28 There's multiple ways I can export out to...all of these models, by the way now, are SketchUp models, the Revit models.

41:34 If I open up a Revit model of Karen's building, it would actually have those spaces in the restrooms...

41:37 ...and the toilets and sinks and objects, inside the Revit model.

41:40 So as an owner, I'm saying, "Here's what I want in the building; now go and resolve it" to the

architect.

41:46 Okay, so let's see if that downloaded. Yep, it's still churning, I think. Something's going on here.

41:55 I think I've got too much stuff running here, but anyway, so let's open up one more thing here.

42:03 I'm pretty ballsy to do this live probably, right? But here's...let's just try this here.

42:11 Any questions while we take a break here? I've kind of been talking a hundred miles a minute here.

42:17 Okay, so there's all the buildings that are on the site and then let's just go to compare buildings...

42:24 ...and let it churn for awhile and run through all the numbers.

42:30 And again, all these models, again would go out, we have city GML coming out of it.

42:34 And it's not really...it's really not about only our tool. It's really...we use a lot of different tools.

42:38 We just created this because we needed to create the links between the different things that were out there.

42:43 And this has been around for five or six years.

42:45 We've been building this version at least...

42:47 ...and before that in the '90s, we had another version that basically used this for collaboration.

42:51 The reason we needed this is because I was ending up traveling a lot as an architect.

42:56 I was flying around working on projects in the Far East. I got tired of traveling...

42:59 ...and then we'd call this low-carbon collaboration. The less we have to travel, we can make decisions.

43:05 In fact the LA BIM storm that I showed earlier, we had teams from Norway saying...

43:09 ...We're going to fly to LA and participate in the BIM storm.

43:12 We said, No you stay where you are in Norway and interact with us through the Internet.

43:16 So obviously face-to-face time is very valuable, but not all the time.

43:20 It's better to be connected, meet a few times, and then work virtually.

43:24 That's how our team works, and we're a very small office actually.

43:27 But because of these kind of approaches, we're able to keep very compact...

43:31 ...and then collaborate with like-minded groups or individuals. It's a different dynamic. You create teams on the fly.

43:38 You're just swarming to attach to that project.

43:41 So if a client has a special kind of requirement, there's no reason to build up a huge team and wait for that project to come.

43:46 You basically work with the experts as you're interacting on these projects.

43:52 So there's the...atlas...see, let's try it. I don't know what's going on there.

43:56 I think my Internet connection just kind of came to a crawl. Okay, there it goes. That'll load. There we go.

44:03 So it's flying down to the site and then it's going to load the buildings that we're looking at...

44:10 ...building volume, space volume, color code by departments.

44:13 So that's our site there, and then you'll start seeing the buildings streaming in there.

44:19 So let's go back to...this...I think we saw everything here. Yeah. Okay.

44:28 Maybe we'll take a few questions. Do we have the mic here still?

44:32 Are there any questions? I'm going really fast here, just shout out your questions and I'll...

44:36 [Inaudible audience question]

44:38 That's a good question. The question was what about civil and construction?

44:45 The Homeland Security project I showed you, not everything is going to be solved in one tool.

44:50 That's another very important concept behind all this.

44:52 No single application's going to be able to solve everything you need.

44:56 You just need to be able to say, I'm thinking of putting a building here and I'm thinking of having this kind of a footprint...

45:03 ...how far underground are you going to go and what's the soil condition?

45:05 Like what Eric showed earlier was a great example. I'm going underground.

45:08 Now I want interaction with somebody else that has that information.

45:11 Where is that other information going to come about the site?

45:14 Obviously GIS is a perfect place for that to come through.

45:17 So it's about putting stuff in and then saying, Now I want to interact with you about this particular part of the process.

45:24 And it happened with us actually with our Coast Guard project as well.

45:27 And we were putting a building on a site and the Coast Guard said, What about security from that road to that building?

45:34 We did not have to bring in a security expert to sit for eight hours in a meeting with us in the room to wait for that question.

45:39 We said, Okay, we'll keep the group compact and we'll let you log in and say...

45:44 ...What do you think of that building next to that site, and so that's no good.

45:46 That's a threat right there, so I moved the building back 20 feet.

45:50 So we were able to immediately on the spot move the building back 20 feet or harden that wall.

45:54 So you start, able to...having that discussion.

45:57 This obviously is not the final design...the detailed design.

46:02 We take these models, just like I showed with the Homeland Security project, pull it out into...

46:05 ...and in that case they were using Revit.

46:07 We hand them a model from here, that's a IFC or XML file, BIM XML, in Revit, they continue in Revit...

46:14 ...and then we run a parallel and track it and say, Here's a client requirement.

46:17 Now the architect is designing different versions of that. Revit's on the desktop.

46:20 Eventually all these full-blown BIM models are going to end up in model servers too. They're not there yet.

46:25 It's just too heavy and the technology's not quite there yet with open standards and model servers.

46:31 There's some interesting things going on, but as other model servers are out there, we're a model server...

46:36 ...but you can start then having a desktop version of Revit, and our version, and we're starting to compare things. Okay?

46:42 Do you have all the square footage you need? Do you have the number of...the right number of chairs and tables?

46:47 Do you have the right...did you remember that stand-off distance that security expert talked about?

46:52 'Cause that kind of stuff gets lost in the project always. You have all these different discussions going on.

46:58 So it's really about connecting many different tools and many different experts...

47:03 ...to be able to have discussions about things that should not create that train wreck.

47:09 Any other question? Yep.

47:11 [Audience question] When you have collaboration on a project...

47:15 ...and let's just say your example of the security guy came in and gave you that

[Untelligible]...

47:21 ...the architect or lead in this is trying to keep track of all those things that need to stay.

47:29 What if somebody else starts moving the building around again?

47:31 How do you control so much interaction so that you end up with something that satisfies all the initial criteria?

47:39 Because there's so many people involved and things might change that might affect what you originally designed? Is that what you're thinking about?

47:44 Yeah. The structure guy's going to change...

47:46 Yeah, exactly. Well, what happens in the traditional process is, architect works on it, hands it off to the structural guy...

47:52 ...waits for two weeks, comes back, meanwhile the design has changed...

47:55 ...and he says, Oh no, that column...so that's happening already in the current process, right?

47:59 What we're finding...and it's not...we're not...although there's some vendors out there that are getting model servers...

48:05 ...that are starting to interact live on the full-blown model, and I think ArcCAD has a version of it out...

48:09 ...and Revit's doing something like that too.

48:11 When you start getting that immediate interaction, imagine if you're the structural and the architect.

48:15 I'm saying I'm doing this and you're saying no you can't do that...

48:18 ...seeing that column in the middle of my room is going to create a reaction.

48:21 If I don't see it, I keep on designing the room for two weeks...

48:24 ...and all of a sudden the column appears and I go, What's that all about?

48:27 So it's really about how close to real time can we get to start having the discussion...

48:31 ...like we're right there in the same room together.

48:35 And because there's just...buildings are incredibly complex, right?

48:39 There's so much data that I think this is really the only way to start trying to narrow that gap of that lag time.

48:45 Right now the lag time is weeks, or months sometimes, and then it also gets forgotten and ends up in construction.

48:51 And I think that's the opportunity. If we can figure out what works today in real time...

48:55 ...and my approach here is that, I mean...my presentation is really all about a lot of this stuff can happen in real time today.

49:04 We know where that limit is. You notice that we're not going into structural modeling when we do this.

49:08 We're keeping it at that lightweight level and we're hopping over when it goes into design and construction...

49:12 ...coming back in the facilities management side.

49:14 So it's about the early planning and the facility management and everything in between is still morphing...

49:19 ...but we're starting to move in and find those views and those transactions that can happen in real time.

49:26 This is actually an animation. I'm just showing some things that I showed you earlier, but any other questions?

49:30 Yeah.

49:31 [Audience question] Do you find that a lot of your traditional architecture colleagues are threatened by this...

49:40 ...because it somewhat automates at least pieces of the design process?

49:46 Yes. As an architect, that's been my struggle from the very beginning.

49:51 When I first got into BIM in '93, I go, Oh boy, all architects are going to jump on board.

49:56 The biggest challenge...and we've had this as part of our Coast Guard project...

49:59 ...the biggest challenge is not adopting the technology. It's the change management that has to happen.

50:05 The threat of change and the threat of losing control of things, as an architect I'm saying this, but it goes for anybody really.

50:12 It is a big threat. But it's also an opportunity for those that are ready to jump in.

50:18 Unfortunately, when the economy was great, it didn't matter, right?

50:23 We can do that. We can do it the old way. We'll scratch on paper and whatever.

50:26 The best thing that's happened in the last couple of years is this economy that sucks.

50:32 It's bad for us, but it's the best medicine. It's changed the outlook of everybody I've worked with.

50:37 The people that didn't have time to look at this stuff are now saying, How do we become competitive?

50:43 And we say, Well, let's talk about it. And we work with clients like this, and the thing for us

to...

50:47 ...from our perspective is, we're not trying to do all...I'm touching on a lot of things...

50:51 ...but we're not trying to do all this ourselves.

50:53 We're really looking for ways to collaborate, 'cause it's impossible for any single group to be able to do all this.

50:58 But are there are going to be casualties in the industry and hopefully the people in this room...

51:02 ...because we're all here and we're thinking in this mode, obviously we're in a different kind of a mode...

51:06 ...but that's the biggest challenge that I've had as an architect, is not being able to get through to the architects.

51:10 And there's also...there are risks involved with...there's contractual issues, the way that you work...

51:20 ...what information are you releasing, and all that kind of stuff, it has to go away.

51:25 If we get too caught up and when we can't do that today, we'll never get there. We'll just have to kind of just go forward.

51:29 Yep.

51:31 [Audience question] Secondly, you were talking about a minute ago...

51:33 ...there's a wealth of security, if the security is working the way it is and they tell me to move the building.

51:39 In your process that you're using, if you move the building and the substrate says, No, it can't go.

51:44 Does it come back and tell you, No, geology won't support it, or geography...

51:49 That would be the ideal...if we had Eric's tool, right? And I was moving a building, right now I don't have it.

51:55 I can't show this slide. For some reason, my Internet connection's gone down...

51:57 ...but we have connections to ArcGIS Server live, we're pulling in parcel data and property lines...

52:02 ...and if we had soil conditions, and if that soil condition knew that as I move this heavy building around...

52:10 ...the soil here is going to cause more foundation.

52:12 Well, that's something I want to know, but it doesn't happen immediately right now.

52:15 I think the follow-up on that then too, 'cause we all know, everybody in here knows that not

all...

52:20 ...I mean, soils maps don't really do what soils maps do.

52:26 Sounds like, Yogi Berra, but anyway, the other side of it is that you do that and then you find out that the dataset is wrong.

52:33 You made the decision on it. What do you think the legal ramifications of that are going to be?

52:36 Right. It's a garbage-in-garbage-out question, right? And we deal with that a lot.

52:40 It's...in an ideal world, yes, that information will be correct...

52:45 ...but I'd rather get something and know where I'm getting it from and say...

52:48 ...Okay, I can make some kind of a judgment on that.

52:50 I still have to make a decision. Nothing's going to be automatic.

52:53 That's the beauty of all this is, all this looks like we're automating everything...

52:56 ...but it's really about people saying, Well, wait a minute. That doesn't make any sense.

52:59 It's just like working with Excel and not knowing anything about math. You don't get what you want out of it.

53:03 So yes, it does require somebody to react to it, and the fact that there are more eyes on it...

53:09 ...actually reduces the chance of something going wrong. We, like I said earlier, we want to create a lot of train wrecks.

53:17 We want to see the train wrecks and weed through it and we do that quite a bit.

53:20 We start piling things on. We throw stuff away and we just kind of...and you create this trajectory.

53:25 It might be bumpy as you go up, but at least you're getting to that point, you keep on refining it, and then you build it.

53:31 But what's happening right now is you're doing all this stuff...

53:34 ...you miss a huge thing, and all of a sudden you're in construction, and you're wasting millions of dollars.

53:39 There's a lot of statistics out there.

53:41 The thing that I could not show you, I had another team, Balfour Beatty, in Virginia...

53:46 ...that was doing a study on this site and they were doing cost estimating on these buildings.

53:50 We had started a couple of hours earlier; while I was sitting in the audience...

53:52 ...I was actually interacting with them and they had submitted some of their buildings with cost in it.

53:56 So it really...it's not about me just putting blocks on a site.

54:00 It's, I want to interact with the specialists out there that can give me answers to this.

54:03 Yes?

54:04 What are the implications for education?

54:06 This kind of fluid, real-time, cross-disciplinary work that you're doing...

54:10 ...is so different from the way in which we still teach, so what would you suggest we do differently?

54:19 I teach part-time at USC too, and I've just been so frustrated with schools, to tell you the truth.

54:25 I mean, it's such a great place to experiment with stuff, but schools are so...kind of stuck in the past.

54:31 The student's are itching to do this and I think the opportunity is ripe to make that change...

54:36 ...and I think schools are a perfect place to do this, but unfortunately, things move slowly some places.

54:41 That's kind of the whole change issue again.

54:44 But it is a perfect educational tool because you start having those kind of dialogs.

54:49 It's not about the beautiful geometry that you're creating and how great it looks in 3D. I mean, the tool's almost like passé now.

54:55 It's really...how do we make these decisions?

54:57 So yeah, we didn't have a long way to go, but I think there's a lot of really great stuff happening out there right now.

55:01 In the last couple of years, there's really some interesting things happening at schools.

55:04 Yes?

55:06 I'm going to play a little architectural inside baseball here.

55:10 But you mentioned that you teach at USC, and USC at the moment is promoting itself as a center of digital design...

55:17 ...based around some very contemporary issues in architectural design culture to do with perimetrics and things like that...

55:23 ...and I wonder if you might...or, I would be very interested to hear you, for this audience...

55:28 ...describe the difference between what's going on in fashionable architecture circles around data-driven...

55:37 ...or "data-driven" design and the work that you're doing...

55:39 ...and how you would position yourself in that larger context of contemporary design culture.

55:45 As far as...

55:46 Does that make sense as a question?

55:47 Kind of. I think you're asking, How does this fit in with data-driven design in the process of...

55:52 I mean, if you looked at the...if we brought up the USC website, there would be a lot of stuff like...

55:56 ...biomorphic shapes that purport to be driven by data-driven processes in Grasshopper, or something like that.

56:03 Yeah, Rhino, and then put scripts...

56:05 Right. And so the...and I'm just interested to see how you would, maybe to an architectural audience...

56:13 ...describe the relevance of the BIM-driven work that you're doing to that thread of contemporary architectural conversation.

56:22 I think there are relationships that...we've done work similar to that with kind of databases driving different shapes...

56:29 ...and then...but you still have to...you create a hundred different variations of that and you narrow it down...

56:33 ...and you make a decision and you keep on going, so it's kind of just automated...semi-automatic process...

56:38 ...and then being able to interact with that.

56:40 And I think in that scenario, if we had a connection...in the ideal world, if we had a connection to Grasshopper or Rhino...

56:45 ...and you were doing that kind of thing and we could pull it in and put it on a site and actually get numbers out of that...

56:50 ...and saying, Well, here's the construction cost for energy or whatever.

56:52 We're already doing that with SketchUp, actually. I didn't get a chance to do that...

56:54 ...but we can do a...SketchUp shape, import it in here, it slices floors, and have that shape there.

57:00 So I think there...we have to have those kinds of discussions, and I think what I wish would happen...

57:06 ...is that more groups that are out there that are experimenting with this kind of stuff can start making connections.

57:10 Because if we're in isolation, just like the great example that we saw at one-thirty about the crime maps...

57:17 ...of being able to leverage what has already been tried and then open it up and try something else.

57:23 In this day and age, I think the most important thing to become relevant...

57:26 ...is to be connected and to share and we tend to close down and say, Well, this is what we're doing.

57:32 And we really have to see how many connections can we make. And some of it might be threatening.

57:37 You might lose some of your IP or you might lose some of your ideas...

57:41 ...but unless we make those connections, then you're...being isolated does not solve anything.

57:46 And I think the schools are another great place to kind of push that, as well.

57:51 Okay. Any other questions?

57:54 Yes. Should I go ahead, or down there?

58:01 Let's go down here and then we'll go up there.

58:04 You've been demonstrating a very high level of hill climbing and trial and error as a design method.

58:11 And in the...the ways you describe making decisions during that process are informal.

58:17 It implies to me that your client does not have a formal decision-making process other than whoever's there making decisions.

58:25 What would happen to your method if you were presented with a client who had a formalized decision process...

58:33 ...and would the design be decision driven rather than data driven?

58:37 It's a combination of the two. It's not just a...it definitely is not an...I'm showing kind of glimpses of our process...

58:45 ...but in our actual projects, we use this just like you're sketching on paper and having a discussion with a client.

58:51 And if there's a formal review process with the client, yes, that has to be part of the process.

58:55 You have to be able to adapt to what the client needs, and each client has different needs...

58:59 ...but you need to have the information about the project to be able to interact...

59:04 ...and then become artistic about the decisions that the client wants to ask you.

59:08 So it's not...that's another thing I get a lot of.

59:10 As an architect, it looks like I'm just automating design and stuff like that...

59:14 ...but it's...yeah, but it's really kind of a...it's not one or the other.

59:18 It's all together. How do you get all this together to make that happen?

59:24 Okay, there was something back there?

59:25 [Audience question] Yes. It's actually a related question.

59:27 I think what you are showing is a process in which speed is emphasized as one of the most positive values here...

59:39 ...and some of the reasons for that are obvious and very compelling, especially in comparison with slowness.

59:47 But I just wonder if you'd like to comment on that a little bit.

59:51 Is speed the most compelling value and are there competing values?

59:57 Definitely. Speed was an issue here 'cause I had 60 minutes and I wanted to make a point that this is possible...

1:00:02 ...but really the reason we automate...what I'm saying is, I want to automate the stuff that should be automated...

1:00:08 ...so I can spend more time to reflect and slow down, which this allows you to do.

1:00:14 It looks like everything's kind of churning like this...

1:00:15 ...but the reality is you're kind of having pockets of things happening and then you have more options to look at.

1:00:21 And then, we use paper and pencil still too.

1:00:24 We're still sketching stuff by hand, but speed is not the primary driver.

1:00:28 It has to be...it's again, it's not black or white.

1:00:31 All this stuff is just another way of doing things and the tools that are available.

1:00:36 I think we're at time now, right? If there's any other questions, or we could talk outside if you want?

1:00:43 Right, Bill? We're done, right?

1:00:46 Yeah. So thank you very much.

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