MIKE ENGEL: OK. So they're closing the doors, which means all the chairs look like they're full. So that's great. Glad to have everybody here. Have just a little discussion about redefining sketching and architectural design.

Before I start, I just want to say a little bit about who I am, why I'm doing this. And maybe my goals, and what I hope you guys get out of the class.

I work as a designer and technologist at ESG Architects in Minneapolis. We're just an architectural services firm. Just architecture and interior and house. We do a diverse range of projects. A lot of multi-family hotels. But also schooling, university work stuff. So big range of projects.

And, really, my goal of this class is not necessarily to teach you guys any particular one skill. I think there are some skills within it that you'll learn. There's some key elements. And those are kind of like bonuses.

But what I really want to do is talk about what we consider sketching today as a process, some tools we can use to do that, go through the background of that. And then go through a couple demos I have of just looking at how I use some of these tools in my process, and give you a glimpse into that.

That all being said, I'll warn you. My process has been described as a little bit schizophrenic. Which is kind of interesting. Usually what that means is one minute I'll be sketching and having a conversation with somebody, and then the next section, I'll be like, well, let's go throw it in Dynamo now.

And they look at me and they're like, how can you talk about sketching with a pen and Dynamo in the same conversation, as if they're all the same? But at the heart of it, it's really what I hope you guys get across, to see that there really there is no difference at the heart of it.

So I've got, like, 60 slides. So that gives me one minute per slide. I'm already behind. And there's some demos in there, so. It'll all work, though. Except for the pointer.

All right. So this is a class summary. It talks a little bit about what I just said. The features, FormIt 360, Dynamo Studio, those are the tools I'm going to use. So they're the foundation. Another way to look at it is those are the nuggets that bring the process together and allow the

process to happen.

The other one that probably should be on there, that you'll see in the demos, is SketchBook Pro. Just a very basic sketchbook process.

And then the other thing with that is just the idea of hardware on top of that. So in the demos, you'll see that they range everywhere from a lot on the iPad, tablets, desktop computers. My desk, rather than being piles of paper, it's four computers, and monitors, and cords, and iPhones, and styluses. And it's just really thick, heavy paper.

So-- oops. Now it's going to work. So, learning objectives. Really, I hope you guys learn these. But, like I said, I hope you learn the concepts. And particularly the first one. Just this ability to take your processes and start to capitalize on all the different pieces to bring them together.

So when we start with that initial sketch, all the way through our BIM documents, our construction, working out in the field with contractors. And really bringing some of these very basic processes that we all do and seeing them as part of this BIM workflow that we all talk about, rather than as separate silos. Sketching, the design process, very often gives in one silo. And BIM is in another silo. Construction's in another silo.

So a little bit of the theory about this. So this is Jackson Pollock. Artist, not an architect at all, but this quote really catches me with it, because what he's talking about is creating stuff. And it really doesn't matter what we create it with. We all have different skill sets. We all have different preferences. And, at the end of the day, it's how we bring those together that really matters, and what we create out of them.

Another way to look at this. I'm sure we've all heard it at some point in our careers. You're working away on Revit, or whatever your preferred CAD software is. And usually a senior principal will come up to you and be like, quit working on the computer. Get it out of the computer. You've got to work on the paper. It has to be on paper.

And more and more, what I've seen is that that has to be pushed aside. That's kind of a very old way of thinking. And when it comes down to it, what we have is just tools. It's really about the users behind the tools and how we use these tools. So regardless of whether that's a number two pencil, Dynamo, FormIt, name it, ink, pen, watercolor, it's really how we start to use these tools to leverage it.

So I think Norman Foster hits that right on the head. And then the other part of this, to start this whole conversation, is just starting to question everything. Maybe not throw everything out. Maybe not throw out the processes of sketching traditionally on paper. But just starting to say, is that the only way to sketch? Is that the only way to get ideas out and iterate ideas?

And then, of course, who doesn't like a good PowerPoint without the LEGOs? It's always better when we can start to-- getting back to this idea of silos-- that start to break down those silos and break down that in the process. And let these disparate pieces of the process start to work together.

And I think you'll start to see this a little bit in the demos, when I get there. But this idea that you can start an idea in one piece of software, or one tool, and that can flow through. You're not stopping, restarting it, recreating it. And you can work back and forth. They talked about it in some of the keynotes today, with Fusion 360, and having this platform that you can really iterate and move all the different pieces through.

And then this is actually a really cool video. I'm not going to play right now. I think it's actually from the 60s. It's really old. It's very old school Disney. But if you have a minute, I encourage you to go watch it. It's about 10 minutes long. And it's four artists who are animators for Walt Disney at the time.

I believe they're working on *Sleeping Beauty,* the movie, and the hand animation. And it's Walt Disney narrating and talking about this process of this team that works together in the animation studio. Hand drawing. One person's doing the background, somebody else is drawing some animations. Rain. And you can see each of them has their piece, just like we do in details throughout the architecture process, somebody's working on window details.

But the other thing this video shows is that this group of artists go out and they pick one tree. And they all paint it. Which is like, OK. They painted a tree. But they paint the same tree with four different medias, four different ways. But it's still the same tree. And it's still the same project that we work on. And starting to be able to leverage all of our skills and our abilities to work through these design problems is, I think, really important.

All right. So we're getting a little less theory based here. We'll at least have a basis here of what is a sketch. So we at least have a baseline of what we sort of agree to.

So I just pulled some definitions here. But if you read through these, I mean, there's nothing

about these definitions that say it has to be pencil on paper, or pen on paper, or can't involve computers. And I think the way software has started to grow really pushes that. So as a baseline, I think if we come from this viewpoint, rather than just the initial reaction that a sketch has to be on paper, we can start to look at it a different way.

So what I see here is it's very much about drafting, or being a draft, doing something rapid, and being able to iterate it. And be able to get ideas and feedback back. And do that.

And this isn't so much a hard and fast rule. But I do want to put this up there. Just because it is pen on paper doesn't make it a sketch. What makes it a sketch is the people that do it, and the process behind it, and why it's being done.

I always like the, well, can you just make that Revit view sketchy? Throw some sketchy lines on it? And somehow that makes it a sketch. And it's like, no. That's not what it does. Makes everybody happy, but-- well, except for the people who have to work in that view.

So these are some very traditional sketches. All in notebooks. Or, actually, there's one little secret here. Three of these sketches were actually created on the computer. I'll let you think about that. But these pen on paper. They're just quick iterations. But they are what most people, if you said, I'm going to sketch an idea, visualize in their mind as that's what it means to create a sketch, an image, in your process.

But at the same time, I will argue today, and for a long time, that these types of images are just as valuable, and just as much sketches, as anything on the previous slide. I mean, this is full on Dynamo of taking in points around a building and doing sightline studies. But it is, at the same time, it's about taking a very quick form, studying it, iterating it, and getting immediate feedback.

That was the only purpose when I created that. This never goes to the client. It's just, in the design process, me trying to figure out what is the optimal thing. It's just part of the process.

And then starting to get into energy studies in Dynamo. I mean, even starting to get a little bit into Fractal, and being able to say, how can I iterate designs quickly, and do these things, and concentrate more on other things.

So all these tools up here, for background. This is FormIt This is also FormIt. Fractal. I think that's FormIt. This is Dynamo, obviously. This is SketchBook Pro over a Revit model. Somewhere, there's a Revit model under there. And this is FormIt with some SketchBook Pro

sketching underlaid.

But they're all about getting an idea to a client, getting an idea to a team member really quickly, and working through that.

So we're going to talk a little bit about the old-- it used to be the cup of pencils on your desk. That was your toolset. And that's still the toolset. I mean, I still have a bucket of pencils and Prismacolors sitting on my desk. I don't use them quite as much. But I have them there.

But now, today, all of these other things, tablet PCs, iPad Pros, doing freeform modeling in Revit and FormIt 360, and even I would argue very strongly that Excel and spreadsheets and getting into Flux and Dynamo and all this data rich stuff-- that is as much about the sketch process of finding, and discovering, and looking at ideas as any of these drawing a perspective with a straight edge.

And you may have noticed a little bit in the sketches, but this idea that you can integrate different flows. Like Emmet says, all works better as a team. So being able to take and work through different tools. When you have an idea and you need to test it, maybe tool A is not the best one. So being able to switch over and leverage tool B to do those things is really important today.

And keeping in mind that we want a full toolset. A carpenter wouldn't try and build a house with just a hammer. He might build it eventually. But I'm not sure it'd be the nicest house. It's really hard to cut a two-by-four with just a hammer.

So it's trying to step back and say, I don't need to use just one tool that I'm comfortable with. It's starting to fill up our buckets, just like we would have multiple color pencils, multiple markers, started to use multiple applications. I could rattle off 20 different sketching apps I use on a weekly basis.

So, getting started. So today-- so this is, in a very cleaned up sense, my workflow. It basically, for the most part, starts over here, on what is the left. And works to the right. Though that's a little simplified. It's more like, well, yeah. If you follow the arrows, it's kind of what the process is.

But today I'm not going to talk so much about these flux and spreadsheets, though I think they are important. I just want to talk primarily about this idea of working between, in this case,

SketchBook Pro to Revit, into FormIt, and to Dynamo. And how this kind of piece works to iterate quick ideas, understand and start to illustrate, and think about different things different ways.

That being said, I do believe these are just as important. And I will touch on them.

So stepping back a little bit from the theory. There's kind of two sides of the tools I'm going to be using. There's Dynamo, which is a visual programming language. Which is, ironically enough, about graphics, which is what sketching's about. So, right there, we've got a connection. It's also about spatial thinking and learning, which, again, is about graphics, and sketching, and illustrating ideas.

The parametric modeler we talked about.

Kind of the big difference, I think, that both scares people but also makes it really powerful, is that when you start to leverage these computational tools with visual programming and other data pieces, it's about defining rules.

And the thing I found, the more I get into these, is where to find the rule in Dynamo, or on a piece of paper, I still define it. It's just whether it's defined as data or it's defined as a grid of lines that maybe I drew at 30 feet on center for doing parking. But it's still rules and criteria. It's just in a different format.

And then the other side of the tools, primarily Revit and FormIt, is just this direct modeling approach. It's just do it. Just draw it. Just push it. And the nice thing that we probably all know, people who work with them, it's really quick. There's not a lot of background I have to do. I can just get that idea, and shove it down to either paper or model space, and start to play with it.

And the one thing that-- I don't know, I have intuitive up here on the direct modeling approach. It's the way I think most people see it. More and more, I don't really agree with that anymore, even though I still say it. I think as the tools like Dynamo and other computational tools become more mainstream, and people are used to them, it's starting to get more and more intuitive.

Bad slide there. So, at the heart of it, just create something. It's all that really matters. If you go back to pen and paper, put the pen on the paper. If you have no ideas, it's just about starting to create an mark. And sometimes that's the greatest point.

Same thing applies in models. Just create a geometry. When I get stuck, it's just, throw a box in the page and start playing with it. Lot of times, it gets thrown out, but--

Now we'll actually look at some real processes. So this first process I like to coin old school meets new school, because what it is, what you're seeing here, is this process of SketchBook Pro into Formit, into Revit.

But really what it is, is doing sketches like this. This was just a quick diagram done on the iPad Pro. So drawing digitally. I'm not drawing on paper. I'm drawing in a way that I can share. So it's basically the same process as drawing on a piece of trace paper.

Ironically, this is done in the Trace app. But it means I can share it. It means I can do stuff to it really quickly. I can take it into Photoshop. I don't have to walk over to the scanner.

But then, because I'm doing this on the iPad-- and like I said, I can do things between different apps-- the next step I usually do is say, OK, I've created that image. It's just an image. Has this base underlay. Bringing that into FormIt in context. So if you guys have had the chance, some of the great FormIt classes have gone through some of the really simple and quick modeling tools of being able to locate Google Earth. Choose your site.

In this case, I'm just doing that and bringing in my sketch, then, on top of that. And then also starting to very quickly extrude up some context. So within an hour or so, very often with a client, or at a coffee shop, or someplace other than my studio, I can get to a quick idea in context. And start to get some square footages and massing back, in a very, very loose and flowing process.

But the really cool thing about this, and why I enjoy FormIt and the sketch process on the iPad, as this then flows into Revit. So what you're seeing here is this is actually the FormIt model that I originally started. And a little bit of terrain that's coming in.

You can see also starting to-- one of the things I do to really push the sketch process on the iPad, and quite a bit on the Windows 10 tablet now, is I will be sketching, like you saw in the first image, make a model out of it. And then I'll take another screenshot. And I'll sketch over the top of it.

In this case, it's just a quick section to understand its relationship with the terrains. But it's all in this interoperability, back and forth, flipping between apps.

And so, at the end of the day, this is what the output is that we ended up giving to the client. But it's all Revit based. So you've got just your basic section, with your FormIt geometry, and some trees, and some material. And adding a few dimensions, and some notes, and very quickly--

So you've gone from a very quick sketch process, get the idea out, understand what it is, bring it into context, get it into your firm's template, a lot of times. Add some notes, so the client can understand your handwriting.

But in what has become a really tight window, particularly in the work we do with developers, it's like, we've got a site. And I need to know if this site works by noon. We can start to do those things and get that in context. And do it in a way that this will flow into our Revit model, that can become [? CDs ?] without throwing it all out completely.

So now we'll get into the complicated demo. I didn't think that was the first slide.

All right. So, before I open up Dynamo, the one thing that I want you all to know about this, because I think it's really-- Dynamo can be really complicated. No doubt about it. But all it really is, is you put something in, you do something with it, and you get something out. No matter how long the graph is.

Sometimes, maybe, you put more stuff in and get more stuff out. But at the heart of it, that's all Dynamo is. Put something in, do something. Get something out. That's a very simplified version, but--

So this first kind of thing is talking about going from data to sketching. And so the one piece-- so what I'm going to use here is Dynamo Studio, which is essentially a standalone Dynamo. It has the ability to publish to the web. You can see over there is a little button under the File menu. That "send to web."

So this is going to package up what you create as a Dynamo script. And send that to the web and create a URL, which isn't the part I use. But the cool thing is, you'll see, is that can actually come into FormIt 360.

So. Toggle over. Make sure you can see. This is Dynamo. And what it is, is this is a set of rules that I use for hotels to test sites. What it is, is a series of inputs over here that I can adjust as sliders.

Turn on automatic. I can start to say, you know, if I start to say, zoning needs to be only six floors. I need to know that, so I can start to do some rule criteria [? base. ?] And this model all responds to based on criteria.

The other one that's usually a big critical one is the client's like, well, in order for it to work, I need to have X amount of keys. So I can start-- oops. 40 is not usually it. That's a small hotel. It's like a bed and breakfast. Oops. 4,000 is not it, either. But you can see what happens. It immediately responds. So. There we go.

So, based on those inputs, there's just some very relatively simple math going on here. And I'm not going to go into it too much. But I will push this up when the presentations get posted online afterwards. I'll put this data set up there, too, and you can dig apart this.

It's actually relatively simple. Essentially, it's just doing some math of saying, how long is the building, I know a guest room width is this, do some math, and round some things. It's very much an approximation. It's not going to give you a BIM model with every finite element. But it gets me close enough, really quickly-- getting back to that idea of sketching-- of what is going to fit.

Now, I don't really do this in Dynamo anymore. I set up these rules. And I go and I publish these to the web. Yes. And I'm not going to do this because I already did it.

But, basically, what it's going to ask you to do is give it a name. It's going to create a URL. This is going to be under your A360 piece. So it's going to wrap that all up. Not going to see the strings anymore. And then, if we open up FormIt-- there we go. There we go. It was already there.

So this is FormIt 360. Very often, what I end up doing quickly is saying, let's pick a site. And we'll go to a neighborhood by me. So nice little neighborhood. And I know there's an--

I was just pondering there. Lost my train of thought. Let's say, I know there's a Target retail here. And they're thinking this little strip mall should go, and there should be a hotel there. I've got that there. Already got it. And this is how quick I can make a hotel for somebody. Oops. Come on. There it goes.

So I'm basically-- this is that same script, pushed out to the web. You get it in a list here. It follows your A360 log in. And I can just drop that in and be like, there's my hotel. That's where the client wanted it.

And once I've-- what I've done here is just really quickly double clicked on it. And that takes you to the interface in FormIt. And all of the inputs that we had in Dynamo show up as inputs over here. So here's all my variables.

And I can just start to say, oh, I know it's brand X, so the width of each individual room X really needs to be 14. And it'll think for a second. And should update ever so slightly. There it goes.

And maybe I want to play with the angles a little bit and some dimensions. And I can start to just push and pull this really quickly, understanding that I know what the metrics are, I know it's going to fit. And get that to fit on the site.

So very quick, very iterative. I can make 100 hotels and get to a yes or no answer really quickly. And that's really about-- a lot of times, when you're starting a project and doing that initial sketch, that's all you really need to know, is does it work or doesn't it work?

And so. Go back to PowerPoint.

AUDIENCE: Is there specific types of outputs that you have to be using with Dynamo for that [INAUDIBLE] to work? Or if you're generating any geometry--

MIKE ENGEL: Yeah. Any geometry that you see in-- the question was, is there any specific outputs? And coming into FormIt, really the critical output in FormIt is the geometry. If you use it on the web as the Dynamo customizer, or get into Fractal, you can actually get other outputs of, like, well, what is the cost, and based on how you build that.

But, basically, what you see in Dynamo is what you get. So any geometry you have visible when you publish it, that's what you're going to see in FormIt, when you bring in it.

So these are the pieces, more for reference, in case the demo crashes. Talked about that.

AUDIENCE: When you're using Dynamo and FormIt, is there-- it's just what's in Dynamo that's [INAUDIBLE]?

MIKE ENGEL: In FormIt? Yeah. So I'm using Dynamo on standalone. So there's no select face, like if you're running it on top of Revit. There are some-- I've done the same script, actually, based on drawing a line in Revit. And then I pick that line, and it builds a hotel based off that, basically using all the same formulas. It's just a different starting point.

This is just a quick little video of that same hotel, how you can start to flex it and push it. Get feedback. One of the things you'll notice when it gets here is this hotel block is very much about the upper stories of a hotel, that are very pretty typical. But once I figure that out, if it gets here, what you'll see is I actually pick it up in the air.

So that's how I figure out my first floor. And what it allows me to do is use data to very quickly get the controlled part of the hotel that I know needs to meet certain criteria. Use the rules for what they're really good at.

And then I start to model freeform, leveraging the direct modeling approach to FormIt, for that base area. How does the porte cochere start to look? Where is the pool going to end up? What gets pushed and pulled at the base?

So, locate it. Guess I rotated in there.

So here you can see, I can start modeling, and actually direct modeling now this base element. And, really, what's really cool in my work is I can start to really leverage the pluses of both. I'm not trying to do everything in Dynamo. I'm trying to make a rule for everything. I'm just leveraging that for really quick things that I know criteria needs to make.

So. And then the other.

AUDIENCE: Are all of those-- so all of the inputs that you add in Dynamo are [INAUDIBLE]?

MIKE ENGEL: Yeah. Any number slider, any number inputs, string inputs. I guess that's really all.

AUDIENCE: [INAUDIBLE]

MIKE ENGEL: Yes.

So the other one you'll see here now, so this is a parking garage. It's all based on that same idea, creating a Dynamo piece that is rule-based. So I can start to do parking. It's a little different formulas.

But the one thing you will start to notice is I've built in some color coding. So this is really powerful if you have people that don't know Dynamo but need to do this. They can start to push and pull this. And give them a site. And find out.

In this case, when it turns red, that means, oh, you've made it too short. Your ramp is too

steep. It won't meet code. When it's yellow, it's like, OK, it meets code. But your parking ratio-- you defined that we needed 400 parking ratios. This is either too big or too small. And then when it turns green, it's like, OK, you're within 10%. So for a quick massing, that's pretty solid.

So just some really quick ways. I mean, that video is sped up a little bit. But it's pretty close. It's not sped up too much.

So. Like the last demo, we went from data to sketching. But the cool thing is we can actually go the other way. So what we'll do now is, if you look at this workflow, down at the bottom here, we're going to start with sketching this time. And shove that through Dynamo to create geometry.

So this demo is going to take a very traditional 2D sketch and start to create 3D geometry out of it. Which just on a very playful, form thinking, trying to figure out ideas, is a really cool process. So see if we can get this up.

Open that. It's the right one. So I'm going to open up this. And we're going to leave that over there for now. Actually, we'll run it first.

So in this case, again, it's all back to the idea of putting something in and getting something out. Don't be scared by all the strings. It used to scare me, too. So don't worry.

But, essentially, what it's asking me for here is just it's looking for an image file. And I'm going to go-- I've done a couple of these little images, you see? These are actually done on the iPad Pro with some things. So it's getting back to that sketching ideas and just thinking about different ways.

But they were just studies. I was thinking about gradients, and what does that mean? But now we can actually start to study, like, how does that interpret then to geometry? And so you can see. As soon as I did that, what this is doing.

So that's the image. I'll slide those over there.

To give you a little background, essentially what it's doing is it's looking at the image here as an input. It's taking some samples. So it's kind of like your test spores on a geotechnical. It's like, oh, I'm going to bore a little hole at each of these things. Tell me what that data point is in the image.

In this case, it's getting the brightness of that image. Is it positive or negative, or what is that value? And then it's basically saying, so now take that and convert what is a brightness to a geometric relationship. In the case of this, I'm converting it to a Z value.

And you can see, I can just quickly be like, oh, well, let's go look at that one. Oops. Didn't like that one.

Oh, maybe it was just thinking. There you go.

So I can start to create some really crazy surfaces. But it's almost taking that artistic sketching hand and pushing it back to a very rigid computer process. And bringing those two together.

Which, if you want to really bring it together, we will open up SketchBook Pro, which is a highly underutilized architectural design tool, in my opinion. But that's just my opinion.

So it's just a drawing program. But what I'm going to do is just going to open up a demo image. And it's kind of like Photoshop. I'm actually going to erase it. I'm going to get rid of the old ones.

So you've just got a white page, and in this case, it's a PNG. So I'm going to save this quick. And then I'm going to go over here and point this at this same file that I have open in SketchBook Pro.

And you'll see, it's flat, right? So then, you can take your stylus-- that's a little hard to see on the screen-- but I can pick a marker. And I can start to literally-- so, let's pick some blue. I can start to put a little color there. As I do that, I can start to understand what those geometric relationships mean as I sketch.

So you're taking a very quick pen input-- kind of an old school approach, like the first demo-- creating some marks on a paper, and converting that to an actual geometry that can start to define space.

You could think about-- I don't know, maybe I was the only one in the keynote-- when they take those lights and go up and down. Like, it was just going through my head. I'm like, oh, I could connect this to SketchBook Pro. And I could be sketching. And as I sketch, they'd be going up and down.

And none of you would ever know. I'd just be sitting back there smiling and thinking, this is the

coolest thing ever.

AUDIENCE: So you don't have to save the file from time to time?

MIKE ENGEL: I actually do. Actually, yeah. So what I'm actually doing up here, and I've talked to the SketchBook Pro team about this, is basically what I do is as I'm marking it, so I make a little bit of mark, and then I just keep two fingers on Control-S. And I just keep hitting Control-S. It's a little bit of a hack. But it's not so bad.

Yeah. There's some knowledge beyond me of how to get programs to autosave.

So you can see, we've got that. And, actually, if I turn that surface off. At the same time, it's actually mapping the colors back on the surface, too. So you can start to play with it.

So yes. I'm hitting Control-S as I'm doing it. Dynamo is running in automatic. So it's always looking at that file. So as soon as I save, it kicks in. But you can also, even beyond form, if we tweak this-- we'll say rather than making a surface-- see, I want to get rid of-- I'll just delete that.

We can do other things, like extrude it. So if we turn this one on. So in this case, it's actually-- it was already running this, but it's looking at that same value. And rather than turning into a Z, it's turning into a radius.

And the other side of this is-- I have actually got a couple of kind of variables. So I can adjust, like, what is the multiplier? How many circles do I want to sample? And you can see that it starts to look a little differently.

If we pick a different image now. That one's got a little bit more articulation. You can start to see in it.

And a lot of times, if you increase the density or multiplying factor-- thinking-- so I don't have inputs on these two.

So I'm just creating circles at this point. But then I can also start to say, well, what if we actually make that a solid again? It should think. Oops. Did I disconnect something? Curve. Circle. Oh, there it goes. It was just delayed.

So same kind of thing. Now it's bringing them both together. Not only is it taking that brightness and turning it into a radius, but starting to say, well, what's the Z-direction?

So you can start to see, there's this relationship of a very quick iterating drawing and data, back and forth. So. We'll close that before it breaks.

And the other thing you can do with this, if we find our PowerPoint-- we went through. So it's just about this idea of illustrating an idea. Again, this is just the background. So in this example image here, you see it's actually turned into a perforated metal panel. I think that can be pretty powerful on a building facade.

Same example. So this is just playing with the density here. I've just made it really dense.

Talked about that.

The other side of this is, like, that's pretty cool. We can do image right into geometry. But the other thing we can tie this to, because it's just a data point of this thing, is curtain walls. So if this video plays. Oops. Come on. Play. There it goes. Hopefully you can see it.

So what it is, it's a little slow and hard to see, but if you watch these little triangle pieces up here, it's actually looking at that brightness. And it's opening and closing the angles of the adaptive curtain panels. There's a slight delay. But you can-- if you watch carefully.

And it's the same process. What I'm doing is I'm just drawing in SketchBook Pro. And I save it once in a while, when I like what I drew. And then I watch Revit on the other screen. It works a lot better if you have two monitors, just FYI. It's hard to see on a split screen.

But it's kind of this idea that people that aren't comfortable designing in Revit, you can connect that data point a little bit more fluidly and actually start to leverage some of this data to inform design decisions.

So now we're going to try and put it all together. This process is exactly what it looks like there. And it usually works. But it's a little buggy.

So essentially what it is, it's bringing all of those different pieces, and bringing it together. And saying, OK, so we create these initial sketches, we extrude those, we got to get them into Revit. We want to do some things with it. How do we start to leverage different tools throughout that process?

And so what I'm going to do here-- I'm pretty sure it's going to work. It worked earlier today. So we've got a sketch plan. So this was created on the iPad the same way as the first demo, of

just drawing, a very traditional approach. Done digitally. Created that image. Bringing that into FormIt and starting to extrude off it.

So, very quickly, figuring out the massing, what's the square footage. And starting to articulate that, just enough, really, to design it. And at the same time, what you'll see is I've set up a series of rules inside of Dynamo. And what I do is read the FormIt geometry through these rules, these criteria. And it articulates it into Revit components.

So the normal FormIt tool is really great on many aspects. It takes your FormIt models and converts it to Revit geometry. To start a project, it's really awesome. But what I found in my process is it's not quite enough. I want to be able to understand different criteria.

What you'll see in the demo is actually window patterning. I don't want to model every window in FormIt, because what you'll find is it's really hard to transfer in and make usable inside of a Revit model, because you now have a massing model that has all these different little window geometries. And, really, you want a window.

So I've said, OK, let's take my left and right side of my brain, use these criteria that say, based on X, Y, and Z, I want you to watch what I'm doing in the FormIt geometry, apply rules to it, do some filtering, do some altering, and apply specific geometries to it.

And the really cool thing about this is I can sit here and I can keep updating my FormIt geometry. And just like I was doing with SketchBook Pro, and pushing that through Dynamo, I can push, essentially, sketch modeling, sketch massing, through this. And see updates inside of Revit.

So, see if we can get it up. Take just a minute. We will open. So we will start with FormIt. Get that open.

So here you can see. This is pretty simple for a model. A lot of times, I'll take it a little bit further than this. But not much. I really try and keep my FormIt models very much as a sketch. I don't want to articulate them too far, because I like keeping them agile. Is just enough to get my ideas out there to relay it to a client.

Some clients want a lot of detail. And then I have to do it. But you can see, in this case, it's some pretty basic geometry. Painting a few materials, because I'm like, OK, they're going to have these bands of windows. And that's going to be really classy. So I just said, it's a big

plane. Paint it glass.

So we will slide that over there. Now we will open Revit.

And you don't really have to have-- the way I'm going to demo this, and I do work this way quite a bit, is having Revit, FormIt, and Dynamo all running at the same time. It works pretty well. I don't have much issues with it, even on this laptop, which isn't super powerful. But it's definitely functionable.

So, that being said, you could imagine Revit, FormIt, and whoever. All those different users. So you could have a user working on floor plans. And he just sees updates as the other person's working on the massing in FormIt.

Open the-- yeah. And the other thing that is a little different than the FormIt tool is this is actually going to build directly in the mass family. So I'm not in a project yet. I'm in the mass editor. I'm going to delete what I have here.

You can see I've already set up levels. Just as reference datums. In this example, they actually don't mean that much. But it's something I usually do. Even though they're probably the same as in the project, I just like to have them there as a reference.

I've often-- these are the FormIt geometry that I did bring through the tool. But these are my balconies. So these are generic objects. These are generic models. They're not coming through as masses. They're just a typical generic family. Really, still a placeholder. We have a much more detailed one that we swap out with that has all the struts, and supports, and structural, and railings. It's crazy. So I've already got those.

So the next step. I need a bigger screen. That's what I need. So I'm going to open up Dynamo.

Now, the difference here is I'm running Dynamo on top of Revit now. Before, I was running Dynamo Studio as standalone. That's a subtle, but critical, difference.

Going to open this.

Basically, just keeping in mind, this is basically a set of rules. Criteria. It could be a structural grid. It could be anything.

So I'm going to open that. There we go. You have to actually click Open. Take a second. All

right.

So before I hit Run, I'm going to explain a few things. Freeze that.

So. What this is doing before I actually connect it, much like the sketch, it's starting with the file path. It's going out and saying, find a file. In this case, instead of an image file, it's reading a geometry file. A SAT file. Which you'll see coming out on FormIt in a second.

Doing a little bit of scaling and importing that. And then it does a little digging. This pieces actually go out and it finds all the faces of this geometry. And that's probably the most critical step here.

From there, it's a series of filters. Looking at and saying, OK, this is a face. In the first one, it says, well, find all the ones, because I want to do this with walls. So, basically says, look at anything that's got a normal, or which way is it facing that's in Z-direction. And if it's in a Z-direction, take it out of the list.

So that gets me rid of all my horizontal, and, basically, floor and ceilings. Just a real quick filter.

And then the series of these next, what they're doing is a-- they're all doing essentially the same thing. They're just doing it in series. But they look at different criteria.

The first one says, is this a rectangle? I want all my window patterns to be a pure rectangle. I don't want to have a weird L shape. So it's looking at, and saying-- that's kind of weird. The pink doesn't show up there. Huh. Pink doesn't work on the monitor. All right.

But this one is-- there's a group around this. This one basically says, like I said, so, it starts to say, well, in my massing, I knew I wanted a spandrel, a band, at the floor line. Because we're not going to be able to afford curtain walls. So I'm going to have a metal panel or something articulated there.

So I know I massed that as a foot. I want you to go find all the ones that are a foot or less in X, Y, or Z in one of the directions and throw those out. And this just really repeats that over and over again to start to filter down, and break these down into buckets, and get certain pieces.

And then at the end it says, this one says, create a divided surface. So this isn't creating walls. It's not creating those things. Remember, we're in the massing environment.

But it is dividing it as a grid and saying, this face needs to be divided. In this example, I'm

actually just dividing it as a single face to get the four corners. It's a little bit of a hack, there's probably some more refined ways in Dynamo to do this. But this is effective. And it works. And that's really important when you're sketching.

And then it's basically setting a parameter to say, what is the window pattern family that I've setup.

So if we-- yeah. We'll just switch this to automatic. It will think for a second. Actually, it will think for a couple seconds.

The first run always takes longer. Does anybody have any questions while we're waiting? Hopefully it goes.

AUDIENCE: So could you apply the same type of logic that you're doing here [INAUDIBLE] instead of working in the massing environment, to, say, use this set of rules. And if it meets this criteria, create [? a wall. ?] Or if it meets this criteria, create a floor.

MIKE ENGEL: Yeah. There's definitely some tools that you can do wall by face. Question is using it with creating things other than the massing environment. Yeah. It's just, I mean, it really just comes down to you defining the rules.

So. I'm going to go out and actually look at the right file here. I think that's the right one. Try this again. Helps if you point to the right file. Helps more if you're certain that this is the right file, as well. We'll let that run. I'll show you what the outcome is while it's waiting.

So this is-- you saw that. Created the geometry in FormIt. This is actually just the Dynamo interface. And it's purely just color coded so that I understand my rules are getting applied to certain things. It's just a really quick way for me to do that. And then, at the end, hopefully you'll see it.

But this is just a perspective view of, then, what is the FormIt geometry with adaptive components all applied to it. And, hopefully, it runs and finishes, and you can see that as I adjust one, I can export and update that, rather than rebuilding it.

And then at the end of the day, you can create stuff like this. And, really, the cool thing is not so much like-- like I could create all this manually. I could push the FormIt geometry once. But the cool process, as soon as it loads, is I can continually work in Revit. And because it's running through this series of rules, it really is updateable.

I don't have to delete it and rebuild it. It's a set of rules applied. I put in new geometry, I get out new sausage. It's like making sausage. Actually, at our office, we usually talk about making bread. And slicing it.

But you can see. So it brought it in, much like it would with the FormIt thing, as geometry. And then it's actually started to apply adaptive components. And these have another layer of parameters. So I can actually come in here and start to adjust what they are. And I can-- well, actually the easier way to do that, in this case, and I can say, well, it's actually just choose a different one to apply. And if I recall--

So I've updated the rules, so it's going to rebuild on the Revit side.

AUDIENCE: [INAUDIBLE]

MIKE ENGEL: So the question is about working different platforms? And how do I get the stuff back and forth?

AUDIENCE: You just have them all connected to the same network? Or--

MIKE ENGEL: Yes. So I think that updated. It's a mess. I'll tell you that. There's not a good way, in my opinion. So anything that I'm working on Windows, primarily for work, it's all through the same network. Anything like the iPad work, I actually use either Box or iCloud Drive to translate files back and forth.

So it's all through the cloud. I don't plug much in, as far as hard transferring it. As much as I love the iPad, I really wish it would connect to the network. But, I don't know. We use ShareFile a lot at work, too. So I use a certain amount of that to transfer stuff.

Yeah. Any other questions? I think we got five minutes.

So that's the last demo. We talked about that. Oops. I just created a new slide.

Standards. All your standard end of the session slides.

Oh, how do you get FormIt? You asked me to put that in there. It's really easy. You go to FormIt 360, you log in, and you just start working. If you want FormIt 360 Pro, it's a little harder. Yeah. It's kind of cool. You can go to any browser and get it.

So I'm going to skip over that.

Thank you. Questions We'll take more questions for a minute. Or feel free to come grab me, and talk to me, and find me in the hall, or Twitter.