AUTODESK UNIVERSITY

FAB121412 (Handout)

Do You REALLY Want Manufacturer's Content? Success Stories in Repurposing Manufacturing for BIM

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Learning Objectives

- Learn about why it's hard to repurpose manufacturing CAD content for BIM
- Learn how manufacturing CAD content can be repurposed for BIM
- Learn how can we retain the intelligence from the manufacturing CAD model and have great BIM content
  Learn how the process differs, from product manufacturers to specialist subcontractors

Description

When adopting Building Information Modeling (BIM), the longest slog is creating the family files that you'll need to generate your designs productively.

But there's already so much great content out there on building product suppliers' websites—couldn't you just use that?

We all know that it's not that simple. Manufacturing models are not only far more complicated than we require for BIM: they rarely contain the data we need. So how can building product manufacturers, suppliers, and specifiers work together more closely to share data in ways that benefit all parties?

In this presentation, we'll tell the stories of customers who've taken on the challenge. We'll look at the problems they've faced and the solutions they've implemented, and we'll discuss the merits of each. The challenges of sharing data with the right amount of detail at the right time are by no means solved.

We're interested in your views on this subject, and we look forward to some lively debate!

Speaker

Paul Munford is an Application Engineer for Graitec UK. Until recently Paul was a specialist joinery draughtsman (a "setter out") and CAD/CAM manager for a U.K. based custom furniture contractor.

Paul had 8 years of experience "on the tools" before joining the CAD department in 2005. As an Application Engineer, Paul handles licensing, deployment, and training for AutoCAD and Inventor software. Paul also uses AutoCAD and Inventor to create manufacturing "workshop" drawings for Graitec's customers.

In his spare time Paul writes the blog entitled CAD Setter Out, and he also authored Mastering Autodesk Inventor 2016. This will be Paul's 8th trip to Autodesk University, and his 4th as a speaker.

@Cadsetterout

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REVIT	INVENTOR
Project A File on disk which is a single database of Information about your design	**Assembly** A file on disk which contains hyperlinks to part files, information on where the parts are in space and how the parts relate to each other. Part data can be collated in the assembly's BOM. *Do not confuse with* Inventor Project *(.ipj) file.*
Element An element represents a real thing in your BIM. Elements are categorized by: • Category • Family • Type	**Component** All items in a design are Components. Component is a generic term that is used to reference Assemblies or Parts. Components can be categorized by: • Normal (Manufactured) • Purchased • Phantom • Reference • Inseparable
Family A class of building element with similar properties, use and representation. For example, a Door, a Truss, a Light fixture.	**Part** The smallest item an Assembly can be broken down into. A Bolt, A Washer, A Screw.
Family – Loadable Custom families which can be created from templates and loaded into a project.	**Part** Parts are loaded into Assemblies to create a design. Assemblies can be loaded into Assemblies to create sub-Assemblies.

Family – System Predefined families that exist with the project. Walls, Floors, Ceilings, Levels.	**No equivalent** Workplanes and Sketches and Cut features can be created in an Assembly.
Family – In Place Custom elements created within the context of a project.	**Part – In Place** Part files can be created within the context of an Assembly, but they will still be written out to a separate file on disk, and can be referenced into other Assemblies.
Family – Nested Family elements can be loaded into Family elements to create configurable 'groups' of elements. For example, a 2D symbol family can be nested into a 3D family, or a door leaf family could be nested into a door set family.	**Sub-Assemblies** Parts are referenced into Assemblies. Assemblies can be loaded into Assemblies to become sub-assemblies. Configurable parts are known as *iParts*. Configurable assemblies are known as iAssemblies**.**
Type A family can contain multiple types, such as size or finish.	**iPart** An iPart factory is a table driven part file which references member files which represent multiple types. iPart member files are also separate files on disk.
Type Catalog A text file containing parameters which define different types for a family. Only the types you want need to be loaded into your project.	**No Equivalent** All iParts members are physical files on disk. Only the member you require is referenced into the Assembly. Components can be temporarily removed from memory using 'Level of detail' (LOD) representations. Content center components are defined in a database that ships with Inventor. Content center components are only created as files on disk when they are inserted into an Assembly.
Instance A Family file is the definition of the building element. The same Family can be placed into a project many times. Each one of these placements is known as an Instance.	**Instance** An Inventor part file is the definition of the part. The part referenced into an Assembly is the instance. When the part fie updates, all assemblies referencing that part will also be updated.

Hosting Elements can be ‘aware’ of their classification and hierarchy within the BIM. Doors know that they are hosted in walls, furniture knows that it will be hosted on the floor.	**Relationships** All relationships in Inventor are local. Relationships remove degrees of freedom. There are six degrees or freedom, three translational and three rotational. ***Constraints*** are face based relationships that (typically) remove one degree of freedom at a time. ***Joints*** are feature based relationships that remove all degrees of freedom, and can then allow degrees or freedom to be ‘opened up’. ***iMates*** are relationships built into catalog components so that they can be placed and constrained in one move. For example, a Bolt that knows it needs to fit into a hole.
Parameters Information stored in a Family (Element). Can be a mixture of measurements, that control the size of the family types, and data.	**Parameters** Place holders for a value. When the value updates, the geometry updates. **iProperties** Data about the component.
Parameter – Shared Parameter information stored in an external file and shared amongst multiple families or projects.	**No Equivalent** All iProperties are shared. Parameters can be set to ‘Export’ to expose them as custom iProperties.
Parameter – Type A value within the family that will be changed for all instances of that loadable family type in the project.	**iPart** A parameter value changed in an iPart factory will be applied to all members. Parameters can be set to ‘member’ only to have unique values for each member.
Parameter - Instance A value within the family that can be changed for each instance of the family. For example, a Door number. The door family may contain a limited number of types, but the Door number must be unique to each door.	**No Equivalent** Any parameter or iProperty change on a part will update every instance of that part, in every Assembly that references it for every design ever!

Schedule Schedules can be extracted from the properties of elements in the project. All schedules in Revit are bi-directional. Schedules can be used to create tables on drawings.	**Bill of Materials (BOM)** iProperties and Exported Parameters can be complied using the Inventor BOM. The BOM is referenced when creating parts lists on a drawing. The Inventor BOM can be used to 'push' data into component files, but cannot be used to change read only properties (e.g file name) or the quantity of instances in the Assembly.
Level An infinite horizontal plane, used to define height or story with a building.	**Workplane** An infinite 2D plane. Can be created in any orientation. Used as a datum to define the locations of features or parts.
Grid An Infinite vertical plane, used to define locations of beams, columns and walls within a building.	**Workplane** An infinite 2D plane. Can be created in any orientation. Used as a datum to define the locations of features or parts.
Reference Plane An Infinite 2D Plane, drawn at any angle.	**Workplane** An infinite 2D plane. Can be created in any orientation. Used as a datum to define the locations of features or parts.
Reference Line A line between 2 points, representing a coordinate system of planes both through the line, and at each point.	**No Direct Equivalent** Work Planes, Work Axis, Work Points, and UCS would be used for equivalent functionality.
Detail Lines Geometry, only seen in specific (2D) views.	**Sketches – 2D** Sketches can be included in parts and assemblies. Only geometry which is parallel to a view can be seen in drawings.
Model lines Geometry seen in all (3D) views.	**Sketches – 3D** 2D and 3D sketches can be included in parts and assemblies. 3D sketches cannot be viewed in drawings.

Pin, Pinning Temporarily fixes an element in position so that it can't be moved accidentally.	**Constraints** Three constraint, or one Rigid joint can be used to 'lock' two components together. A component can be 'Grounded' to fix its position in 3D space without constraining it.
Detail Level Elements can be modeled in multiple detail levels, including 2D and 3D Geometry. Detail levels are Coarse, Medium and Fine.	**No equivalent** (Not to be confused with Inventor's 'Level of Detail' LOD representations).
Worksets User generated categories used for performance or organizing the BIM.	**Assemblies** A design is usually organized into assemblies in the same way as it is intended to be manufactured. The top-level Assembly represents the entire design. The design is broken down into sub-assemblies to represent individual groups or systems. Collaborating users can open a sub-assembly independently of the main assembly to work concurrently on the design.
Shared coordinate system Construction projects can be coordinated by using a shared coordinate system. This will represent a physical coordinate somewhere on the planet - usually defined by the civil engineer. Small projects may work around the 0,0,0 origin – like CAD.	**Origin** All Inventor models are built around the origin of the part/assembly files (0,0,0). Inventor doesn't like to work on models where the Assembly origin is a long way from the 3D geometry. If a shared coordinate system is required, it is usually better to place an Inventor assembly into a 'Container' assembly and use a UCS to place the Assembly in the correct location within the container.
Central Vs Local A Central BIM project is located on the server. Local BIM projects are copies of the Central Project on a user's PC.	**Vault** Vault PDM (Product data management) resides on the server. Assemblies are 'Checked out' to be worked on (Copied to the local machine and locked in Vault).

Users ‘Sync to local’ to load their updates into the Central Project.	Users can collaborate by only checking out the components they wish to work on. Changes are ‘Checked in’ to supersede the original design. Another user can now check out the files.
Clashing An algorithm looks for overlaps between 3D objects and reports them as ‘Clashes’.	**Clashing** An algorithm looks for overlaps between 3D objects and reports them as ‘Clashes’.
Library Revit ships with a library of Loadable Families for you to use.	**Content Centre** Inventor ships with a database of standard components for you to use. If there is a BS, ISO, DIN, ANSI etc. standard for an item, it will be in content center. For example, we have nuts, bolts, washers. We have structural members for steel, but nothing for brass, aluminum or plastic extrusions. Content center includes components for use with Inventor routed systems (Tube and Pipe & Electrical).

No Equivalent Do not confuse with a Revit Project file (.rvt).	**Project File** An Inventor Project (.ipj) file is used to let Inventor know where to find your data. All components are saved in the 'workspace' defined by the project file. Project files also control project settings such as which Design Center libraries are loaded and where the template files will be found.
No Equivalent Do not confuse with Revit detail Levels. Or BIM LOD (Level of Detail & Level of Development).	**Level of Detail (LOD)** An Inventor Level of detail representation is used to manage memory with large assemblies (1000 – 50,000+ instances). Components can be 'Suppressed' to temporarily remove them from memory. An LOD is used to save what is currently suppressed. When opening an Assembly, an LOD can be referenced to open the Assembly faster.

With thanks to Marie Hunter of Avixi.com for some helpful additions and clarifications. Any mistakes are my own.