Capturing Strategic Value Using Multiple 3D Platforms (Inventor, Revit, Inventor ETO, Vault)

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Class summary

- Transformation of a mass customization business from a 2D-based environment to a full 3D operation.
- Discuss automation and interaction of multiple 3D platforms and products
- Impact on various business aspects; sales automation, digital design, CAD-CAM, paperless manufacturing, and more.
- Taking Inventor and Vault platforms beyond being technical tools to becoming effective global enterprise resource planning (ERP) tools.
- Innovative ways of creating workflows, enabling multiple product platforms (Inventor software, Revit software, 3ds Max software) and internal processes (architectural design, product design, manufacturing, technical sales) to work together in collaborative and efficient ways.
- Measuring success, evaluating performance metrics and strategic business benefits

Key learning objectives

At the end of this class, you will be able to:

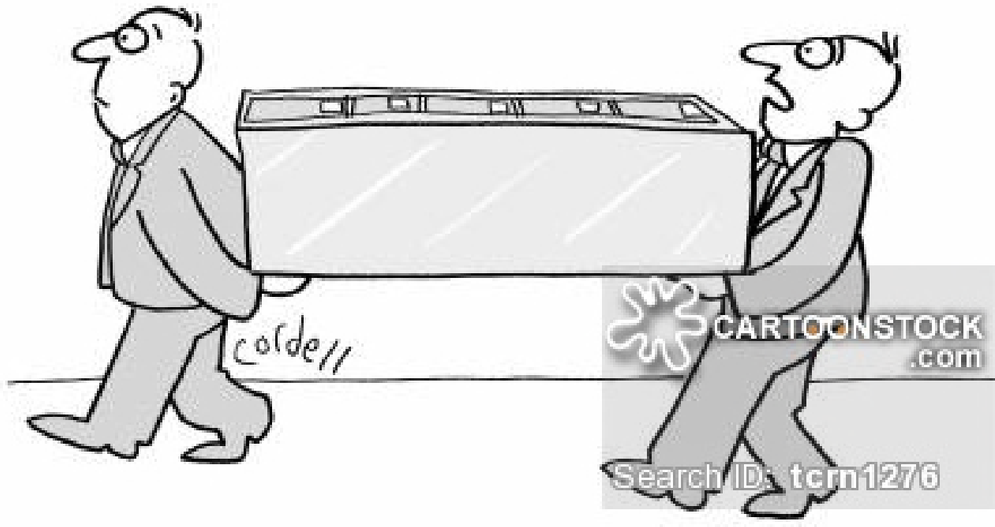
- See innovative ways of how multiple product platforms and processes can work efficiently together in real time
- Discover how automation can impact the entire organization and transform the business model
- Discover how global reach can be extended through the use of sales automation and advanced custom visualization tools
- Learn how to take Autodesk products beyond being technical or design tools and use them as ERP system drivers for a global business

Disclaimers & Ground Rules

- Broad discussion focused on strategic decisions and impacts rather than technical detail
- Fast paced; will fly through stuff quickly….
- This content is being presented by a management level employee….
  - No detailed technical questions will be answered!
  - Successes will be drastically blown out of proportion.
  - Any issues will be ignored and generally not mentioned.
- Have fun, interact, ask questions….

"I was told to keep my presentation interesting. How do you program a projector to explode?"

Company Background



"Surely there's an easier way of moving files?"

EVANS

DESIGNS & EQUIPS MISSION CRITICAL OPERATIONS

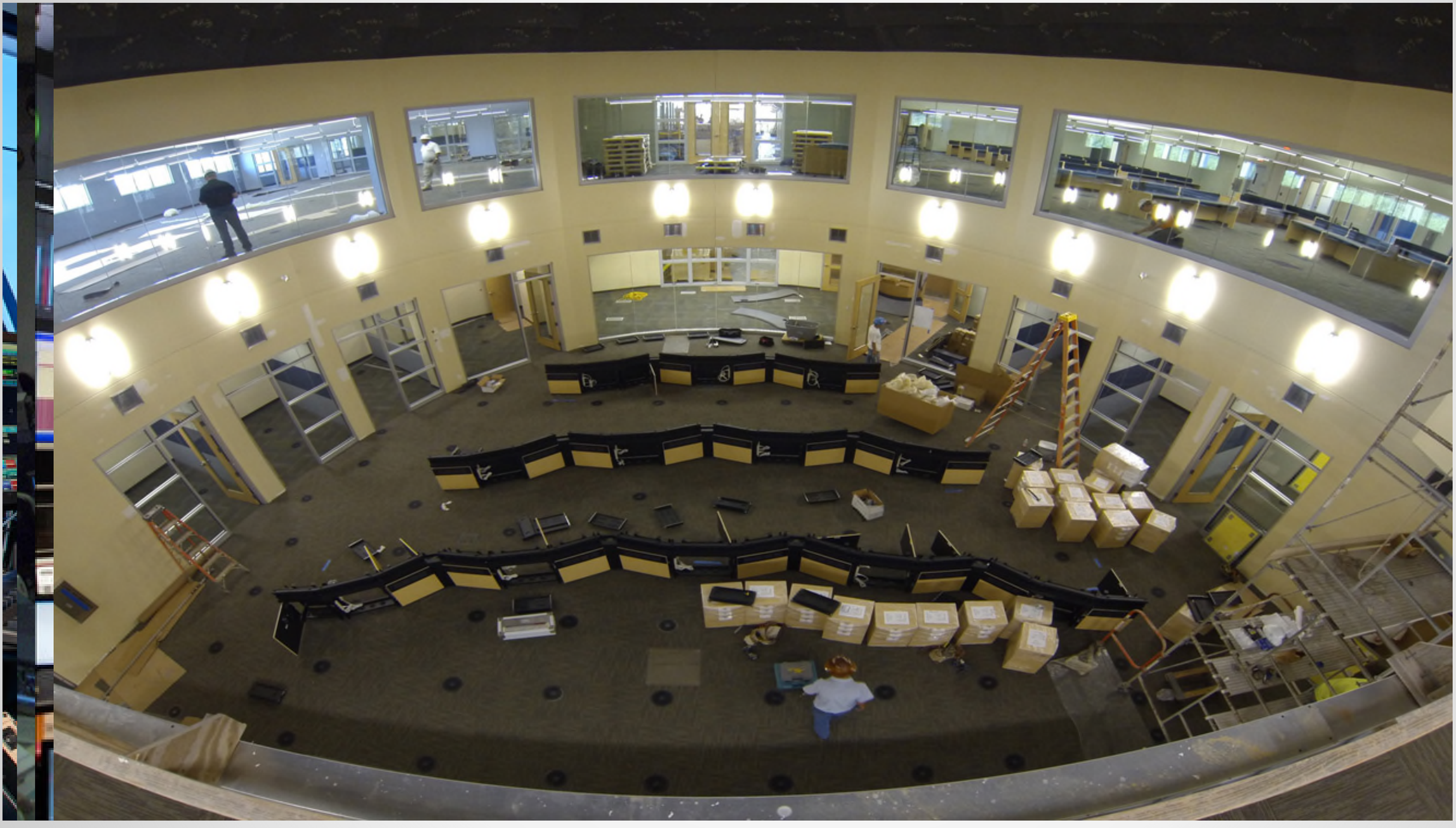
About Evans…

The WORLD LEADER in designing, planning, manufacturing and implementing mission critical and 24/7 use facilities.

NASA – Shuttle Launch Control Room (Firing Room #4) Kennedy Space Center, FL

What is a Control Room?

- Control rooms are specialized facilities that are used to monitor “mission critical” operations.
- Often, these facilities are very secure not generally accessible to the public.
- Control rooms are the heart of every operation.
- Typical cost per operator (including hardware, software and workstation):
  - Office Environment (workstation) - $5000.00
  - Control Room - $1,000,000+



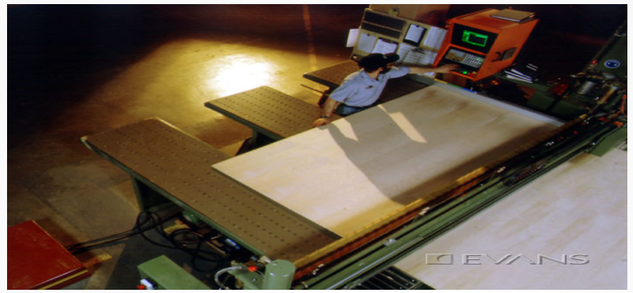
If you can dream it, we can build it….

Product & Services Offering

Project Planning and Design

- Project Planning
- Room Design
- Ergonomic Assessment
- Live Cutover Planning
- Project Management
- Traffic Flow

Product Manufacturing

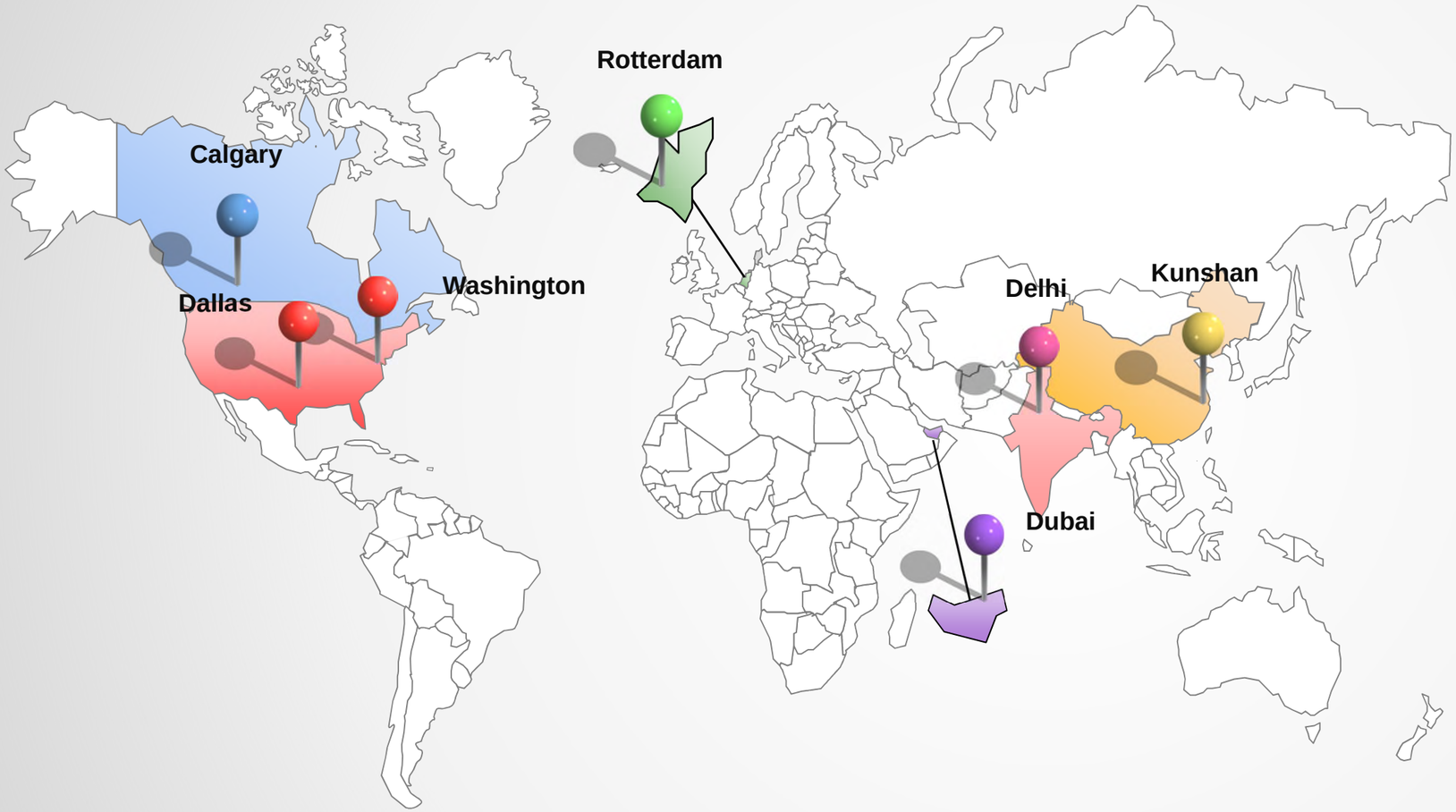


- Control Room Consoles
- Custom Millwork
- Technology Tables
- Power & Data

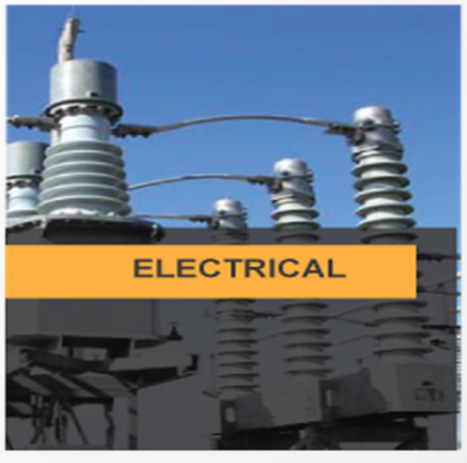
Construction and Installation

- Installation services
- Construction Services
- Electrical & Plumbing
- Raised Flooring, Lighting and Acoustical Products

Global Presence

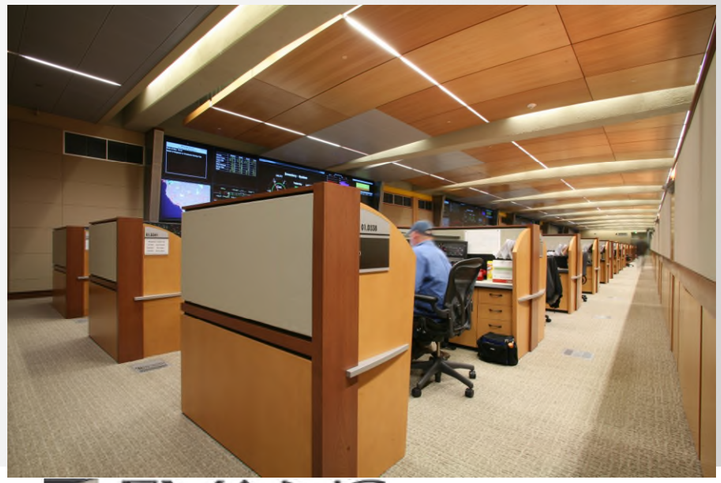


Multiple Market Segment Expertise



Product & Services Strategy

- Highly customized product design
- Over 10, 000 control rooms delivered; no two are the same
- Typical product customization;
  - Dimensions
  - Materials & Finishes
  - Customized equipment integration
- Platform Challenges;
  - 30 year history of using 2D Auto Cad
  - 3DSMax used for key project renderings (1998)
  - ERP System drives BoM creation (Microsoft Dynamic AX)
  - Significant ERP system automation (significant upgrade & maintenance cost)



EVANS
DESIGNS & EQUIPS MISSION CRITICAL OPERATIONS

AUTODESK.

Autodesk Platforms Used at Evans

Snap Design

Inventor OEM 2013

Used by Proposals, Design, Manufacturing

AutoCAD 2010/2013

Inventor Pro 2013

Vault Pro 2013

Renderings

3ds Max

Manufacturing

Design Review 2013

Product Manuals

Inventor Publisher 2013

Consulting/Architecture

Revit 2014

Product mix (complexity) – pre transition

Product Complexity	% of Business	% of Time Invested
Standard (No Customization, existing in Database)	35%	25%
Parametric (“Stretching” standard modules; length, width, height, layout angle)	35%	25%
Custom (Custom designed to specific customer requirements)	30%	50%

Strategic Challenges/Limitations

Sales/Proposals

- Highly custom product; specific to each location. Sales/dealers not technically capable of doing proposals.
- Training of new resources time consuming due to custom nature of business
- All content in 2D; line drawings time consuming to generate; difficult to interpret by non-technical resources.
- Time required to generate typical proposal: 1-2 weeks – all done in Calgary.

- Strategic challenges:
  - Difficult to differentiate
  - Scaling business difficult; throughput increase = resource addition (1:1)
  - Challenging to reduce lead times.
  - Challenging to handle international projects.

Strategic Challenges/Limitations

Product Design

- Design “starts over” with each project; data not useable
- Create detailed layout, create each part separately
- BOM is created separately in ERP system
- Training new designers 12-18 months

Manufacturing

- All received content in 2D
- Manual programming of all CNC machines based on Design 2D files
- Must “unfold” all sheet metal components
- BOM from ERP system very rigid. Information difficult to interpret/communicate
- Very difficult to train new staff, particularly in assembly.

Strategic Challenges/Limitations

Accounting

- All cost accounting based on estimates or overall consumed materials review
- Project cost accounting unavailable
- Too time consuming to attach accounting info to design models (in ERP BoM)
- Real Time Cost accounting not an option due to custom nature of the business…
- Key strategic issues;
  - Difficult to accurately audit project performance (Sales price vs. actual cost)
  - Cannot do pre order project profitability
  - Time consuming to consolidate month end financials (WIP, actual vs. BoM)

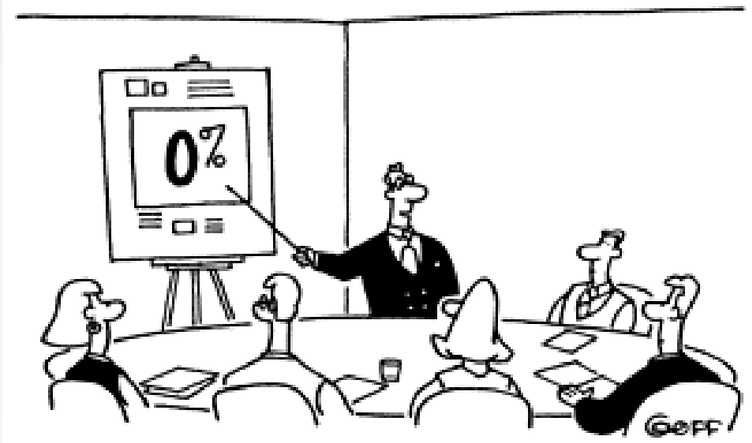
Procurement/Materials Planning

- Blanket PO's available for raw materials only
- Project specific PO's issues at the time of design - lead time challenge
- Inaccurate forecasting ability for loading management
- Allocation and consumption of VMI items not available per project.
- Key strategic issues:
  - Long inventory cycles
  - Human error – disconnect between Procurement & Design
  - Difficult to coordinate global sourcing
  - Increased expediting costs

Innovation Approach

- Out of the box thinking in how to utilize software platforms
- Efficiency, risk mitigation, business scalability key consideration factors
- Integration of tasks; minimizing repetition and avoiding human error
- Maintaining a market leadership position using technology

- As a market leader, we must continuously be innovative and continue to drive the market.
- Make innovation a part of the overall organizational strategy allows us to apply innovations in all areas of the organization.
- Innovation is driven by a need;
  - Reactive
  - Proactive
  - “Game Changing”

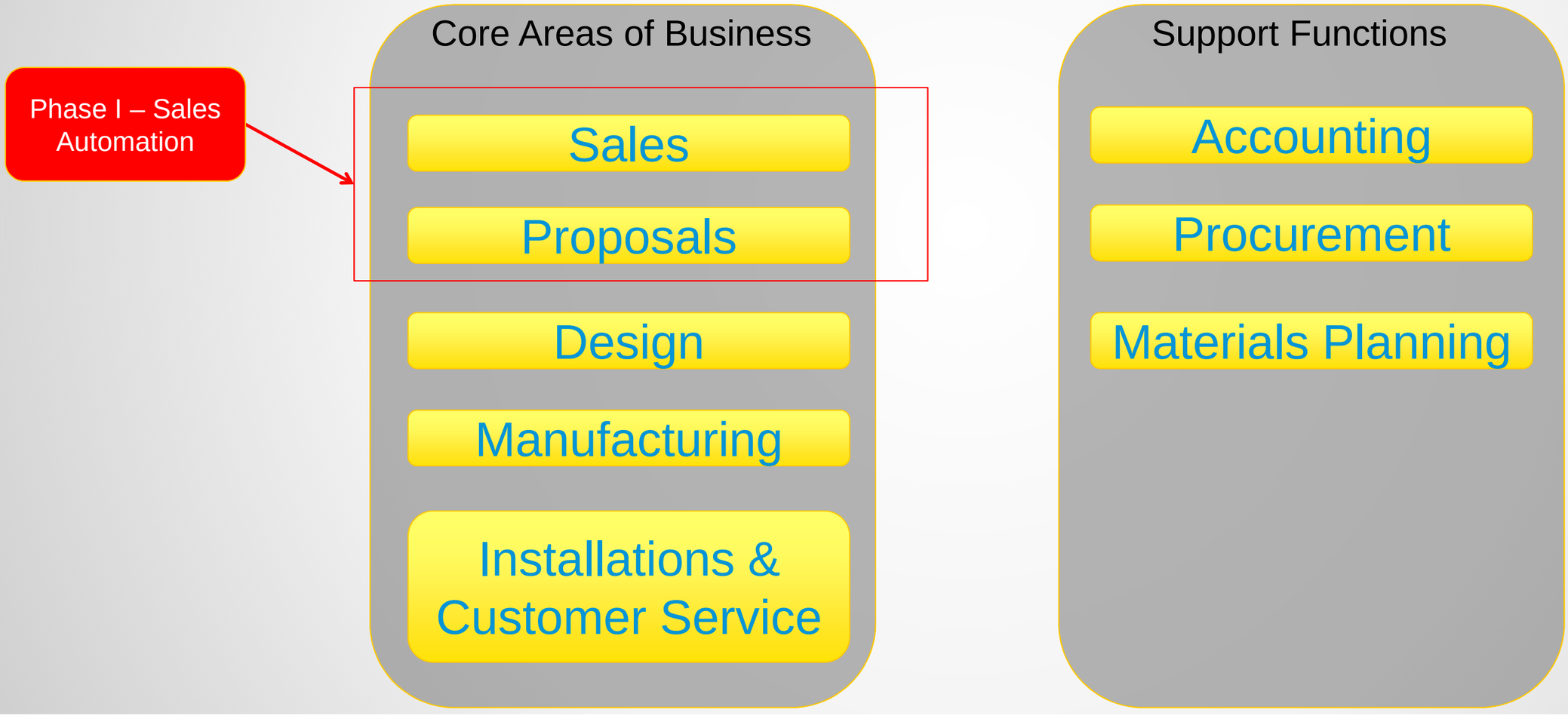


"Our study concludes that this is the percentage of our customers who will buy from us without any effort whatsoever on our part."

Phase I: Sales/Proposals Automation

Sales/Proposals Automation

- All aspects of the organization considered when thinking about Design Platforms….
- In 2007, decision made to transition business to full 3D/Digital platform



Sales/Proposals Automation

Objectives

- Sales/Dealers to generate all standard proposals in the field
- Training time: 1 Day
- Have full output package in 3D and 2D line drawings
- Generate all pricing
- Generate renderings
- Generate 3D videos
- Propose all parametric projects (no pricing).
- Generate complete sign off package
    - Drawings
    - PQ
    - Logistics form
    - Pro Forma Invoice
    - PDF Outputs
- Direct to Manufacturing

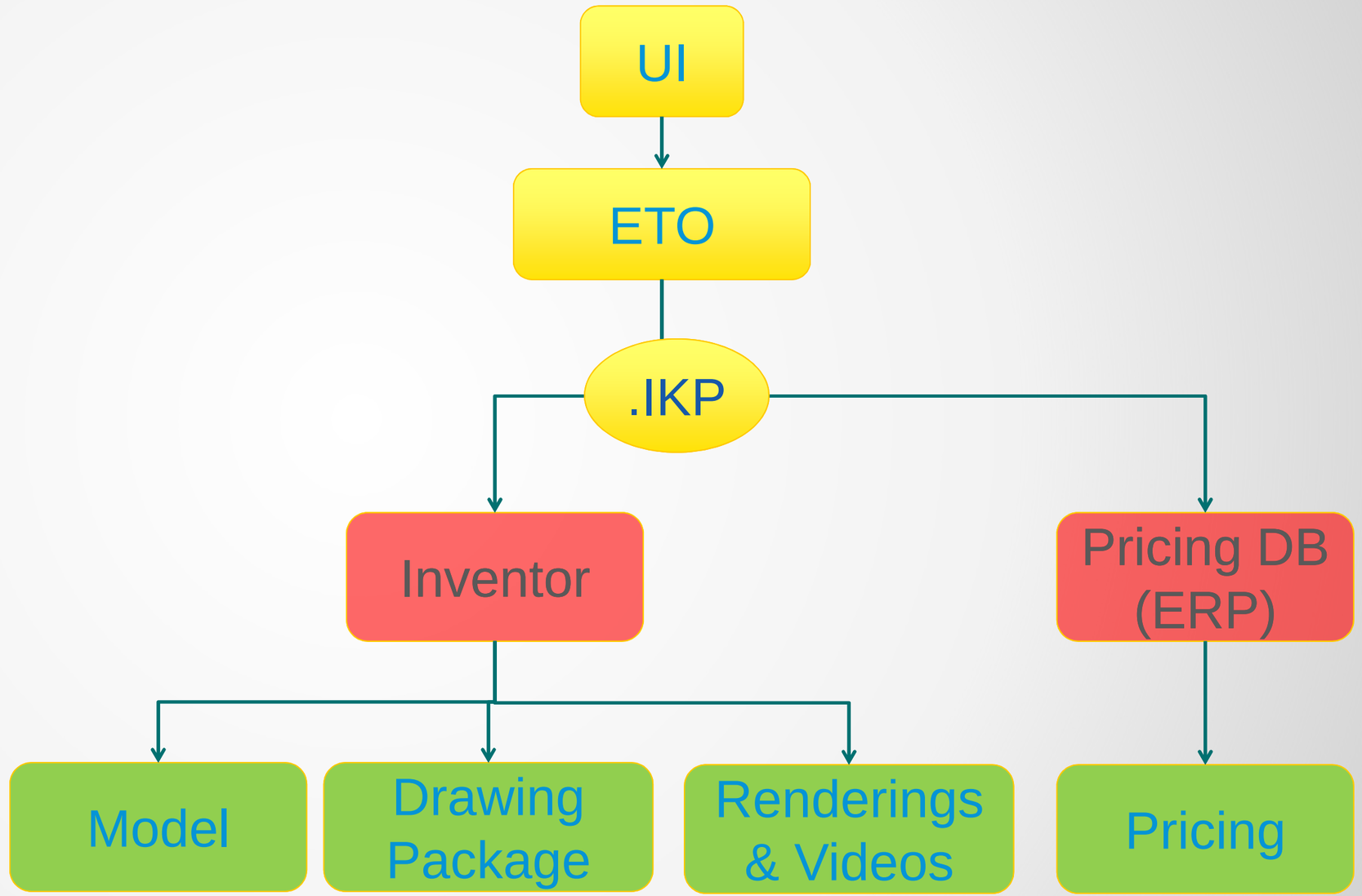
Challenges

- Non technical users
- No knowledge of Inventor, Auto CAD or any drafting platform.
- No understanding of product/design logic
- Manage currency & discount structures

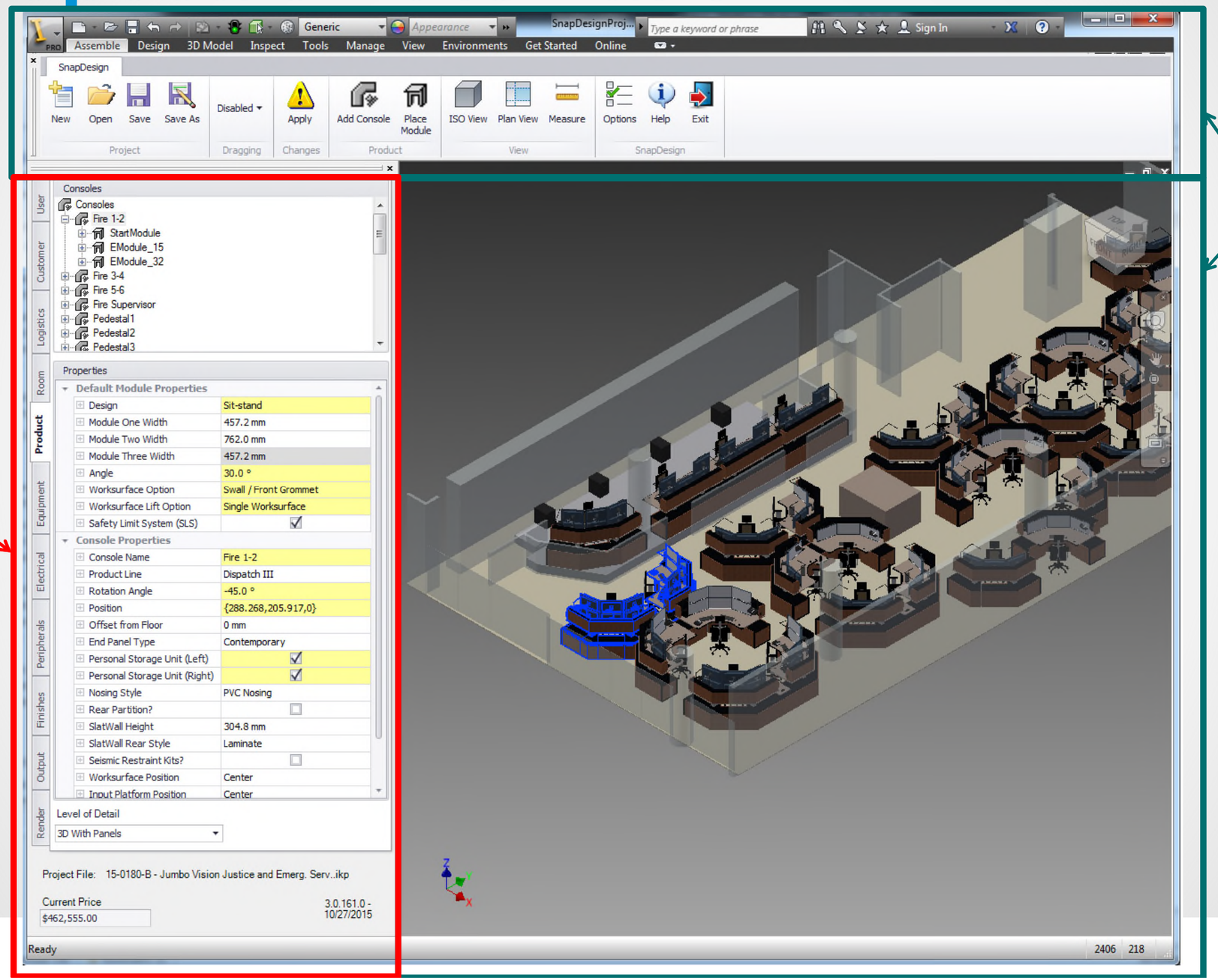
Sales/Proposals Automation

- Inventor chosen for the software platform;
  - High degree of technical capability
  - Good visualization options
  - Can be scaled; simple versus complex models
  - API can be customized

- ETO Chosen as the “driver” for the application
  - Engineering control
  - Model Control
  - Pricing & Options selection
  - Translate inputs from user to inventor



Sales/Proposals Automation



Customized Inventor Interface

Customized UI for Input Control

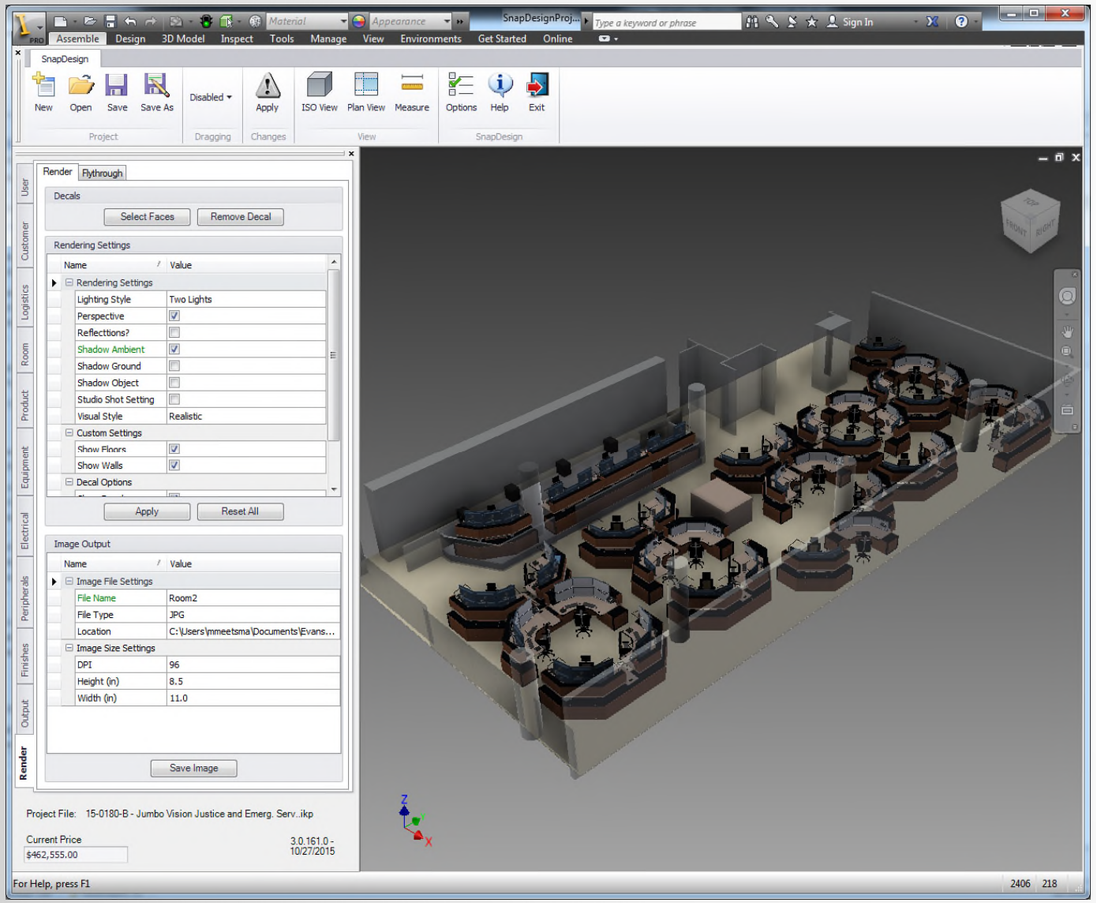
Sales/Proposals Automation

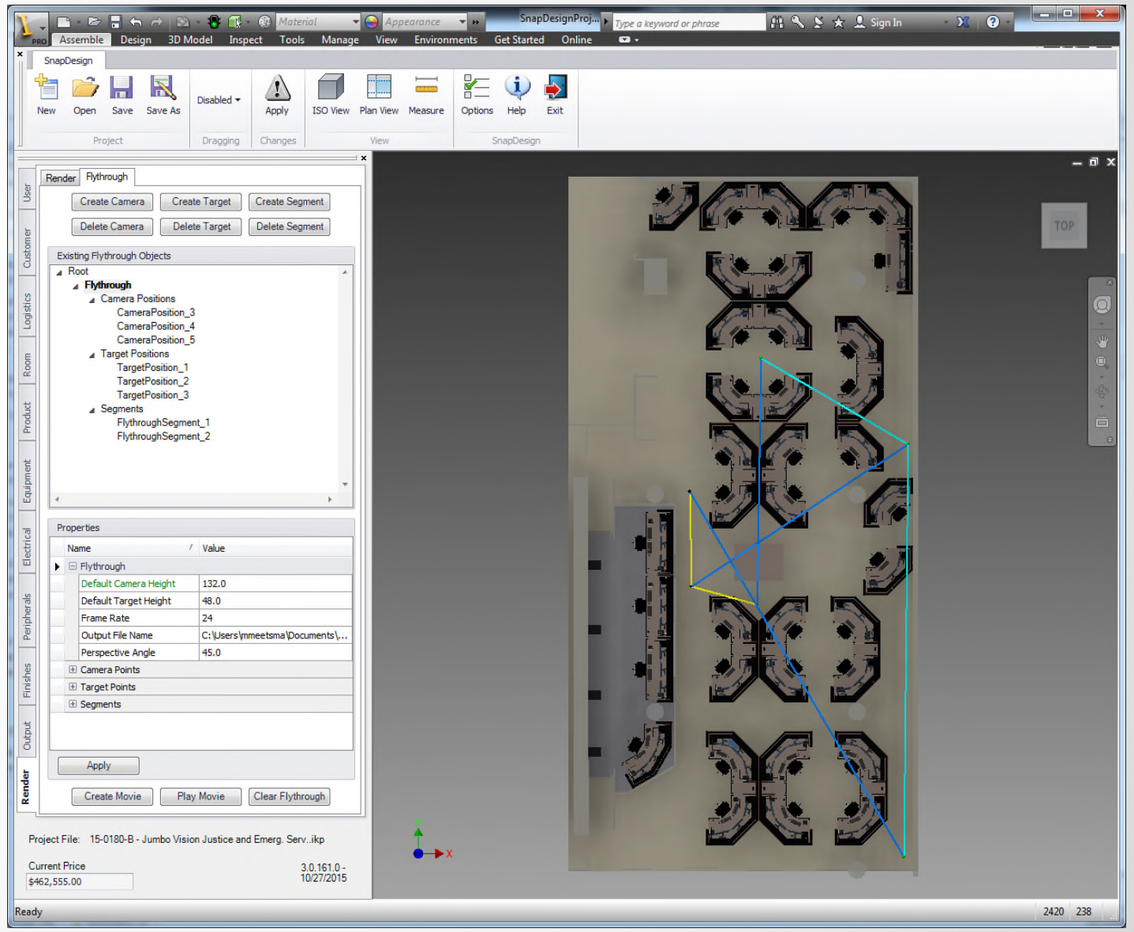
Live Demo

Sample Output Package

SNAP Output File (.IKP)

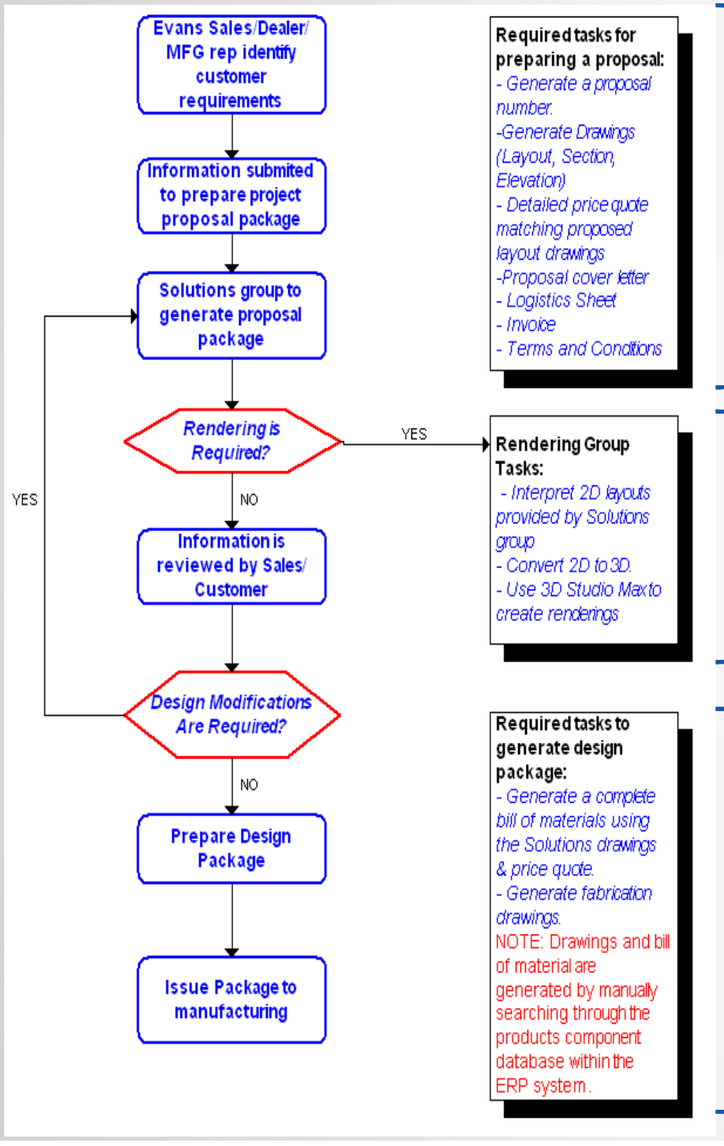
Sales/Proposals Automation - Rendering





Sales/Proposals Automation

Previous Process

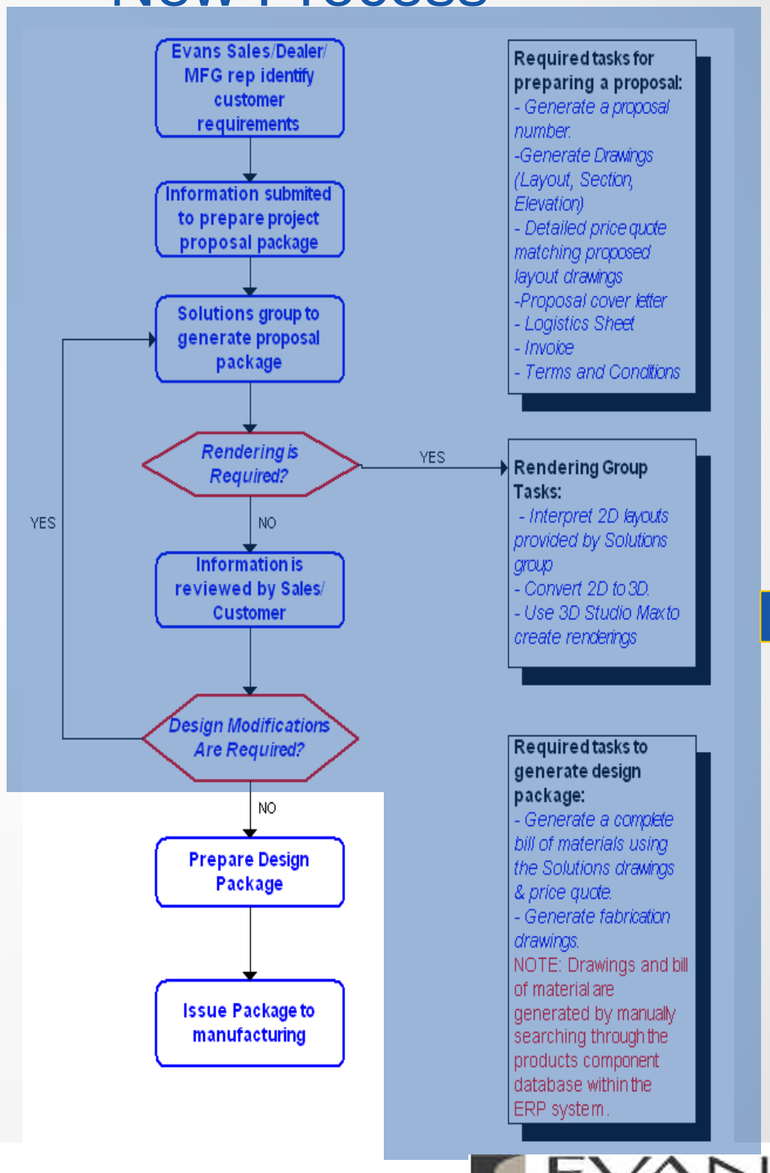


1 Week

2 Days

2 Days

New Process



30-90 minutes

SNAP Automation

- SNAP was the foundation of the 3D transition;
  - Controlled sales input

Internal Benefits

- Quick, automated sales & proposal tool
- Fully controlled proposal outputs
- Complete package creation; drawings, pricing, sign-off
- No further internal inputs req'd
- 50% Internal efficiency improvement

Customer Benefits

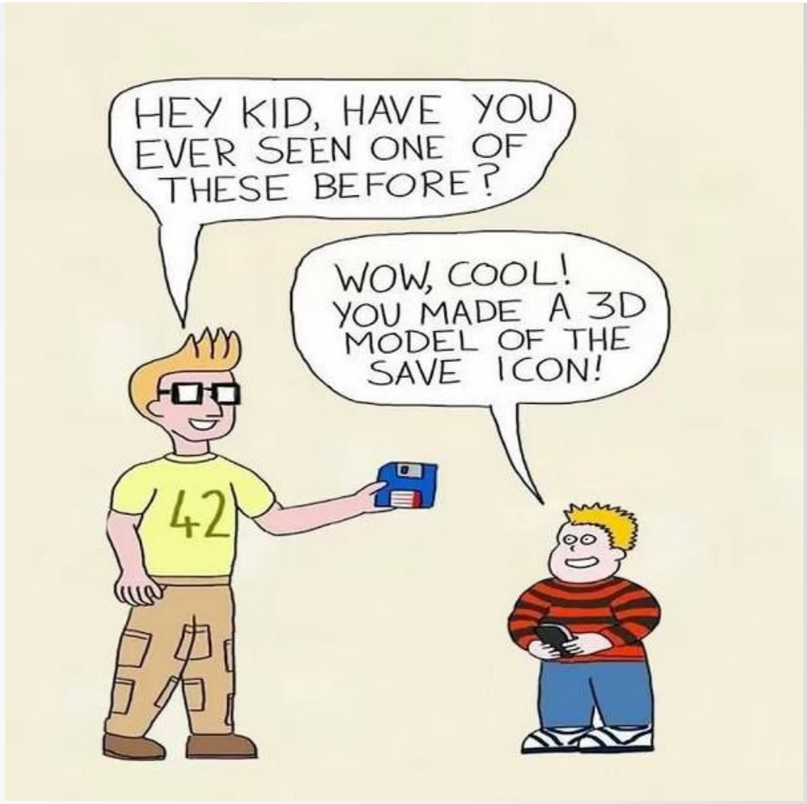
- Full 3D content
- Impressive visualization; renderings, videos
- Fast turn-around time (hours vs. weeks)
- Simple revisions process
- Involving customer in the design process

Strategic Benefits

- Allows for business scaling (more quotes/less proposal resources)
- Increasing global reach – inclusion of strategic partners
- Differentiator versus our competitors
- Automated BD tracking; win/loss, market segments, discounts, funnel tracking
- Full pricing & discount control

SNAP Automation

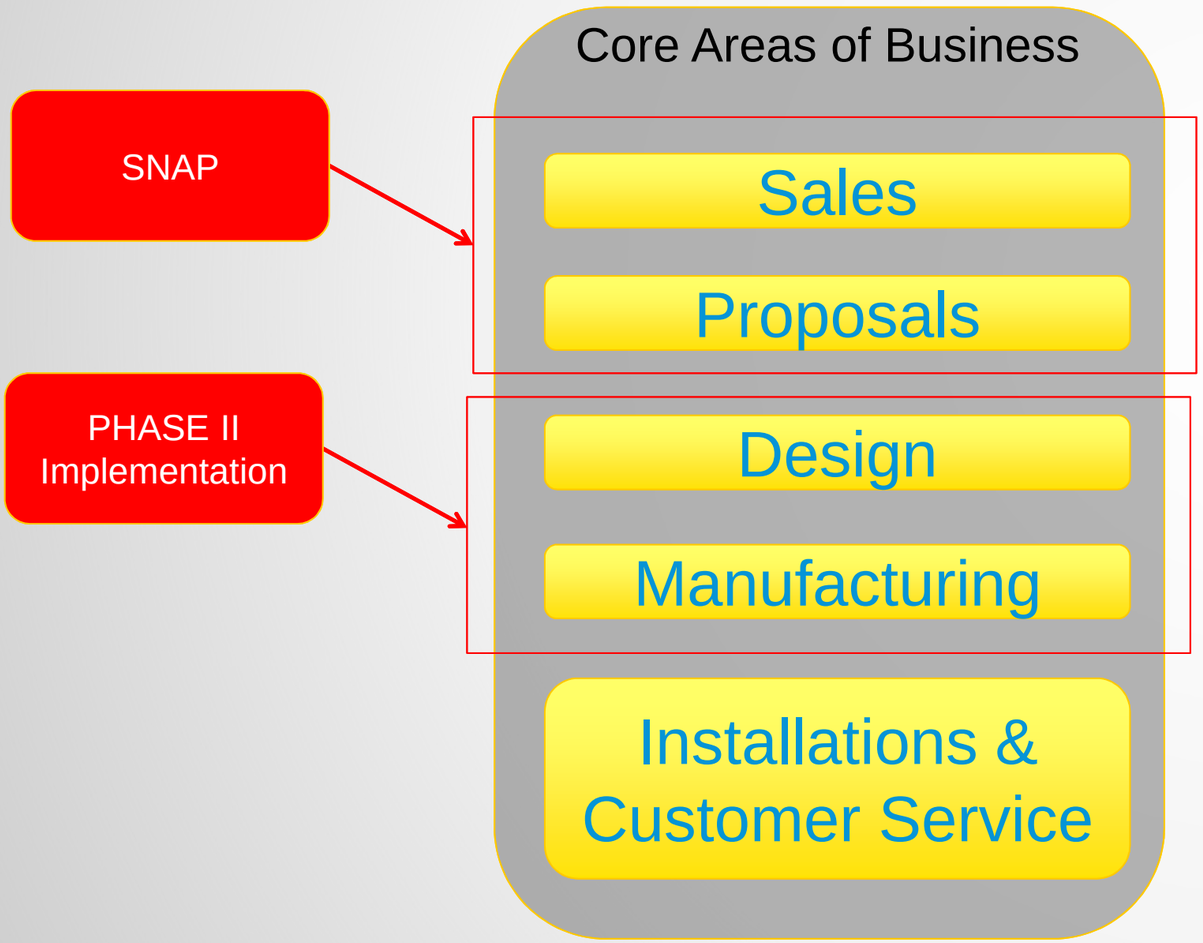
Product Complexity	% of Business	% of Time Invested	% of Time w/SNAP
Standard (No Customization, existing in Database)	**35%**	**25%**	**0%**
Parametric (“Stretching” standard modules; length, width, height, layout angle)	**35%**	**25%**	**20%**
Custom (Custom designed to specific customer requirements)	**30%**	**50%**	**80%**



Phase II: Design/Manufacturing 3D Transition & Automation

3D Implementation Phase II - Operations

- Phase II of corporate implementation



- What about these guys?
- Can 3D be leveraged to improver their performance?

Operational Implementation

- Very challenging transition form 2D to 3D in a live manufacturing environment.

- “Changing a tire while driving”….

- Key factors to overcome;
  - Investment justification
  - Fear of change
  - Distraction from core business
  - Is it the right fit for our model?

- A key question; can “off the shelf software solutions satisfy our needs?”

- What is the risk of being technology partner dependent?
  - Will customization of software platforms create risks or limitations in the future?

Operational Implementation

- Looking at 3D models from an innovation standpoint

Expected Advantages

- More Accurate
- More Visual
- Easier to Understand
- Parametric Ability
- Digital Prototyping

“Intelligent” 3D Model

“Innovative” Advantages

- Accounting Tool
- Procurement Tool
- MRP Tool
- New ERP Foundation
- Forecasting Tool

Product Design – Building the “Intelligent Model”

- Use standard features of Vault & Inventor for:
  - Part number creation
  - Modelling, drawing creation, I-Logic
- Create custom features to optimize and expand information;
  - Custom material templates
  - Parametric product platforms
  - Automated output tools
  - Agnostic format outputs

Leveraging Inventor & Vault – Product Design

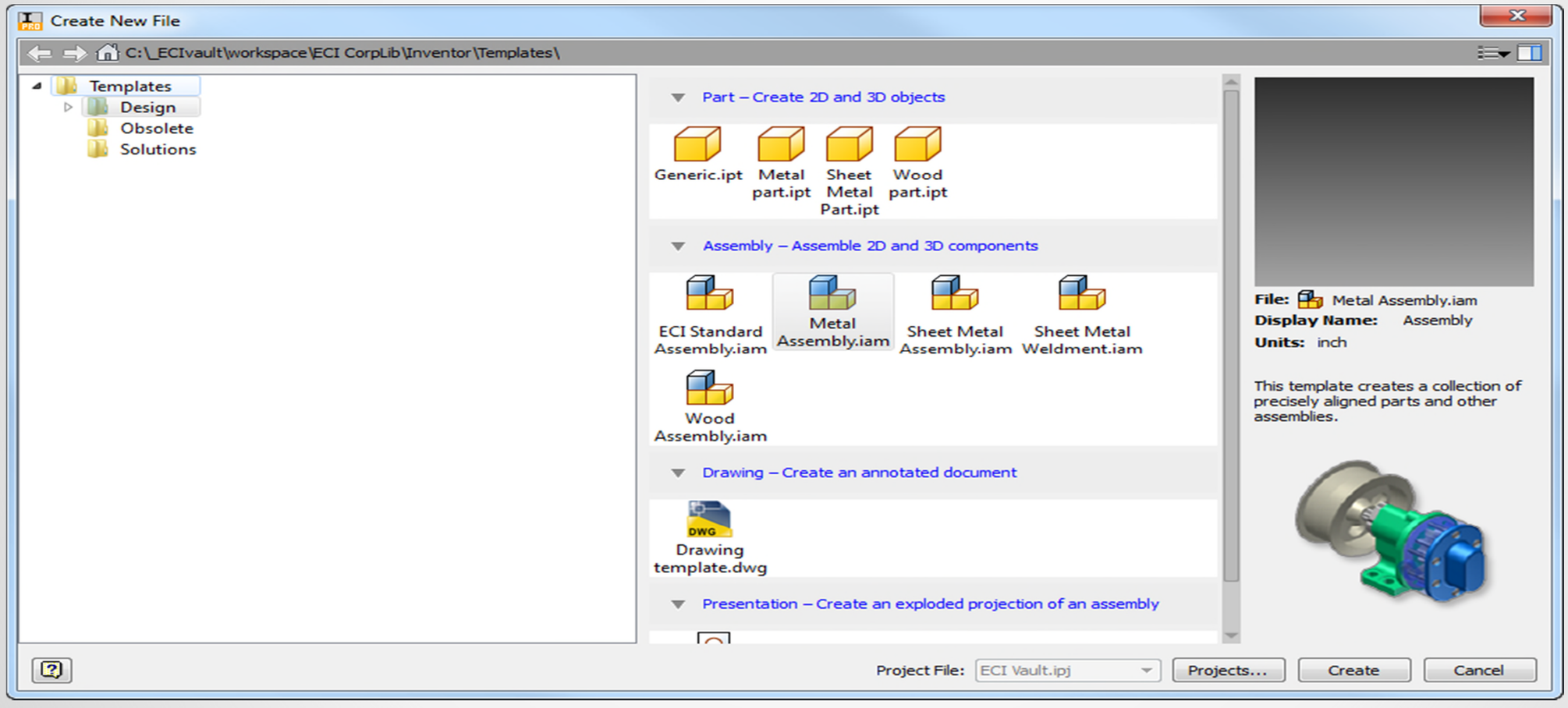
Creating Custom Templates

- Why?
  - Material selected by designer will match standard raw materials (as per ERP system)
  - Tools (punch profiles) will match existing manufacturing configurations
  - Custom Vault Buyout libraries – synchronized with ERP system

- Benefits;
  - Added information is key for developing interfaces with other areas of the process.
  - Once the templates are designed, process is seamless to designers.
  - Forces all designers to follow same process.
  - Design (no matter how custom) is in sync with ERP system

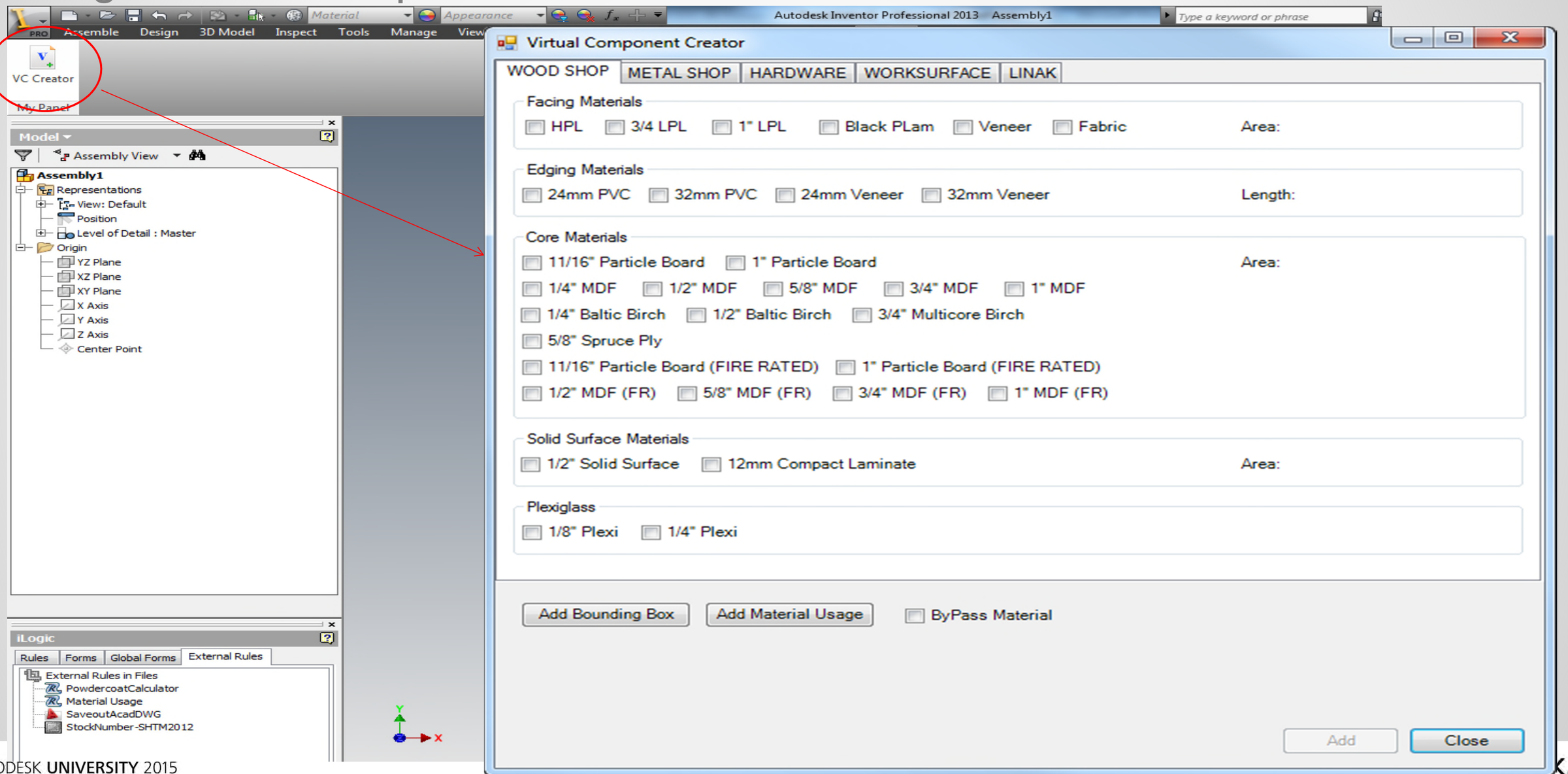
Leveraging Inventor & Vault – Product Design

Creating Custom Templates



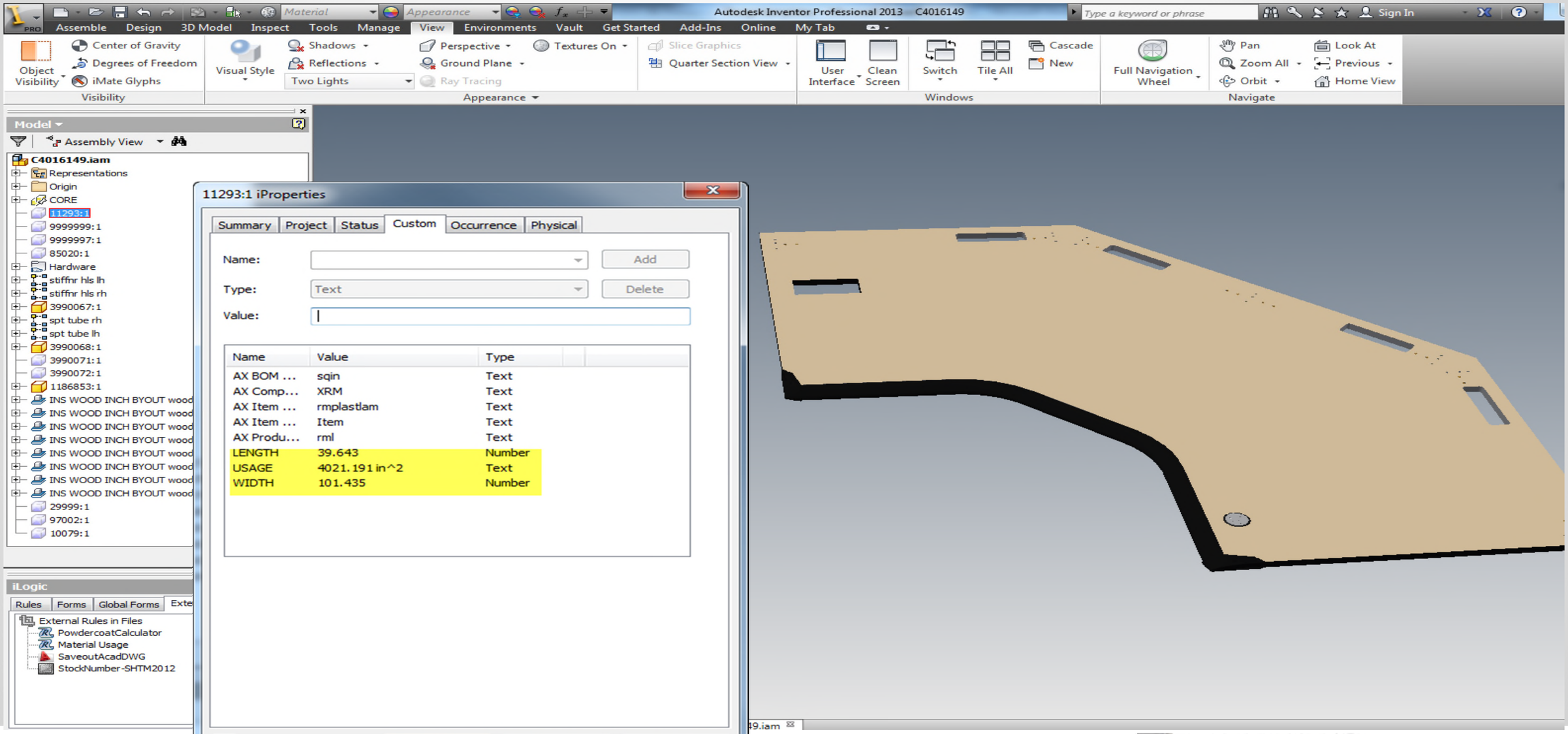
Leveraging Inventor & Vault – Product Design

Creating Custom Templates



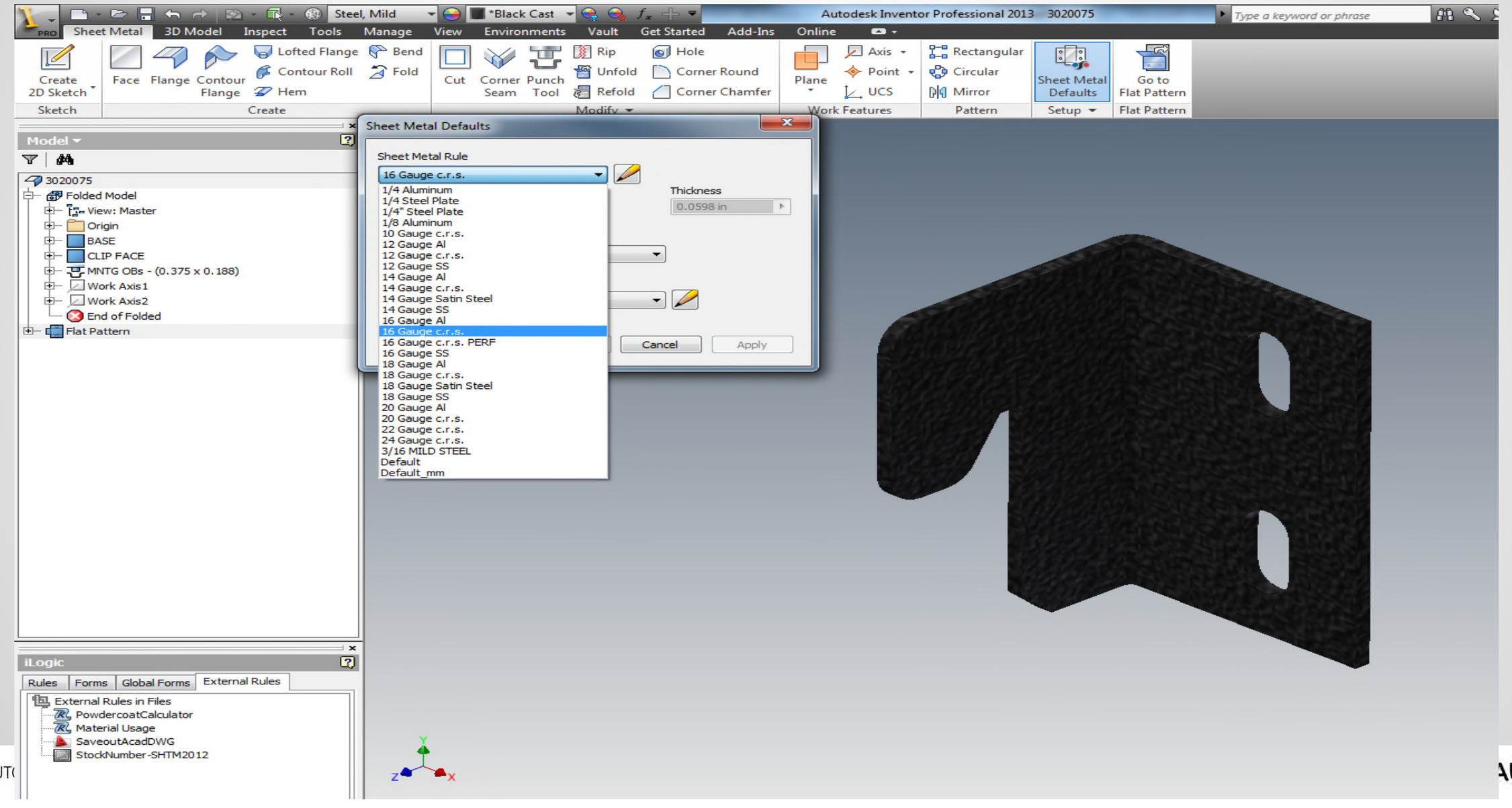
Leveraging Inventor & Vault – Product Design

Creating Custom Templates - Adding information to Model (materials and usage)



Leveraging Inventor & Vault – Product Design

Creating Custom Templates - Metal templates and i-logic rules



Leveraging Inventor & Vault – Product Design

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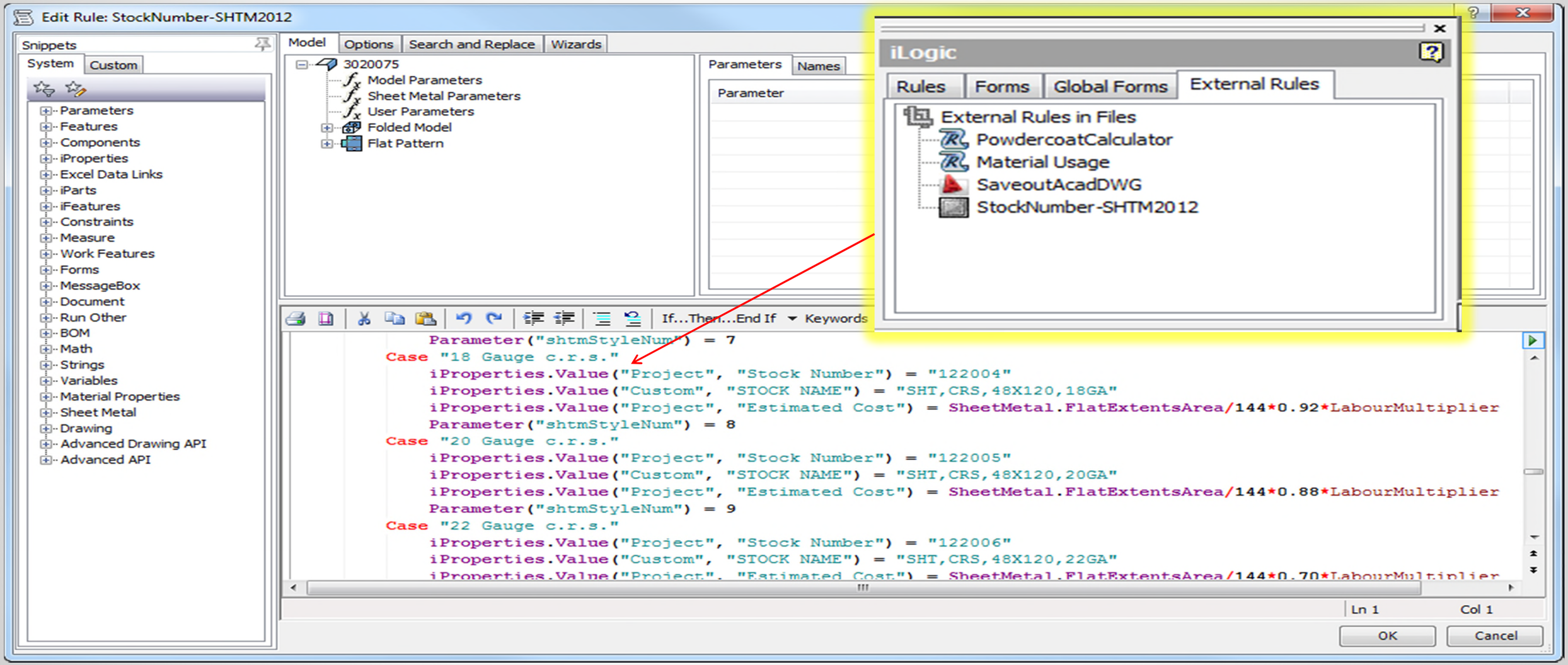
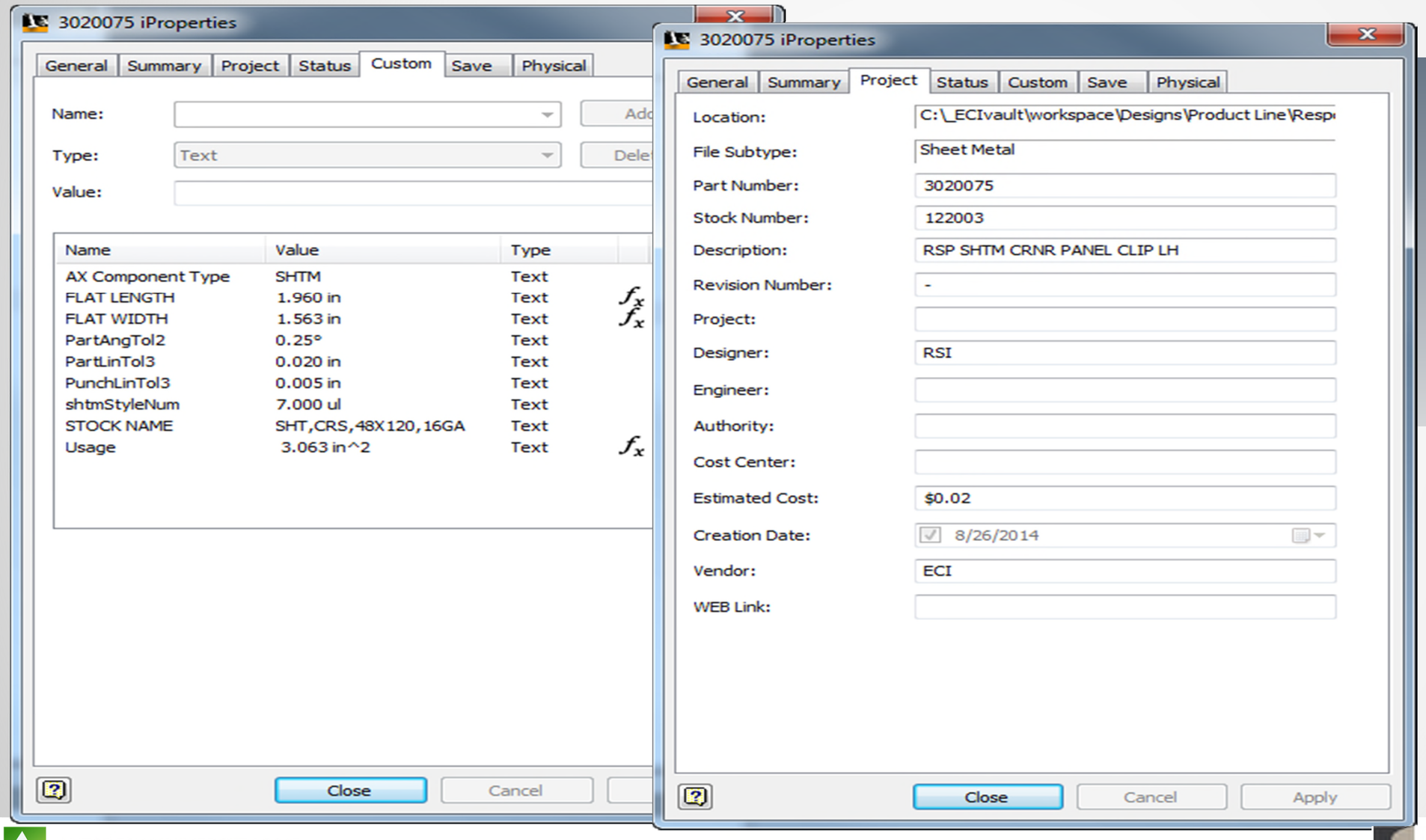


Leveraging Inventor & Vault – Product Design

Creating Custom Templates - Filling information into i-properties



Leveraging Inventor & Vault – Product Design

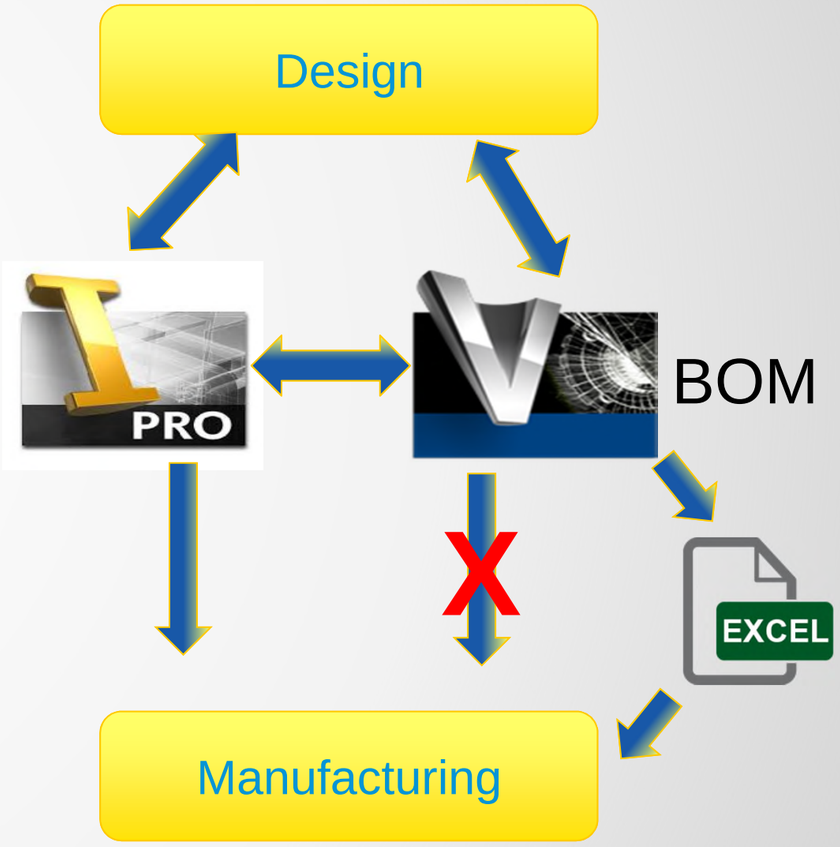
Agnostic Format Outputs

What are they?

- A format of outputs from design (Bill of Materials) that can be easily read throughout the organization (Excel File)

Why?

- Easier to share information across the organization
- Allows for easier manipulation of views – customized to functional area
- Does not require knowledge in navigating Vault/Inventor (Manufacturing, Procurement, Accounting, etc.)
- Easier to maintain/manipulate



Leveraging Inventor & Vault – Design

Major advantages;

- Significantly reduced design times;
  - Custom projects – 60%
  - Parametric – 80%
  - Standard – 20%

- Once model is complete; BOM generated automatically
  - Eliminates human error
  - Design originated revisions reduced by 60%
  - BoM quantity revisions reduced by 90%

- Output package greatly simplified;

Leveraging Inventor & Vault – Manufacturing

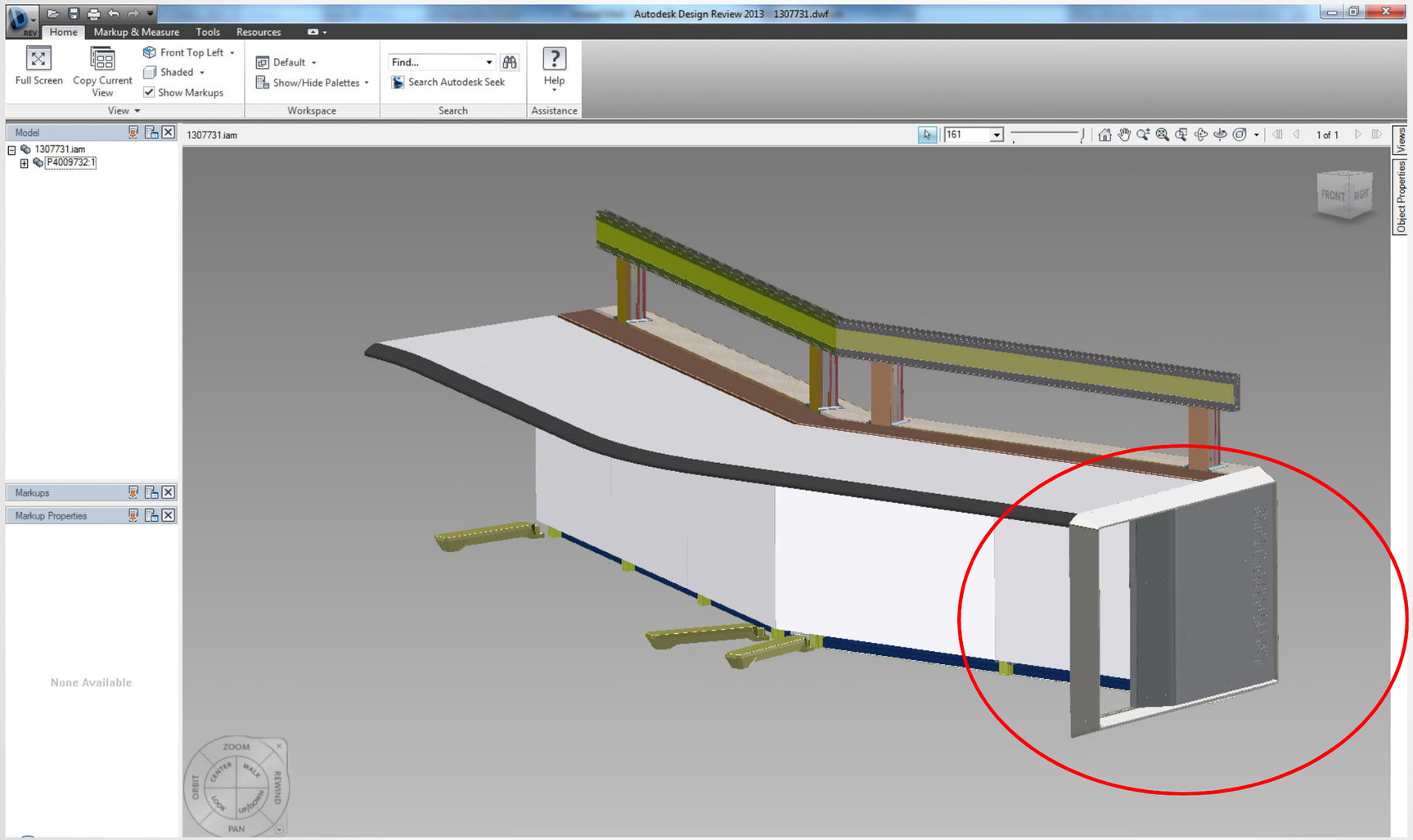
New communication approach

- Utilize “standard” Inventor & Vault Outputs
  - Drawings
  - CAD-CAM outputs; MasterCAM, Radan (Metal, wood)

- Creating automated outputs;
  - Visually based searches
  - Simplifying viewing assemblies
  - Custom part routing
  - Creation of automated hardware/buyout kits

Leveraging Inventor & Vault – Manufacturing

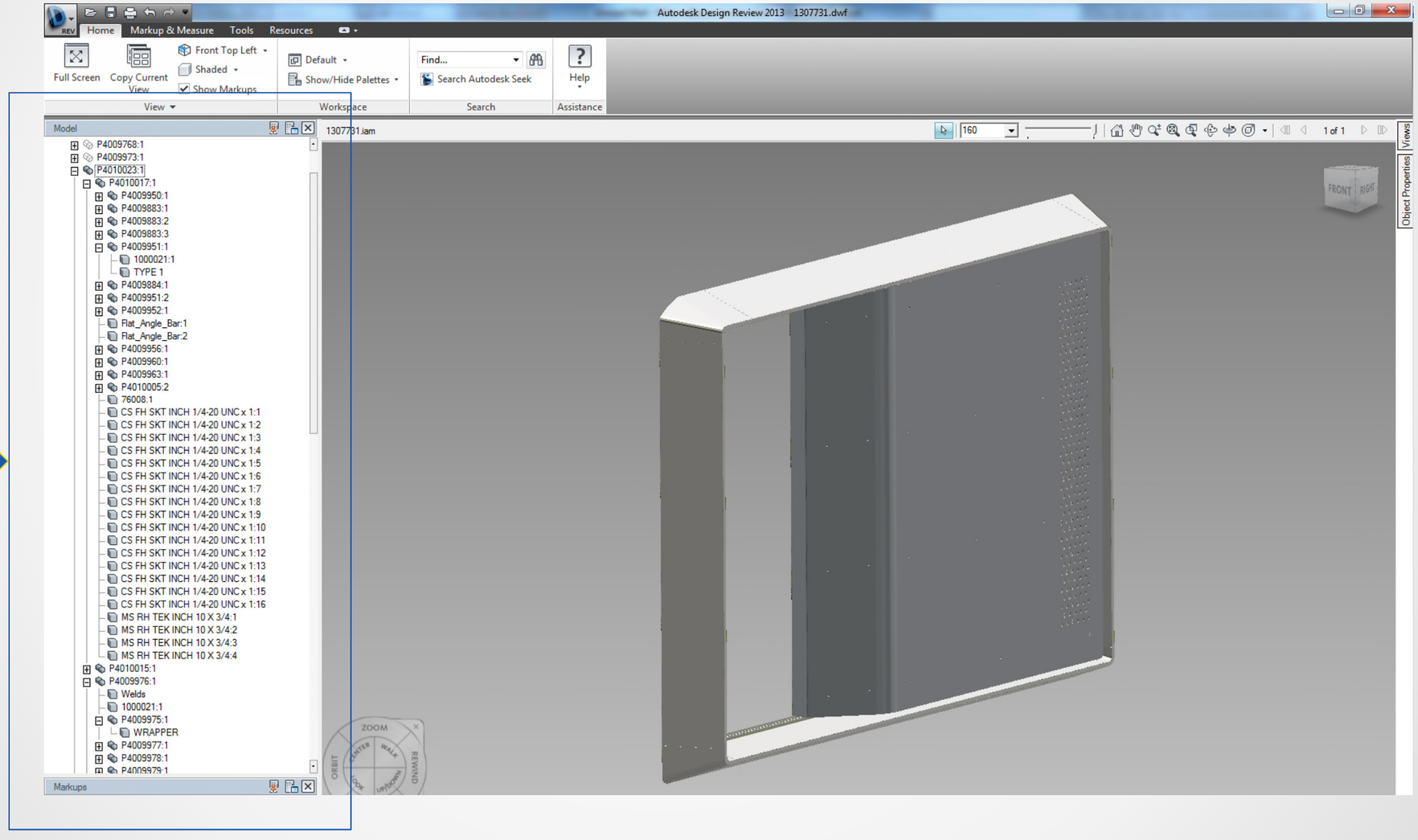
DWF Viewer



Leveraging Inventor & Vault – Manufacturing

DWF Viewer

Sub Assembly BoM



Leveraging Inventor & Vault – Manufacturing

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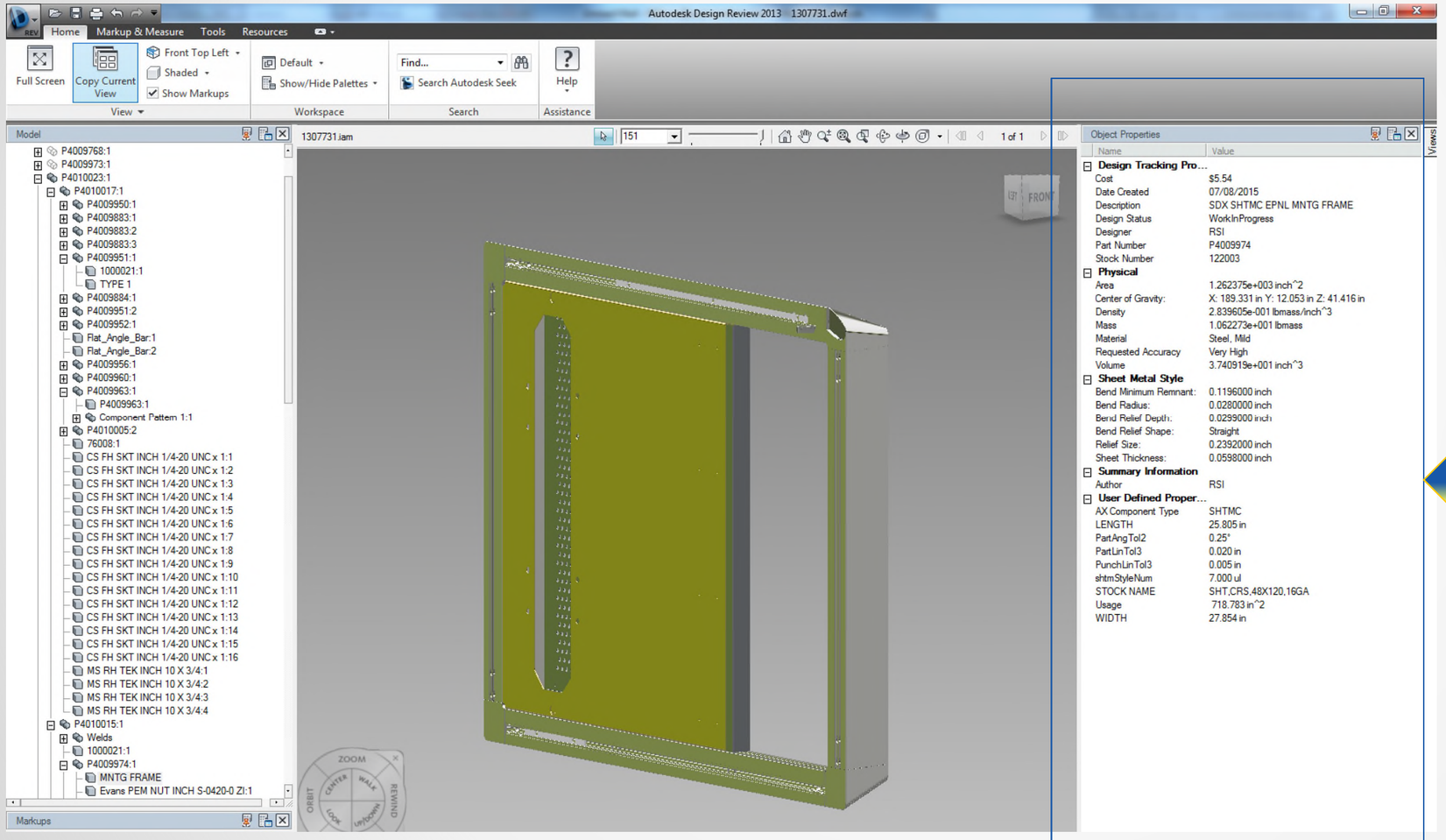


Part Specific Information

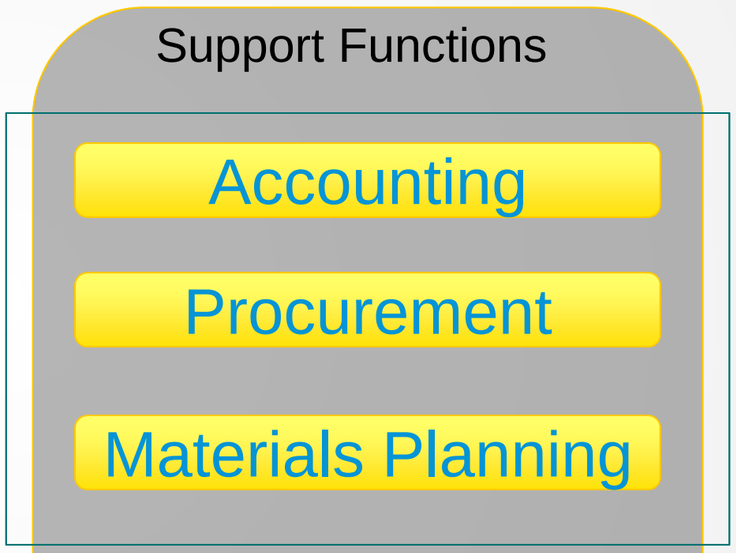
Leveraging Inventor & Vault – Manufacturing

Major advantages;

- Eliminates need for paper (80%);
  - CNC fed directly form Vault
  - Assembly drawings not required (DWF Viewer)
  - Part flow uses custom routing (Excel)
- Paper copies printed on demand;
  - Highly custom assemblies
  - QC checks/auditing
- Significantly easier to train new staff
- Less errors/revisions

Phase II: ERP System Automation

3D Implementation Phase II – Support Functions



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Strategic Challenges/Limitations - Refresh

Accounting

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- Key strategic issues;
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- Key strategic issues:
  - Long inventory cycles
  - Human error – disconnect between Procurement & Design
  - Difficult to coordinate global sourcing
  - Increased expediting costs

Quick Facts on Cost Accounting

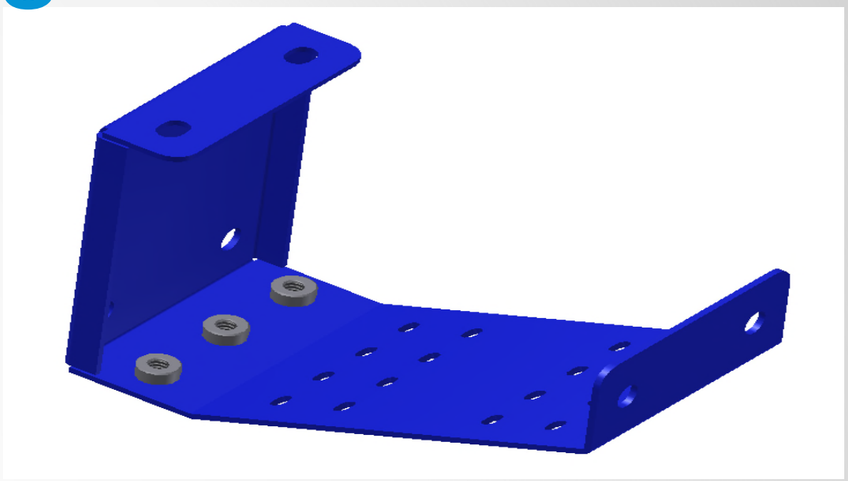
- Very Difficult to do in a highly customized Business…
- All components must be entered into ERP system.
- We do 90 projects/month, approximately 40-50% custom components.
- Each part needs size, ERP part number (for Raw material), stock number etc…
- Must be done at the design stage (most Valuable Resource!)
- We tried it! Increased lead times by 50-75%!

"I think I can get us a tax credit if we start cooking the books with solar heat."

Quick Facts on Cost Accounting

Elements of a basic component:

Cost Accounting Requirements



Overall Part Number → Overall Qty. for Project

Raw Material Part Number → Overall Qty. for Part, Overall Qty. for Project

Powdercoat (Finish) Part Number → Overall Qty. for Part, Overall Qty. for Project

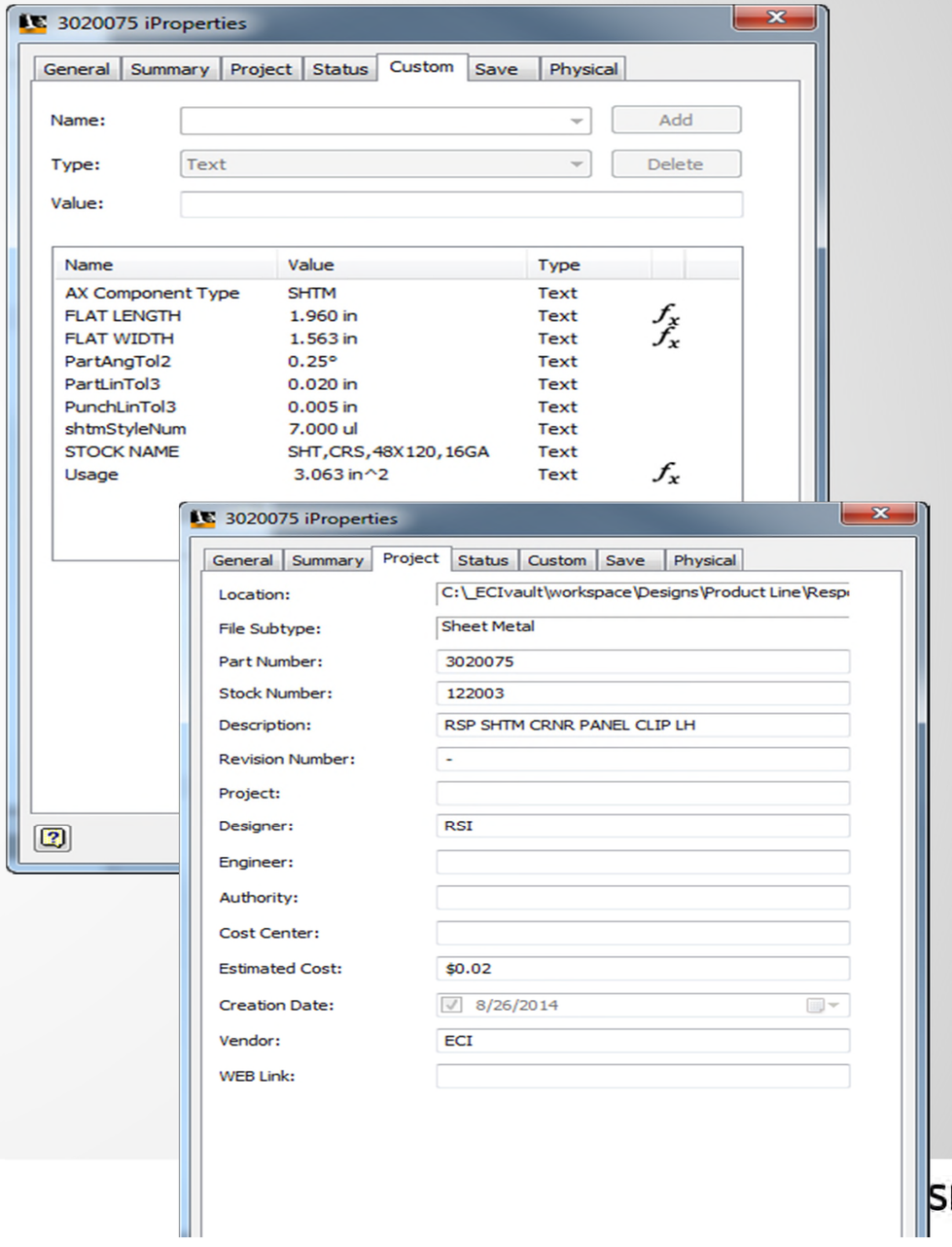
Hardware Part Number → Overall Qty. for Part, Overall Qty. for Project

Very Manual, Time Consuming and Error Prone!

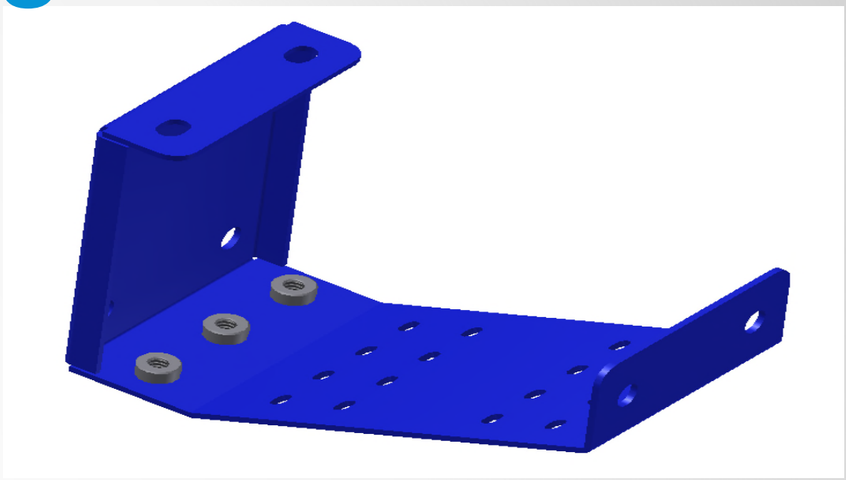
Information relevant for Accounting, Procurement, Materials Management

Quick Facts on Cost Accounting

- Recall, new Design templates allow for real time capture of all raw material and buyout information
- All of the information is populated automatically
- The Excel BOM consolidates all of the information to a project level (multiple assemblies)



Quick Facts on Cost Accounting



Elements of a basic component:

Cost Accounting Requirements

Overall Part Number → Overall Qty. for Project

Raw Material Part Number → Overall Qty. for Part
Overall Qty. for Project

Powdercoat (Finish) Part Number → Overall Qty. for Part
Overall Qty. for Project

Hardware Part Number → Overall Qty. for Part
Overall Qty. for Project

AUTOMATIC

3D Implementation Phase II – Support Functions

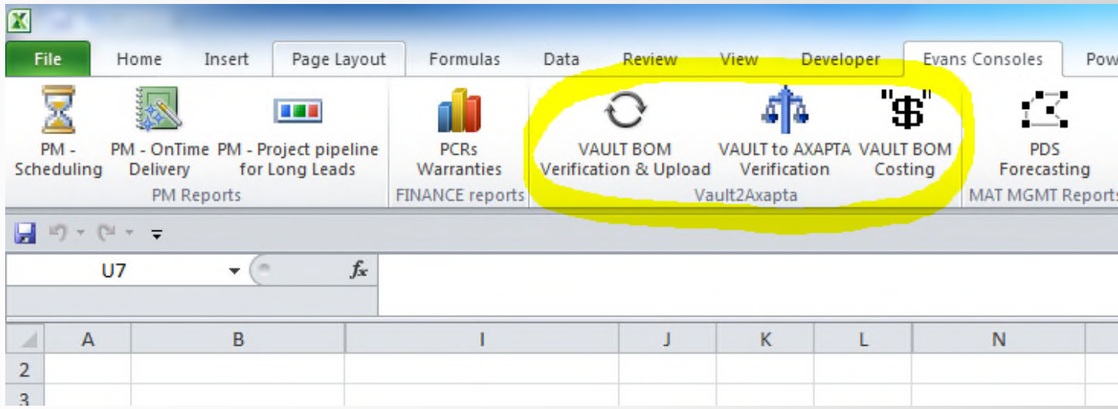
- Accounting/Procurement/Materials Planning can now use the new BoM format to automatically generate project information

- Vault and ERP system are synchronized to have same raw material and buyout information

- All pricing is still controlled within the ERP system so it is updated in real time

- Any product design, regardless of customization level, can be priced instantly.

- If a change is made in the ERP system (discontinued part), BOM will be flagged automatically.



3D Implementation Phase II – Support Functions

Major advantages;

Accounting

- Instant and accurate project costing
- Month end consolidation significantly simplified
  - WIP breakout can be done using completion BoM's
  - Direct vs. indirect material breakdown
  - Project profitability can be done pre & post sale

Procurement/Materials Planning

- Long lead items can be ordered prior to design start
- All VMI items can be tracked accurately; stock replenishment triggered automatically.
- Custom hardware and buyout BoM's can be created for any point in production (hardware on demand)

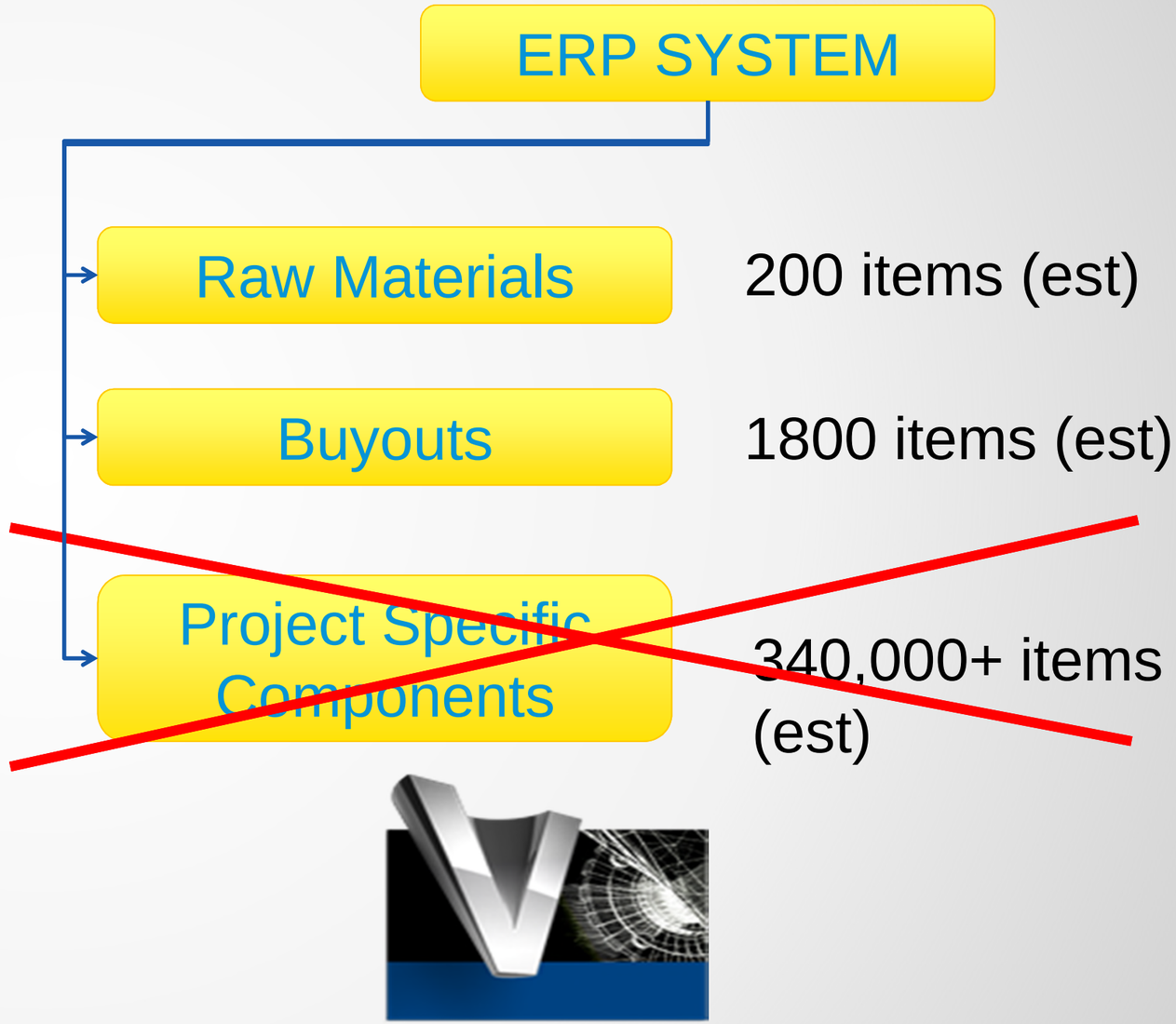
3D Implementation Phase II – Impact on ERP System

ERP System Pre Phase II

- Active Database of 350 000 items
- Significant customization od Design/Manufacturing interface (BoM)
- Average Upgrade Cost: $ 400k – 500k
- Upgrade Cycle Time – 8-12 months

ERP System Post Phase II

- Active Database of 2000 Items
- No customization required
  - Design/Manufacturing no longer use ERP BoM
- Average Upgrade Cost: Covered under subscription
- Upgrade Cycle Time – 1 month



Phase III: What We Are Working On

What we are working on – Phase III

Automating Transition from Proposals/SNAP direct to manufacturing

- SNAP/Proposals group use different models from Design

- Design level models too large to be effective as a proposal tool

- Previous attempts to use same model unsuccessful;
  - Shrink-wrap
  - LOD modelling

- Out of the box approach needed…

Sales/Proposals Level Model (SNAP)

UI

ETO

.IKP

Inventor

Model

Drawing Package

Renderings & Videos

Design Level Model

.IKP

ETO

Vault

Inventor

Pricing DB (ERP)

Pricing

Manufacturing Output

What we are working on – Phase III

Proposal Vault Life Cycles

- Not what you would expect!
- Vault life cycles typically used for managing parts from design to manufacturing;
  - Revision Control
  - Updates
  - Communication on key issues
- Allows for users to create product states;
  - Released
  - On-Hold
  - Revised
  - Revision pending
  - Etc…

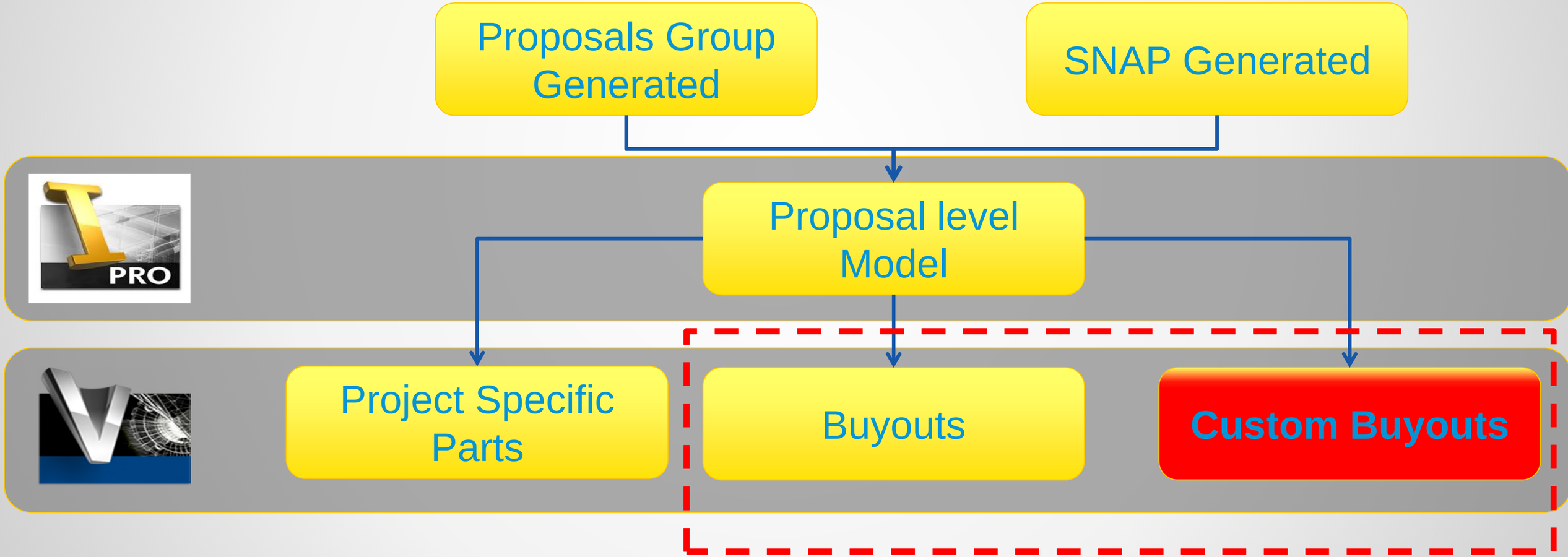
Question:
So why create product life cycles in the proposals group?

Answer:
To create an advanced forecasting tool, of course!

What we are working on – Phase III

Proposal Vault Life Cycles

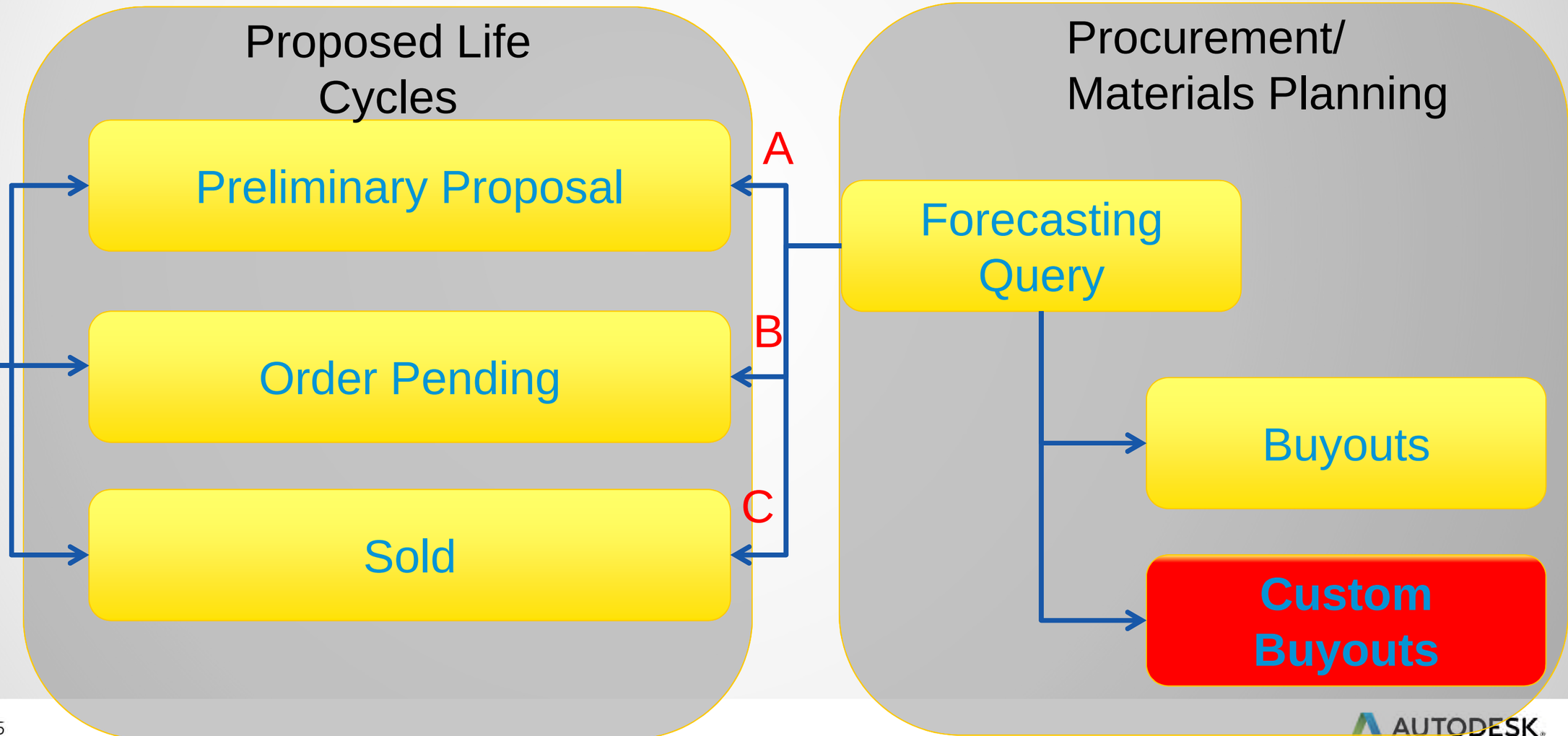
- All proposals saved as assemblies in Vault under specific project #



What we are working on – Phase III

Proposal Vault Life Cycles

- Use Vault Life Cycles to Create project level states;



What we are working on – Phase III

Proposal Vault Life Cycles – Anticipated advantages

- Advanced visibility of incoming demand
- More time to effectively procure/prepare buyouts (Reduce expediting costs)
- Ability to better manage blanket PO's
- Provide real time data for our VMI partners
- Increase lead time window;
  - Utilize global sourcing
  - Reduce shipping costs
- Early visibility of custom components
  - Understand part versus qty. costs
  - Understand/communicate lead times to customer
- Reduce on hand inventory; increase inventory cycles.

What we are working on – Phase III

Revit Integration

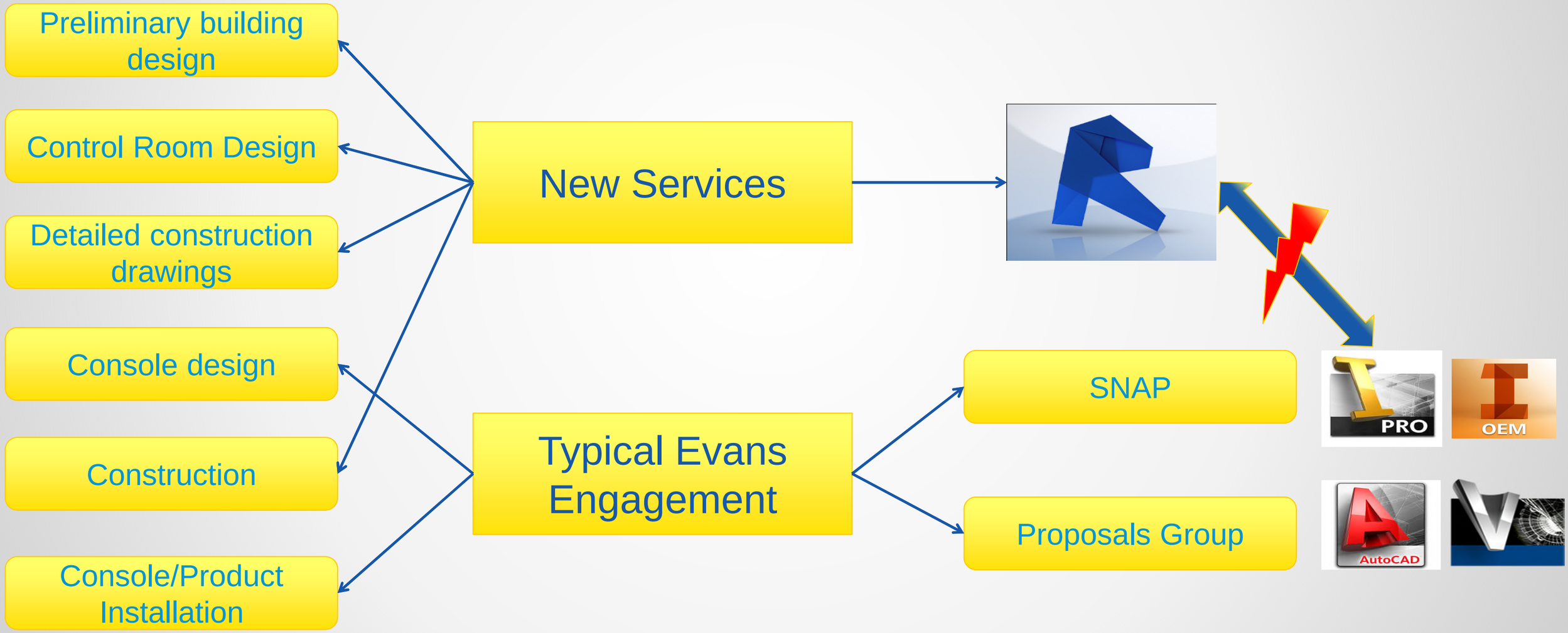
- Business model progressed from Manufacturing only to a full Design and Construction Services model (Turn-Key)

- This has introduced Revit into the mix
  - Architectural design
  - Construction design
  - Lighting studies
  - Acoustic studies
  - BIM Integration

- Challenge is to be fully integrated across the board…

What we are working on – Phase III

Revit Integration – Change in project lifecycle



Closing Comments…

- Technology and applications available today have tremendous potential to transform your business….they are just not available out of the box
- Looking at innovative uses of existing software can be game changing
- Ask the question; “Why are we here as a business?”
- Leave your technical bubble; look at ways of inclusion across the organization by addressing needs
- Think of all the future users
- It may be overwhelming…but it is a systematic process
- Long term commitment…may not happen overnight, but can be well worthwhile

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