



## 3D Model-Centric Processes in Standards-Based Ecosystems

Lean design, development, and manufacturing processes, utilize baseline solid model libraries to enable the rapid-fire delivery of new products within the PICMG standard architectures. In addition, the products delivered from this efficient, model-centric approach are consistently accurate, of higher quality, and reflective of creative collaboration.

A report from Boston's Aberdeen Group indicates that the design world is still 85% dependent on 2-Dimensional design documentation. Looking back at the introduction and adoption of design software packages that surfaced during the 1980's and 1990's, it seemed there was always a new platform or version emerging. Each promised a more feature-rich set of capabilities, and with each version announced, there were more extensive, integrated development tools. Large companies, committed to maintaining pace with the cutting edge of design processes, were wooed by the sweet sell of software sales engineers, touting the capabilities of their most recent versions. These corporate early adopters were the pioneers whose currency continued to drive us forward. However, throughout the 1990's the staple of most designs remained the 2D drawing using .dxf and .igs files.

We have come a long way since then. With the continual migration of ProE through the late 1980's, and the introduction of Solidworks (1993) and Autodesk's Inventor (1999), we now enjoy the benefits of model-centric design with rapid prototyping, shorter tooling cycles, lean manufacturing, and universal communication. It seems odd that in the background, the old system file types still permeate the product development cycle in many areas given the huge benefits currently available with solid modeling.

Keeping this in mind, how do the mechanical standards of the communications ecosystem benefit from the model-centric



infrastructure available today? The answer is “More than you would probably imagine.” The PICMG specifications, ATCA and its offspring, AdvancedMC and MicroTCA, as well as CompactPCI have provided an architectural bridge to a sound mechanical fabrication philosophy. This has allowed manufacturers of various components, faceplates, module assemblies, and chassis mechanics, to construct extensive baseline solid model libraries, sharing these with customers for either drop-in design use or for collaborative customization.

In addition, the baseline library is a dynamic set of models, morphing with the natural evolution of the standards, and at the same time providing rapid, often instantaneous, customer applications support. At its core, the 3D model has the capability to produce associative assembly and dimensioned reference drawings, files for rapid prototyping, machining processes, and QA inspection programming.

During the periodic belt-tightening of corporate engineering staffs, often it is the resident mechanical engineering function that is sacrificed, to be eliminated or outsourced. Internal libraries and accumulated knowledge bases risk erosion through the reduction of engineering staff. Loss of continuity can also result from mergers, acquisitions and their aftershocks.

With a fully documented supplier/partner, maintaining a stable library of the specification base models and customer specific models, an uninitiated new hire or an outsourced design service can be quickly updated by the applications support of the supplier. Brief online meetings, now requiring only a couple of minutes of setup, offer the opportunity to consult with a customer at any location, most often viewing and manipulating 3D models. These meeting tools foster a rapid understanding of the design details and processes in a global environment and consistently prove efficient and effective.

Backtracking a bit, we now see a manufacturer with:

- Applications Engineering support

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- An extensive solid model library of the common components used in a customer designed baseline assembly.
- A solid model library of the customer's purchased product range.

Combine these resources with a manufacturing philosophy which is also model-centric. In the ideal operation, each component of a customer's mechanical product assembly is tracked in real time through the supplier's MIS system. The customer's released model must be the centric element to the manufacturing process. The imbedded standard elements of the baseline models enable the manufacturer to directly develop universal fixturing and to program all automated fabrication operations. The same model would have been converted to the file type needed in QA for automated coordinate measuring, ensuring timely processing of first article and lot inspections. Model driven prototypes can be produced in a few days using production processes and assembly resources.

In addition to the 3D model, the online files in the enterprise wide information system contain live links to customer documents, artwork requirements, factory routings, finish specifications, and drill down linkages to the documentation for every element in the BOM. In the event that an outside contractor is required to produce a custom component, they receive email RFQ's with one or more embedded ftp links to seamlessly download the relevant model and finish requirements.

## **How does the model-centric manufacturer service a varying range of customers?**

### **Four Scenarios**



- Customers with mechanical engineering support staff and well versed in the standards can construct and submit complete models with their RFQs.

The manufacturer's engineering services group will quickly overlay the customer submitted model(s) with the baseline library model(s) and spot any deviations that might be problematic. The customer benefits from an immediate external check on essential common features. It is noted that any subtle deviations from the latest released specifications would be highlighted during this process.

- A customer has outsourced the engineering to someone still a bit unclear about the subtleties of the standard. A simple example might include preferred positions for LED's in an "area reserved for LED's".

From a quick phone call, email, or web download, a version of the solid base model (typically a .stp or step file which can be used in most/all 3D software packages) can be in customer's engineer's hands immediately. Questions are minimized, explanations explored, and extraneous errors eliminated up front.

- A customer has no dedicated mechanical engineering but wants to design their product into one or more of the xTCA standards.

Again, using solid baseline models, the customer's technical resources are engaged by an applications engineer in an online session. Perhaps a set of circuit board files is exchanged, along with some component specifications from which 3D models can be downloaded. The delivery of a first cut model serves to give the customer confidence in their ability to proceed with the development of the product. It also generates a corresponding confidence in the manufacturer's sincerity and interest in their business, the capability to add value, and a sense of technical partnership. Saving even one re-spin of a circuit board means a leaner process has been achieved.



- Lastly there are the customers who have demonstrated a quest for novel execution of a broader-based specification in order to create a unique solution. Using the base models and close collaboration with applications support from the manufacturer, this joint development activity results in rapid enrichment of the ecosystem, by bringing a new, unique product to fruition while still coloring inside “most” of the lines,

The willingness to provide these collaborations has a couple of significant effects.

- First, the customers are given educated encouragement that their idea has merit, is apparently unique, and importantly, can be accomplished.
- Second, the enrichment of novel designs reaching the marketplace encourages others to follow, ask questions, and seek solutions. The customized standard is good business and raises an OEM’s technical stature.

And it’s all easier to pull off in a model-centric environment, one .step at a time.

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The XTech base model PICMG standards library currently contains more than 100 solid model assemblies and 700 individual base components.

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