CAD Translation Comment.

There is an ancient proverb that says "to know where you are, and to know where you are going, first look at where you have come from". Actually, there's no such proverb, but there should be. Knowing about the past and knowing where we are at the present are vital ingredients in forming opinions about the future. This can be applied to just about anything, even that apparently deeply technical world of CAD data translation.

The recent past is one of considerable change and a great deal of development. In CAD systems, 3D solids are now the norm, almost to the extent where people are beginning to realise that they are not the answer to every design application. Sometimes designers just want to be able to work with surfaces, or work with surfaces that are a part of a combination of many entity types. Niche surface design applications are now well developed, and a small number of entry level hybrid modelling systems have gained good acceptance.

Design methods have also changed. There is much more assembly based design where once designers would work on discreet components. Now designers often work in teams, where once it was not possible, and the tools at their disposal allow different types of design, working with parameters, features, constraints and other techniques that simply were not available just a few short years ago. The result has been different kinds of geometry, being used for different purposes. At one time the drawing was the master, the 3D model followed and now digital mock up is becoming more important.

There has also been significant movement in CAD companies themselves. At the top end, the world that we now call PLM, there has been a reduction in the number of competing companies. Three companies are joined in the battle of the giants. Perhaps, where data translation is concerned it is significant that one of these uses a widely available modelling kernel and the other is based on a proprietary format and the third is seeking to establish its own kernel amongst the standards. From a users point of view, the field may have narrowed, but all three options are hugely capable.

Below the battle of the giants, and above the plethora of 2D solutions ACIS and Parasolid based systems proliferate, many of them widely distributed in the supply chains of the OEMs using PLM level systems.

So that's where we have been, and this is where we are. The world of engineering, design and manufacturing is still a wide mix of different systems, and there are no signs to suggest that this situation will change.

Trading patterns have changed over recent years, and this too has had an impact on the need for exchange of data between CAD systems (or PLM systems if you wish). The products produced by those who work with sophisticated design systems are generally complex mechanical assemblies, with aerospace, automotive and white goods being responsible for by far the largest portion. These markets are characterised by fierce competition, the quest for improved product in ever decreasing design cycles and one of the most recent trends, globalisation. All of these factors, though perhaps in new guises still adhere to the design and manufacturing goals of reducing cost, improving quality and reducing time to market.

Inside this whirlwind of activity, almost at the level of background noise, there is still the call from engineers across the world for improved CAD data translation. What is going on that will help

them? What are their options? How do they make the right choices? What can they do to ensure that they select the right CAD data translation for their needs?

The translation systems available align themselves in a sort of beauty contest each calling out to those who need them "I'm the one for you - pick me!"

Despite the apparent complexity, there is a way of reducing the risk of getting it wrong. In some respects, it is not too different from making any decision that has serious implications.

The starting point is to identify the basis of decision criteria. That is, to identify each item that is going to be considered as part of reaching a decision. Normally, these questions, or something like them creates a checklist that gives a feeling of comfort that the decision is being made on a sound footing:

- Can I afford it?
- Is it easy to use?
- Will it do the job?
- Will it run in our CAD environment?
- Will I be supported?

However, within this list is a trap that will catch the unwary. “Will it do the job?” The trap is to start the process of reviewing the decision criteria without first fully defining the job! The best decision on which translator to use will be reached by having a clear understanding on the use of the translated data. The use of the translated data should be the primary driver in deciding which translator to use.

Whereas in time gone by we would think about translation simply to re-create a 2D drawing, now there are dozens of uses of CAD models, and many ways of translating. In manufacturing, we might think about tool path generation, or off-line programming of 3D co-ordinate measurement machines, or maybe the creation of rapid prototypes. Each of these different usages may best served by different types of translation.

Consider the workplace where the designers use a solid modeller to define a product. Their manufacturing department use a different 3D design system to define tool paths for CNC machining. Tool paths work on surfaces, and so solid translation may not necessary, but perhaps the CMM equipment uses one of the standard modelling kernels and requires a solid. Rapid prototyping, even though it is one of the latest technologies, works with a tessellated representation of the data, and doesn't actually need surfaces or solids that might be essential to another user.

Data translation requirement for Finite Element Analysis is equally misleading. The complexity and mystery surrounding software that examines a mold and shows where the runners and risers should be, or shows cold spots, implies that nothing but the most accurate translation is acceptable, but this is not the case. Compared to the accuracy in the design system, the accuracy required for finite element analysis is coarse. A good approximation would be fine, provided that the volumes are completely enclosed, and sometimes even this isn't a necessity.

What about the people in the wider business areas such as administration and purchasing? Do they want the full model definition as created in the design office? Do they require all the weight of a fifty or sixty megabyte model in their SAP system? No they don't, they need something that will enable visualisation, clash detection perhaps, and maybe the ability to "red line". There are translators that provide just that with accurate "light-weight" models.

Does the company in the supply chain want to send out fully defined 3D representations, including history trees, parameters and constraints, and in so doing parting with key intellectual property? Food for thought! Even in these circumstances where the recipient might say they want full Feature and History translated parts are they entitled to modify the geometry? What about version control? What about product liability? No, the vast majority of supply chain data

translation only requires explicit geometry, but the temptation is still to get drawn into the beauty contest, making comparison of features that either are not necessary or could be positively harmful.

Feature and History translation has now found its niche. It can be very helpful where design departments have more than one CAD system, and translation can be used for resource balancing, or possibly used when organisations migrate from one CAD system to another. However it has been found to not be the "silver bullet" it was once thought to be.

Five years ago who would have thought that a great deal of supply chain CAD interoperability could be solved with a fairly simple solution that combines visualisation with explicit geometry? A completely different philosophy to the complexity of Feature and History translation, and yet despite such simplicity, providing significant business benefit.

Things have moved on and there are not only more CAD translators now, but there are also different types. There is a place for each of the different types of CAD translator and the challenge is for the user to make the right decision. The best way to do this is to ask early in the decision making process "What do I want to do with the CAD data once it has been translated"? Not asking this question, or not attributing the right significance to the answer is the root of poor decison making.

Armed with the correct answer and with the right weighting against it, the decision maker is well placed to select the right translation strategy for the business needs. In this way, the fundamental objectives of reducing cost, improving quality and reducing time to market are most likely to be satisfied.

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