Reuse Series, Mike Upah, August 2018

Encouragement Isn't Enough to Drive Part Reuse

Part reuse seems like an obvious win-win scenario..., after all, who doesn't want their company to save thousands or even tens-of-thousands of dollars each time it avoids putting a redundant part into production? But making part reuse a fixture of company culture is much harder to achieve than it seems.

The friction is primarily due to part reuse initiatives being out of sync with the instincts of most designers. Designer's like to design, and they often take pride in having their name attached to as many new models as possible over the course of their career. The result is a start-from-scratch mind-set that is difficult to tame.

Even when it's obvious that reuse options were ignored, designers and buyers have an easy excuse, pointing out that the PLM's search tools do a better job of hiding models in a forest of clutter, rather than spotlighting those with reuse potential. PLM search works great so long as a user already knows a filename or part number, but part reuse doesn't work that way. Instead, Part Reuse is fueled by a designer having easy access to data they are not already familiar with.

IT personnel, however, don't see cluttered or empty searches as a fault of the PLM. Instead, they see it as a problem of users' own making. From the IT perspective, if the designers and purchasers applied the company approved and correctly formatted attributes in the first place the models would be easy to find. No doubt..., if human error could be eliminated PLM search would be improved, but there are still the problems caused by logical synonyms, difficult to remember file-naming and part-numbering conventions, foreign languages and acquired data created under different standards.

All of these issues compromise the accuracy of attribute-based search schemes used by PLMs.

The alternative is parametric-based search, which uses measures like surface area, volume and moment of inertia as surrogates to represent the shape of a part. There is some logic, after all, that if two parts have identical surface area, then they might indeed be identical. The problem is that part reuse is not intended to find identical models, but instead to be able to find a range of models that are similar. With parametric methods, adding just a small tolerance to parametric values results in unwelcome clutter due to coincidental matches.

"Yet most engineering departments are still limited to out-of-date parametric search tools that produce either thousands of hits, or no hits at all. A typical part search would turn up as many as 2,000 hits, forcing frustrated engineers to simply design new parts from scratch."

Accelerating Innovation with New Data Strategies, tdwi.org

A designer's start-from-scratch instinct gets a little itchy whenever a search is empty or cluttered. Frustration quickly leads to abandoned searches, new models being designed from scratch, and a growing rate of duplication that affects the bottom line for years to come.

"What we realized is that we couldn't reuse what we couldn't find. [...] We don't need the ability to search something. We need the ability to find something."

Dana Nickerson, Whirlpool Corporation

BUILDING A CULTURE. There are two critical elements to creating a culture that consistently achieves model and part reuse. First..., designers and supply chain personnel have to be enabled with quality search tools that don't frustrate users with clutter or omissions. The best tools have the characteristics of being:

- **Accurate** Accuracy requires the simultaneous ability to control false positive clutter while still being comprehensive;
- **Universal** The ability to index CAD formats of all types, including native formats, neutral formats like STL, and also assemblies;
- **Flexible** The ability to provide a variety of useful and convenient search methods, i.e., you don't have to remember a filename or part number to start a search.

Without these characteristics a designer will quickly believe that it's more efficient to design a new part from scratch than it is to search the database. This is where geometry search has a tremendous advantage. Geometry-based methods are:

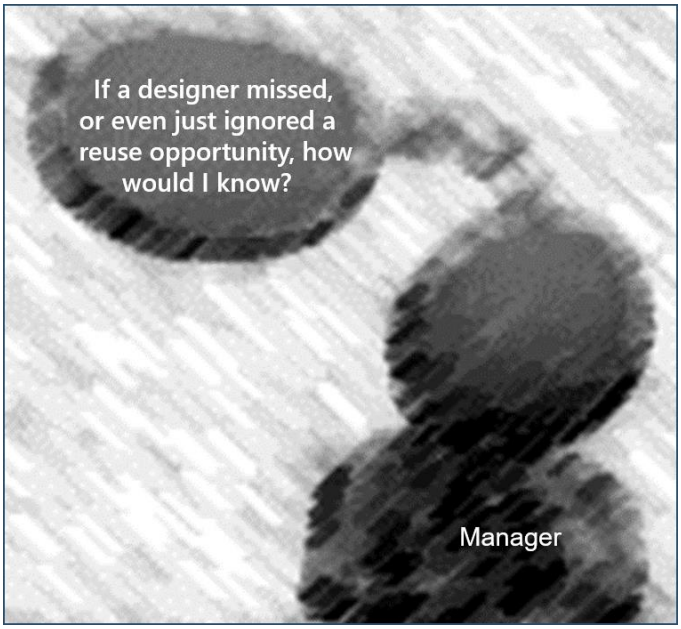
- **Comprehensive** All models have shape. Missing or erroneous attributes, unavailable parametric data and misaligned orientations, do not exclude a model from search, or coincidentally retrieve irrelevant models. The geometry is always available, doesn't rely on manual human effort, is unbiased, intuitive for new employees, and unaffected by native language or units of measure.
- **Accurate** Geometric methods operate across all facets of shape, rather than simplifying geometry to a description, or a couple of parametric values that only consider scale but not shape.
- **Universal** Tools that capture geometry are universal and work with proprietary formats, neutral formats like STL, assemblies, and even less structured data like 3D laser scans and point-cloud data.
- **Flexible** Geometric methods allow the classification of a database by shape, which automatically sorts models into groups of similar parts. This allows intuitive, visualized searching for more efficiency.

BUT OLD HABITS DIE HARD. Regardless of how good the search application is..., *search first* is a difficult mind-set to instill. Any process that disrupts the established workflow is challenging to ingrain.

Live-search is a search feature that overcomes this challenge by embedding the search process autonomously into design. A live-search feature monitors a CAD design in process and automatically performs a search for existing similar models as the design evolves. The automated awareness of similar models drives part reuse through awareness within the existing design process.

THE SECOND CRITICAL ELEMENT. When organizations adopt part reuse initiatives the responsibility for achieving part reuse goals falls to managers, but typically the only tools at their disposal are reminders and encouragement.

Managers are given responsibility for building a reuse culture but lack enabling tools to monitor reuse efforts.



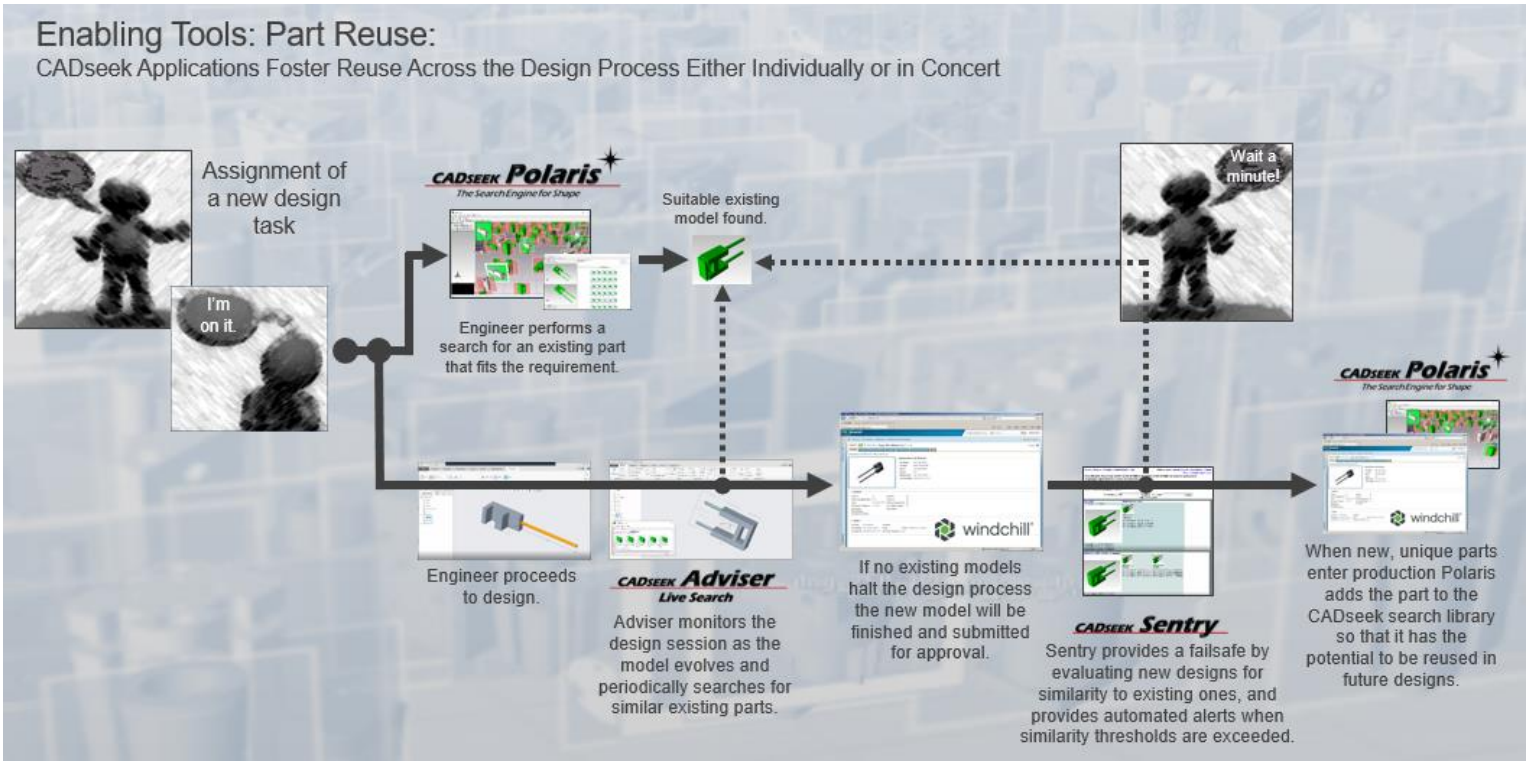
Search tools that have the ability to accurately determine the degree of similarity for any two models can be used to alert managers when any new model exceeds a similarity threshold to an existing model. Managers can then review whether a reuse opportunity might have been missed, not only adding automation, but also creating a basis for rewards, reminders or even reprimands.

Even when a reuse opportunity was missed and unnecessary time was spent on design, an analytics tools still provides value by allowing managers to intervene and avoid the unnecessary expenses that follow design including prototyping, qualification, manufacturing setup and inventory carrying costs.

CADSEEK applications span the design and purchasing process and enable a culture that drives model and part reuse:

- CADSEEK captures the full geometry of a CAD model at the same high resolution as the model itself, providing superior accuracy and flexibility for shape-based search, classification and analytics.
- Search before design is provided by CADSEEK Polaris allowing designers and supply chain personnel to visually browse and search one or more CAD datasets by shape with attribute-based filtering.

- Search during design is enabled by CADSEEK Adviser Live-Search. Adviser monitors a new design in process and automatically alerts a designer when a similar model already exists in the CAD database.
- CADSEEK Sentry is a management tool that provides weekly New Models reports for managers, listing all new models that exceed a similarity threshold for an existing model.



Collectively, CADSEEK applications provide designers, purchasers and managers the enabling tools needed to both drive and support a culture of reuse.