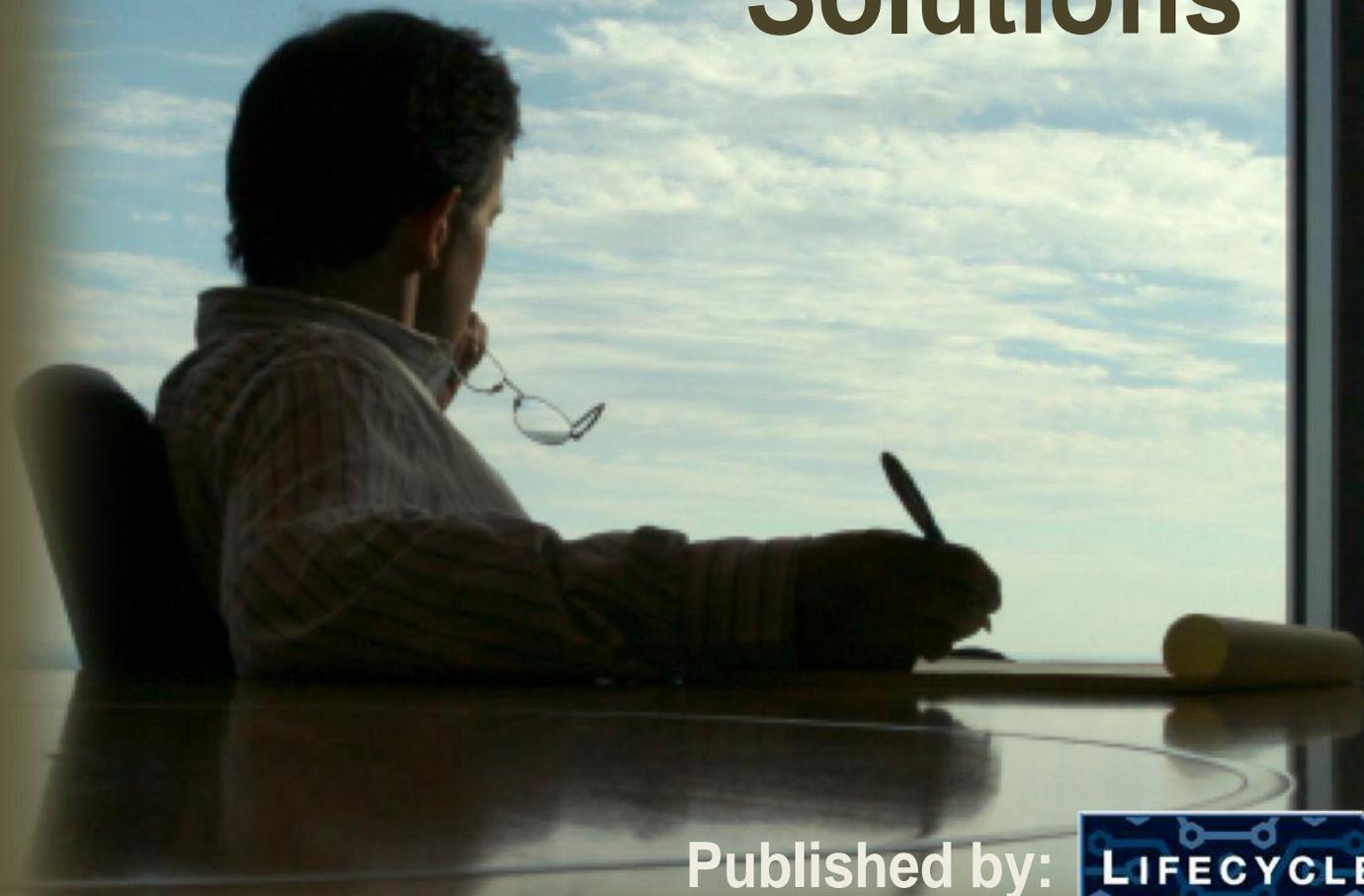


A Buyer's Guide to Concept Design Solutions



Published by:



Introduction

Good concept design is critical to the development cycle. But if that's so, why is it so dramatically *underserved*? Findings from the ***Trends in Concept Design*** study conducted in July 2011 show that a variety of ways are used to capture and mature concept designs: none of which are used by more than 27% of the study's respondents. What's that mean? None of them have delivered enough value to be deemed the standard means of developing concepts.

But times are changing. Over the past few years, the CAD industry has undergone a transformation. After all this time, there are actually specific solutions tailored for concept design. And that promise is providing some motivation and confidence within organizations to find a new solution to develop better concepts.

But there's the catch. *How exactly do you select a specific software solution and good partner?*

Answering that question in today's environment is no easy task. The sheer volume of marketing-speak in the CAD industry makes it difficult to tell truth from half-lies. Beyond that, the CAD industry is a very dynamic and changing landscape. But it's not a lost cause. There's a time-honored way to cut through the noise: build your list of selection criteria. The challenge of that is to educate yourself on new capabilities and determine which are most important to you.

That's where this eBook comes in. On the following pages you will find several categories of criteria to consider for your own list. You find an explanation of the capabilities as well as some rationale about why it should be included. So don't fret too much. Selecting a software solution and a good partner can be challenging but it is well within reach.



This eBook makes several references throughout to a survey-based study titled *Trends in Concept Design*. The study, conducted by PTC, includes responses from 214 individuals in product development organizations and was completed in July 2011. The full set of results is accessible at <http://www.ptc.com/go/concept-design>



Chad Jackson is the founding Industry Analyst for Lifecycle Insights and publisher of the blog engineering-matters.com. He investigates and writes about the issues that matter the most to engineering. He can be reached in Austin TX at (512) 284-8080 or chad.jackson@lifecycleinsights.com.



Subscribe or Follow



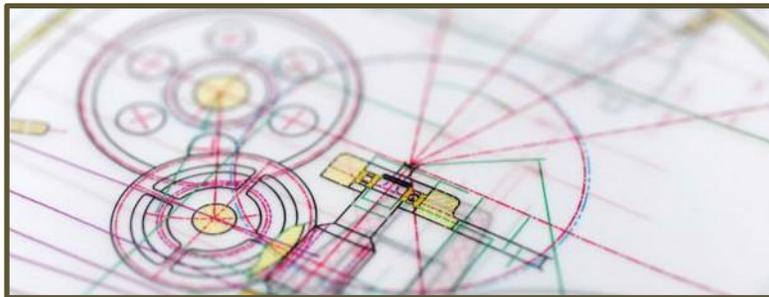
2

Underwritten in part by PTC, all concepts and ideas developed independently, © 2011 LC-Insights LLC

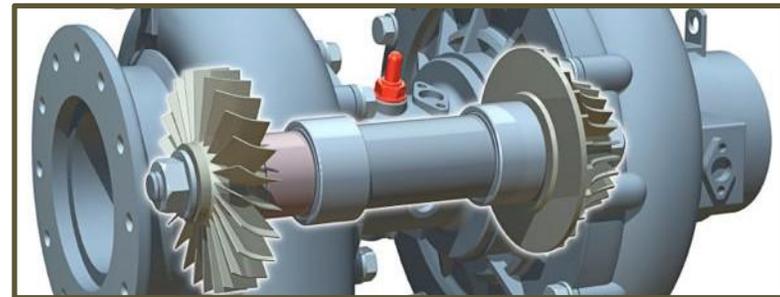
Capturing and Maturing Concepts

First and foremost, the solution you select should enable you to capture and mature concept designs. That's because concepts progress from quick and dirty representations to very high fidelity and detailed ones. Here are some details.

- ! **2D Sketching:** This functionality digitally emulates hand sketching on a napkin. It allows users to draw in a freeform manner using a stylus or a mouse without prismatic lines or arcs. It is frequently used to capture aesthetics in a quick and dirty manner so it can progress to a more 2D model.
- ! **2D Modeling:** This capability includes 2D drafting tools to create lines, arcs and the like to represent the traditional side, top, front or even cross section views. In comparison to 2D sketching, this representation can be fine tuned, measured and controlled with dimensions and parameters. From here, the concept can mature into a 3D model.



- ! **3D Direct Modeling:** Developing a 3D model for concepts has always been desirable. The problem has always been the skill and time required when using parametric feature-based approaches. In the new approach, users can use direct modeling to push, pull and drag geometry directly to approximate the concept they are trying to develop. It's a quick and easy way to make the transition without having to completely define every piece of geometry. And of course, a 3D representation leaves little room for ambiguity and interpretation.
- ! **3D Parametric Feature-Based Modeling:** Last but not least, there are scenarios where users want to explicitly control parts of the concept with dimensions and parameters. Also, they sometimes want to embed design intent and intelligence into the model as well. Parametric feature-based modeling lets users define that control or intelligence through features that use dimensions, parameters and relationships for change.



But it's not all about the capabilities to capture and mature concept designs. Interoperability within the concept design phase is critically important. Here's what to consider for functionality.

! Read and Use Multi-CAD 2D and 3D Data:

Findings from the *Trends in Concept Design* study show that 74% of respondents use existing designs when creating concept designs. They use this to develop front, side, top or cross section views in the 2D approach or as references for the 3D approach. It's important to do this with high fidelity so new concept designs are as accurate as possible.

! Interoperability between 2D Sketching, 2D Modeling and 3D Modeling: When you employ software applications that do not let you move from one representation to the next, then you have to recreate design data. And unfortunately, findings from the *Trends in Concept Design* study show that 59% of the respondents are doing exactly that. Seriously consider this capability when looking at software solutions.

For the *concept design cycle*, having the range of the four modeling capabilities to support the progression of a concept design is important. But interoperability between these modeling approaches provides a opportunity to eliminate the recreation of design data within the concept design cycle.

Percent (%) of Respondents that:	
Recreate part of the design data during the concept design stage because design tool formats aren't compatible	59%
Leverage existing designs when creating concept designs, rest start from scratch	74%



Supporting the Entire Design Cycle

Another set of considerations that should be taken into account is what happens *after* the concept design is finished. There is a range of activities, inside and outside engineering, which needs to be supported that include:

! **The Transition of Design Release:** Findings from the *Trends in Concept Design* study show that 61% of respondents recreate the concept design once it goes to the detailed design phase. That represents a huge investment in non-value add activities if the software applications used for concept design and detailed design are not interoperable.

! **Detailed Modeling and Engineering Drawings:** Before a design can be released, it must be documented in unambiguous detail. Some of that work includes creating new designs from scratch, but more frequently existing designs will be reused with small tweaks or no change. Interoperable direct modeling and parametric feature-based models both help make the job easier.

! **Engineering Exploration, Performance and other Design Characteristics:** Another set of design cycle activities that are important is the exploration of different design choices and understanding their impact on product characteristics, whether that be cost, weight or stress. These trade-off studies enable engineers to make the right decisions in the design cycle. This includes simulation, calculation and other types of capabilities.

! **Multi-CAD Interoperability:** Another unfortunate reality of product development today is that suppliers and customers often use CAD software applications that are different from yours. Yet you must find a way to pass design data back and forth such that the entire design chain can collaborate together and make good engineering decisions. Look for capabilities that enable design data to move exchanged without loss of model fidelity.



When it comes to product design, there is a lot to take into account. Modern approaches take both enterprise considerations and engineering objectives into account when making design decisions. This can only be accomplished, however, if stakeholders from marketing, sales, manufacturing, procurement, service, suppliers and customers can close the design feedback loop with engineering. Fortunately, the CAD Revolution has changed how some of these stakeholders do that.

! **Multi-CAD View and Markup:** A longstanding means of providing feedback on a design has been to use view and markup technology. However, this traditionally has been done in formats that are not compatible with the original CAD applications, making it difficult for engineering stakeholders to get the feedback. Over the past few years, however, some CAD applications and View and Markup tools have been integrated such that they natively read each other's information. This is important to closing the loop successfully.



! **Suggesting Changes with Direct Modeling:** While view and markup tools have been used successfully, nothing removes ambiguity like an actual 3D model. By incorporating direct modeling, some CAD applications can now be used by non-engineering and casual users to make the actual changes and provide a 3D model back with the actual suggested changes.

When thinking about the *entire design cycle*, it's important to consider capabilities to eliminate the recreation of design data such as interoperability and direct modeling. It's also important to enable the right decisions by supporting engineering exploration and closing the feedback loop on wider enterprise considerations.



Supporting Downstream Processes

Selecting the right software and partner is important to improving concept design and the design cycle, but with changes in the recent CAD Revolution, there's an opportunity to improve downstream processes as well. The idea is to enable non-engineering organizations to independently use engineering deliverables to generate their own content. Here are some details.

- ! **Manufacturing Planning and Ramp-Up:** After design release, manufacturing needs to design tooling like molds, jigs and fixtures used to manufacture products. They also need to generate code used to drive numerically controlled (NC) machines. While building these deliverables based off 3D models is nothing new, interoperability between 2D and 3D modeling, including direct modeling, let's manufacturing engineers do their jobs with less translation and hassle.
- ! **Marketing and Sales:** Another use for engineering deliverables is for marketing and sales to create renderings and other images for collateral on their own. In addition to that, the CAD Revolution has worked at making direct modeling approaches so easy to use, that some sales organizations are actually designing products in front of their customers. This lets them validate and confirm exactly what the customer wants and accelerates the closure of sales.
- ! **Service Planning and Documentation:** Another non-engineering application of CAD-like capability is the use of 3D models to both plan and document service procedures. While not a new concept, the

recent emphasis on direct modeling and merging of CAD applications and 3D visualization applications has made it far easier for service organizations to make it into a reality. The result is that service teams can explore and verify disassembly, installation and reassembly steps using 3D models from engineering. And once verified, they can use the same models to create the illustration or 3D based service instructions that are used in the field.

For *processes downstream from engineering*, there are opportunities to leverage design data to do their jobs faster and independently. Manufacturing can design tooling and generate NC toolpaths without data translation. Marketing and sales can create their own collateral and even design in front of customers. Service organizations can verify and then document procedures.



A Centrally Managed Product Record

As you've read so far, it is important to author in an interoperable fashion during concept design, the design cycle and in downstream processes. But if you don't track and manage your data, the wrong version, iteration or configuration on those deliverables could be used downstream. And that results in errors that turn into ECOs, scrap, rework and missed launch dates. Here are some things to consider.

- ! **Managing Concept Designs:** Most people don't think about managing data during this phase. But fundamentally, the idea is to explore lots of concept alternatives and understand their associated characteristics. As such, it's critically important to track all that information so you can make the right decisions about the right concept.
- ! **Managing Detailed Designs:** The work-in-process nature of this phase is chaotic. And if you don't explicitly track and control which versions and iterations are used, especially amongst a team, important engineering decisions can be made based on the wrong information.
- ! **Managing Manufacturing Content:** It's important to create manufacturing deliverables based on the *right* design deliverables. But if you're not tracking and controlling the manufacturing deliverables, then you run into the same issues that can occur in detailed design. You cut metal with the wrong NC code. You produce jigs and fixtures that don't fit.

! **Managing Marketing and Sales Content:** Data management might not be the first thing that springs to your mind when you think of sales and marketing content. But if the image on a product's collateral doesn't match the real thing, it's a problem. And if you co-design a product with a customer but lose track of which version they agreed to purchase, that's also a problem.

! **Managing Service Content:** Service procedures are often unique to specific product configurations. So it's important to know which version and iteration of a service procedure applies to a specific product configuration, otherwise field service teams can't resolve product issues.

Whether it's managing concepts, detailed designs, manufacturing, marketing and sales or service content, tracking and managing their versions, iterations and configurations as well as their interrelationships is just as critical as authoring them in new ways. ***Centrally managing the product record*** is critical.



The Intangibles of a Good Partner

Investigating and selecting a software solution based on its capabilities is both important and has its challenges. But it's not the only thing to focus on. The software provider should also be a good *partner* as well. And that involves a number of things.

! **Breadth, Reputation and Responsiveness of**

Technical Support: No software is perfect. And at some point, you will find yourself logging an issue you found in the software. After the issue is logged, there are several traits of the software provider that impact how quickly they can get a resolution back to you. This includes their global support, the type of support staff and certification for their internal processes.

! **Alignment to a Software Provider's Vision:** Most software providers have a vision of the industry problems they want to solve. Some are grand in design. Some are focused in a specific context. Finding a good match means the future direction of the software will more closely fit what improvements you want to make in your company.

! **Solvency of the Software Provider:** Another important question to ask yourself is this: will this software provider be around for the long haul? We're not yet clear of difficult economic times. With product development so critical to your company's recovery, you want to make sure your software provider is around to support your efforts.

! **Forging Executive Relationships:** Any realist knows that nothing in product development or software is perfect. So it's best to be ready when issues arise. With a proverbial mountain of things that could be worked on, a software provider must pick and choose where to invest their development resources. Building and retaining an executive relationship is a way to ensure that high priority issues are escalated and resolved appropriately.

Ultimately, the success in using a new software solution isn't all about technical capabilities but also includes the *intangibles of a good partner*. This includes good technical support, alignment in terms of vision, solvency of the software provider and the ability to forge executive relationships.



Conclusion and Selection Punch List

After decades without any real software solution for concept design, the past few years offer some new hope. The idea is to switch between four different modeling approaches to let users capture and then mature concepts. In this eBook, we've looked at a lot of criteria to consider when selecting a software solution and provider. Here's a quick summary of each category.

The Selection Punch List

- ! For the **concept design cycle**, having the range of the four modeling capabilities to support the progression of a concept design is important. But interoperability between these modeling approaches provides a opportunity to eliminate the recreation of design data within the concept design cycle.
- ! When thinking about the **entire design cycle**, it's important to consider capabilities to eliminate the recreation of design data such as interoperability and direct modeling. It's also important to enable the right decisions by supporting engineering exploration and closing the feedback loop on wider enterprise considerations.
- ! For **processes downstream from engineering**, there are opportunities to leverage design data to do their jobs faster and independently. Manufacturing can design tooling and generate NC toolpaths without data translation. Marketing and sales can create their own collateral and even

design in front of customers. Service organizations can verify and then document procedures.

- ! Whether it's managing concepts, detailed designs, manufacturing, marketing and sales or service content, tracking and managing their versions, iterations and configurations as well as their interrelationships is just as critical as authoring them in new ways. **Centrally managing the product record** is critical.

- ! Ultimately, the success in using a new software solution isn't all about technical capabilities but also includes the **intangibles of a good partner**. This includes good technical support, alignment in terms of vision, solvency of the software provider and the ability to forge executive relationships.

Concept design has been underserved by enabling technology for so long, most have given up and simply continue to quietly bear the load. But with changes in the last few years, that is no longer the case. There are many things to take into account when looking for a new software solution. And not all of them are directly related to concept design or even technical capabilities.

This Buyers guide is courtesy of 3 HTi. Visit us at www.3HTI.com



For General Information: info@3hti.com or call Toll Free: (866) 624-3HTI