



What Is Design To Cost? An Overview With Examples

BY DAVE MCDERMAID

For manufacturers, cost-cutting is an ever-present goal: achieving lower costs while retaining the desired functionality means higher profit margins, more market share, and happier customers.

Historically, however, most manufacturers have had to resort to an effectively ad hoc strategy for estimating and managing cost. But that's no longer the case.

More and more manufacturers are using Design to Cost methodologies and tools to rationalize cost management by providing comprehensive insight into cost structure when it matters most: while a product is still being designed.

That's precisely why Design to Cost is such a vital paradigm for modern manufacturers to understand.

In this article, we define Design to Cost methodology, examine what it takes to transition an organization to utilizing these practices, and look at a few practical examples. Finally, we look at how the right technology tools are an essential foundation for Design to Cost in manufacturing.

WHAT IS DESIGN TO COST?

Design to Cost is an organizational methodology for integrating cost management with decision making at the design stage.

What Makes Design to Cost Different

Of course, manufacturers have always had to think about cost. But, traditionally, this thinking generally happened after the design stage: first the product was designed, then it was priced. Design engineers' focus on performance, appearance, and reliability all took strong precedence over cost when making design decisions.

If the generated design proved too costly for the market, engineers would have to redesign to a new cost target. These cost targets were often effectively arbitrary from a design perspective. In many cases, for instance, cost cutting targets were calculated simply by subtracting the desired profit margin from the market price.

Ignoring granular analysis of the most salient cost drivers while setting cost cutting targets across every aspect of a design is a recipe for a poor outcome. Design engineers risk being pushed to chase low impact cost drivers, unduly harming the functionality of the design. And, if the most inefficient cost drivers are not identified, the design may remain far from competitive in the marketplace.



Most manufacturers have adopted some sort of more rigorous methodology for estimating product costs. This can range from extrapolating from similar past projects to adding up core material and labor costs using an Excel spreadsheet. But manufacturing cost estimation is in fact an incredibly complex analytical problem, and these back-of-the-envelope costing systems may only generate vague estimates of a product's true final cost.

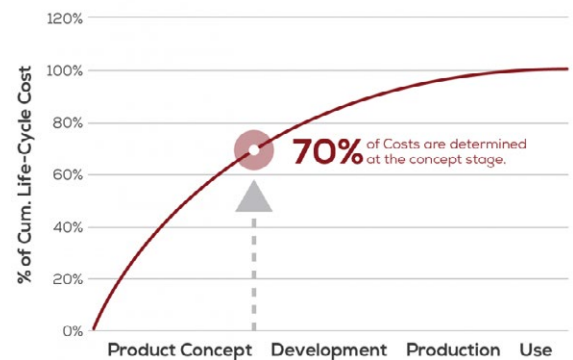
An impactful Design to Cost strategy needs to substantially improve estimate precision, but this approach doesn't just seek more accurate cost targets. Design to Cost works to accomplish something else entirely: integrating simulation-driven cost analysis at the design stage. The goal is to shift the onus of cost cutting away from arbitrary targets. Instead, in a Design to Cost environment, costs are tied directly to the design decisions driving them.

A mature Design to Cost strategy transforms cost from a post hoc business target tacked onto the design process to an independent variable within the design process.

AN ESSENTIAL PARADIGM FOR MANUFACTURING COST REDUCTION

Competitive pressures in manufacturing, coupled with the growing complexity of international supply chains, are driving more and more manufacturing companies to invest in a modern Design to Cost strategy. Design to Cost has the potential to be so effective because the design engineer can influence 70% of a product's final cost.

To generate a comprehensive analysis of cost drivers for a design, design engineers need tools for precisely evaluating a huge range of potential cost drivers. A short list of concerns that need to be accounted for include:



- **Material Specification:** in addition to direct costs, additional material usage indirectly affects process costs, ecological costs, and each of the other factors below. Everything from tolerance to machining-requirements needs to be analyzed.
- **Packaging, Shipping and Logistics:** weight, volume, fragility, and storage requirements are all instrumental for evaluating a design's true cost.
- **Manufacturability:** from cooling times, to facility availability, to equipment costs, manufacturability matters for every aspect of design.
- **Labor:** adding a part that requires manual assembly, for instance, can have a cost-impact far out of proportion to its direct materials cost.



But none of these factors can be analyzed in isolation: every design choice has consequences for the cost and functionality of the rest of the design. While these relationships can be clear cut—added weight requiring increased component tolerances—they can also exhibit incredibly complex interactivity (particularly when facilities and supply chain costs are included).

For a deeper analysis of the factors that go into determining product cost, you can read our white paper on the [Anatomy of Product Cost here](#).

Accounting for complex, interrelated variables of this magnitude requires a serious organizational commitment to making cost management part of product engineering's culture, coupled with an investment in innovative tools for manufacturing cost estimation.

THE TRANSITION TO A DESIGN TO COST CULTURE

Behind the Design to Cost approach is a question of organizational ownership: whose job is it to care about product cost? In a traditional design environment, there can be a dangerous disconnect between the business unit with functional control over cost management and pricing (Sales or Business Development, often with close input from upper management) and the actual design team. At best, this disconnect drives organizational silos that prevent holistic evaluation of cost-drivers. At worst, it can result in a turf war between engineering and other business units over the viability of cost targets.

To align organizational thinking about cost management, functional design, and customer needs/marketplace pricing, an effective Design to Cost strategy needs to give design engineers the responsibility, power, and tools to integrate cost management with design.

While this shift certainly requires an engineering culture change, bringing cost management to the design stage isn't just a matter of learning some new jargon: many essential cost-drivers are largely opaque to ground-level product engineers. Engineers need tools that help them holistically analyze cost in the design context—without burdening expert resources or hampering innovation.

For instance, an engineer exploring design alternatives may see that adding more of a particular component is only adding small marginal material cost to the design while improving reliability. But each marginal addition doesn't exhibit a linear effect on final cost. After several components are added, the overall design crosses a weight threshold requiring it to be manufactured in a second facility with higher rental costs. In addition, this second facility is located in a country with higher tariffs and a less advantageous exchange rate differential than the first. The complex effects of a design decision can drive far more cost than a traditional designer can reasonably be expected to anticipate.

In the past, these sorts of dynamic interactions were almost impossible to quantify when comparing design alternatives. *Today, however—with the right technology tools—this problem becomes solvable.*

HOW THE RIGHT COSTING SYSTEM IS AN ESSENTIAL ENABLER FOR DESIGN TO COST

An impactful manufacturing cost estimation software like aPriori functions as an essential foundation for Design to Cost, providing robust analysis of every element of a design's cost structure. To do so, aPriori needs advanced costing models including everything from labor and raw materials to highly specific manufacturing processes. *In fact, aPriori works directly with 3D CAD files to analyze cost-drivers in the highly dynamic context of the design itself.*

We provide a deeper overview of the features aPriori [uses to enable an advanced Design to Cost strategy here](#).

This depth of technological capability is essential because a robust Design to Cost strategy requires not only calculation of a product's cost drivers, but the ability to generate analyses of cost-drivers for alternative designs at the speed-of-business.

Spirit Aerosystems (an aerospace parts maker), for instance, noticed a part exceeding cost targets. aPriori quickly revealed that an inexperienced designer made a series of seemingly marginal aesthetic choices which in fact drove up overall costs for the part by over 10%. You can watch a video about how Spirit used aPriori to pinpoint and [eliminate those extraneous design features here](#).

