Tech-Clarity Insight:

Product Cost Management

A Knowledge-Based Approach to Optimizing Product Cost

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Executive Overview

Many things factor into the profitability of a product. Innovation, satisfying customer wishes, and product performance drive sales, command price premiums, and boost top-line results. These get a lot of attention and engineers focus passionately on the form, fit, and function of their designs. But engineers don't have the ability to evaluate the product cost impacts of their decisions to drive profitability from the expense perspective.


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Too few companies include a thorough "design for cost" analysis in their product development process to optimize profits. Engineers must optimize cost and make design tradeoffs early in the lifecycle when there is still design flexibility. "*You need to have the right concept early on,*" advises the Manager of Cost Engineering for a major automotive OEM. "*The leverage you have is much higher when you start.*" It's critical to get the cost right as early as possible, particularly for high-volume parts.

PCM allows companies to simulate and evaluate different manufacturing scenarios to develop an ideal "should cost."

Most engineers don't have visibility to the impact their decisions have on cost. They can't optimize cost with other design parameters because they don't have the right information. Product Cost Management (PCM) processes and software enable manufactures to design for cost by providing early visibility to the cost implications of design decisions. PCM allows companies to simulate and evaluate different manufacturing scenarios to develop an ideal "should cost" model based on detailed knowledge of materials, manufacturing processes, and supply chain costs.

PCM benefits go beyond design. Most sourcing efforts result in suboptimal pricing because they aren't based on how much a part *should* cost. Predicting manufacturing and supply costs confidently helps companies negotiate better prices based on facts and enables transparent, open discussion with suppliers. "*We tell suppliers we aren't looking for a cost reduction,*" explains the Manager of Design Costing and Analysis for an agricultural machinery producer. "*We want to improve their process and decrease their work so they can reduce the cost. It's critical to start the discussion this way.*" Beyond savings from one-time negotiations, PCM helps educate suppliers on how to get closer to an ideal should cost model. This win-win approach sets up continuous improvement with vendors to improve prices without putting unrealistic pressure on suppliers to blindly reduce cost. In the end, PCM changes negotiations to a battle of knowledge versus a battle of will and drives more sustainable cost reduction over time.
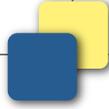
The PCM Approach

PCM is a software-enabled methodology that helps manufacturers understand the cost implications of their design and sourcing decisions. This visibility allows them to identify cost saving ideas such as changing materials, simplifying designs, combining parts / functions, or changing production locations. PCM is a detail-oriented process that systematically determines what a part should cost. The Making Product Tradeoffs report shows that product developers don't understand the cost impact of their design decisions. In fact, "understanding different cost factors" is the most prevalent challenge in optimizing product cost. Predicting costs isn't easy. It requires a thorough understanding of manufacturing processes and cost drivers. As the Manager of Cost Engineering for an auto manufacturer puts it, however, "*When you buy a component 5 to 10 million times it's worth going into detail*."

> ### *PCM is a software-enabled methodology that helps manufacturers understand the cost implications of their design and sourcing decisions.*

There are different methods to determine how much producing a part should cost. There are feature-based techniques that look at the characteristics of a design to eliminate unnecessary, high-cost design features. There are also bottoms-up approaches that calculate a more accurate should cost based on the manufacturing processes and tools required to produce an item. These approaches develop high fidelity cost models based on a detailed understanding of what it takes to produce the product, the BOM and Bill of Process (BOP). The BOP includes labor, equipment, tooling, setup, and other production information. Modeling multiple production methods allows manufacturers to analyze multiple scenarios and perform "what if" analysis.

> ### *Modeling multiple production methods allows manufacturers to analyze multiple scenarios and perform "what if" analysis.*

Cost modeling allows analysts to simulate different production scenarios to develop an optimal "should cost" for the product. This should cost reflects the cost if it was produced in an ideal setting. "*We look at the type of materials used, where it's manufactured, logistics, space requirements for storage, and more*," describes the Head of Product Cost Optimization for an agricultural equipment manufacturer. "*We calculate nearly a total cost of ownership over a lifecycle of 5-15 years*." To determine this, the model needs to include real cost drivers, not just rolled up numbers. It should take into account where the product will be produced and how, including the need for capital investment by suppliers. Building these detailed models based on accurate materials, production, and supply chain costs requires input from subject matter experts in production materials and methods. "*Our cost estimation team needs experts that understand the production process of the*
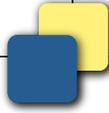
component," says the automotive OEM, "*We can train a production planner to calculate cost but not a controller enough about production to talk to suppliers*."

Design for Optimal Cost

PCM allows manufacturers to design products for optimal cost by providing them feedback on the cost impact of their decisions. This approach is often more effective than "value engineering" processes that aim to take out cost from in-market products. Reducing cost is more feasible early in the design process where flexibility is at the highest point before decisions are locked in.

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Of course cost decisions must be made in context with other product decisions and consider tradeoffs between product characteristics (Figure 1). As Tech-Clarity's <u>Making Product Development Tradeoffs</u> finds, "*Today's product development teams have to focus on more than product performance – they must balance cost, environmental compliance, sustainability, and other factors in their design process*."
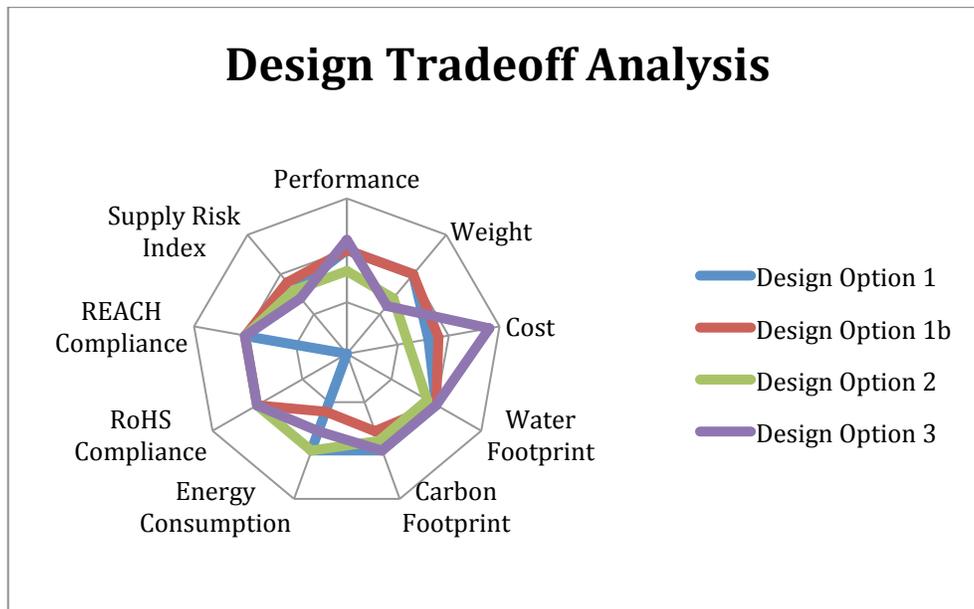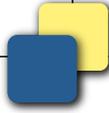

Figure 1: Design Optimization Trade Study

Cost optimization is not the same as designing parts and products for the lowest possible cost solution. Most customers don't want a product that is "cheap," it must still meet

quality targets and meet customer needs. "*The focus should not be on cost optimization but on value optimization*," cautions the equipment manufacturer. Sometimes the right decision is not the least expensive but still leads to higher profitability. "*We try to target the right cost by finding the best functional, technical, and cost solution*," explains the Manager of Design Costing and Analysis for an agricultural machinery producer. "*The best technical solution might not be the best cost, but might be a higher margin*."

The focus should not be on cost optimization but on value optimization.
Head of Product Cost Optimization, Agricultural Machinery Producer

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Source for Optimal Pricing

Designing a product for ideal cost is only part of the battle. Most manufacturers rely on their supply chain for components and assemblies. To compete profitably, then, they need to find the right suppliers and negotiate a fair price. Requests for Quotation (RFQs) aren't effective at reducing prices because they only allow price competition and not competition based on cost. "*Most purchasing organization only do market requests and compare them, they don't know the details*," says the equipment manufacturer. Pricing is a commercial issue. For example, suppliers might be able to command premiums for innovation or unique capabilities. But cost is factual. "*We like to call it cost engineering*," says the automotive OEM. "*We consult to developers and then our colleagues in Purchasing do the final negotiations with suppliers*."

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PCM processes and tools can be applied here as well. Using knowledge and costing models, manufacturers can simulate their suppliers' production costs to develop a should cost. Although it's likely no supplier that can match an ideal should cost model with existing capabilities, it provides purchasing with the knowledge needed to help get the best supplier pricing. "*We try to find out how suppliers are doing the work*," explains the machinery producer. "*The more we go to detail the better we trust the cost*." The price should include a reasonable ROI/IRR for the supplier because it's important that it's win-win to keep them financially healthy while remaining aggressive on cost reduction.

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Manager Design Costing and Analysis, Machinery Producer

PCM provides documentation of the factors influencing cost in detail, including any assumptions. Sharing this information with suppliers encourages "open book"

negotiations based on facts. "*We tell them 'here is where I have the costs' to try start a real discussion and find out why he is more expensive than my expectation*," explains the machinery producers. "*In one example we found out they had gold connectors that weren't needed. When we asked why, the supplier said we asked for them! We changed our specifications and lowered the cost.*" PCM changes negotiations from battle of wills to battle of knowledge. "*We hope we can focus supplier negotiations on a factual basis and not just emotions*," offers the Manager of Cost Engineering for the automotive OEM.

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> *on a factual basis and not just emotions.*
> *Manager Cost Engineering, Automotive OEM*

Drive Continuous Cost Improvement in the Supply Chain

The goal should be to cut down supplier cost not just beat them up on price and potentially force them into selling bad business. In the long run that is not good for anyone. PCM can help identify supplier inefficiencies and put in place a plan to close the gap between their cost and the should cost. This is valuable for contract negotiations but also for continuous improvement. "*We have very detailed discussions with the suppliers on their offer and where it deviates from best practice to support the buyer in negotiation*," says the automotive OEM. "*Sometimes the supplier may change their cost structure by relocating production or trimming fat on overhead.*" The Head of Product Cost Optimization for the equipment manufacturer shares a similar approach. "*We show suppliers where the differences are between our calculations and theirs*," he explains. "*We help them get better prices for subassemblies or improve their own manufacturing processes.*"

> *The problem isn't that suppliers don't want to reduce the cost,*
> *they don't know where to reduce the cost.*
> *Manager Design Costing and Analysis, Machinery Producer*

Manufacturers and suppliers can share in the benefits of PCM. "*The problem isn't that suppliers don't want to reduce the cost, they don't know where to reduce the cost*," says the machinery producer. "*We try to be very transparent.*" Manufacturers can partner with their suppliers to reduce cost from the supply chain. "*It's good for a supplier to see where they have some disadvantages compared to their competitors*," advises the automotive OEM. PCM can help manufacturers develop their suppliers, for example setting up Six Sigma and Kaizen projects to continuously improve and drive additional cost savings. Suppliers can also leverage PCM processes and software directly to develop more accurate quotes and defend costs with their customers.

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Apply PCM Across the Product Lifecycle

Ideally PCM is done early, as early as the conceptual phase. It's better to get products designed right the first time because designs and supplier selection is much more flexible early in the process (Figure 2). Of course not all companies can optimize cost early, or not in all situations. "*We try to manage cost as early as possible because R&D determines about 80% of cost and we are only able to make small changes on the other 20%*," says the Head of Product Cost Optimization from the equipment manufacturer, "*We try to do it early, but we don't always have the chance*." Despite the best practice to design for cost, data from Making Product Development Tradeoffs indicates that only about two-thirds of companies aggressively manage cost during design, while about three-quarters look for cost reduction after the product is in the market.

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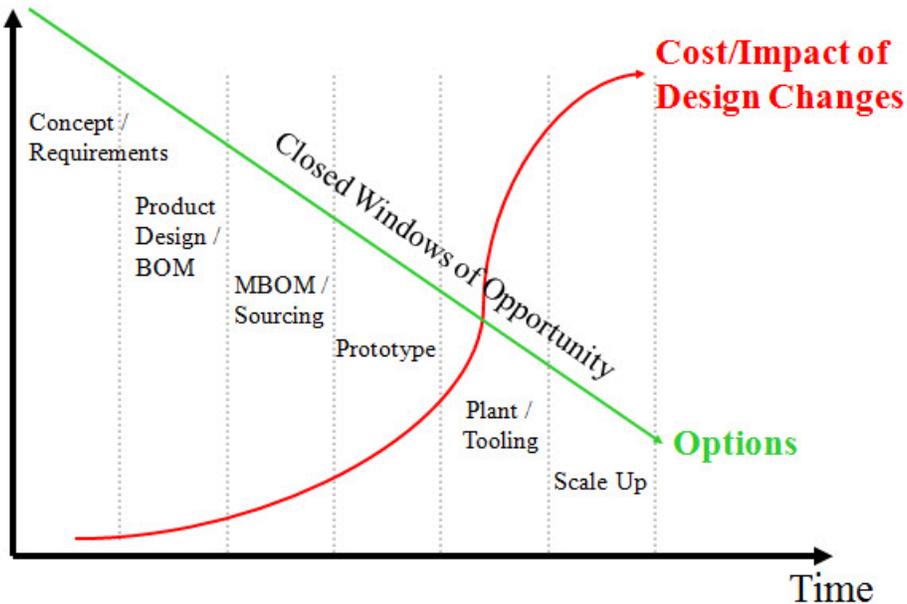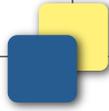*Head of Product Cost Optimization, Equipment Manufacturer*

Figure 2: Windows of Opportunity for Design Change

PCM processes and tools can also applied later in the product lifecycle. Cost models and consultation based on facts should be applied early and often. "*We don't just calculate cost once, we look at it several times over the lifecycle*," shares the automotive OEM. "*We also do cost calculations for changes to make sure we don't pay too much. But most of the focus is 30 to 50 months before production*." Regardless of when PCM is applied, timeliness is extremely valuable. "*Some other companies are trying to get very close estimates but they couldn't save the money because they spent all of their time on the calculation*," explains the machinery producers. "*We can do a front axle in 1.5 weeks that takes them 2.5 months. In that time we were analyzing and reviewing options instead of calculating*."

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Manager Cost Engineering, Automotive OEM

Leverage Common Data with Enterprise Class PCM

It's important to take an enterprise class approach to costing. The most commonly used tools for PCM, spreadsheets and programs that conduct simple rollups, are not suitable for enterprise-class processes. These solutions do not provide the details required to develop credible cost models. They also make it very difficult for designers to compare products, concepts, and scenarios. Spreadsheets fail due to quality problems and the inability to implement them effectively on an enterprise scale, resulting in different product lines, geographies, or lines of business having different approaches. Non-enterprise approaches also make it difficult to reuse information or apply product changes, currency fluctuations, burden rates updates, or commodity cost changes.

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A PCM system should have a common database for information such as labor rates and material costs so that they can be updated once and reflected across models. "*We have documentation for basic data – energy, labor, annual usage times, etc. – at a single point*," says the automotive OEM. This provides consistent data to make calculations efficient and credible. "*Our software gives you stored information that all colleagues have access to*," offers the equipment manufacturer. "*One big problem with spreadsheets is that the data isn't on a server so it isn't always the same*." An enterprise class PCM system should also be able to quickly access current BOMs across all product variants and be updated as designs change.

Instill Consistent Analysis with Enterprise Class PCM

Costing practices and calculations should also be consistent and repeatable, as suppliers will quickly see through inconsistency. "*To deliver the highest quality information, the only solution was to use common calculation software to make sure everyone is using the same information*," explains the manager from the automotive OEM. "*We don't want to approach the same supplier with different assumptions for labor or a machine cost. That wouldn't look professional and would be inefficient*." The equipment manufacturer also points out the need for consistency, "*Calculations should be consistent, not depending on the person doing the job*."

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> *Manager Cost Engineering, Automotive OEM*

An enterprise system is also important for efficiency, allowing companies to reuse cost models. As the machinery producer shares, "*We have one calculation that three people use. We can copy and paste it in 10 seconds and not in 10 days*." Cost models may also be based on a prior version of the product or perhaps on standard, reusable templates. "*We don't want to start from scratch, so we have good documentation for every calculation. 75% of the vehicle is usually the same so we can look at last time adapt old calculation. It's much faster*," explains the automotive OEM.

> *Standardization allows us to improve calculations for the next time.*
> *Manager Design Costing and Analysis, Machinery Producer*

Finally, a consistent, enterprise-level approach allows continuous improvement over time. As the manager from the machinery producers says "*Standardization allows us to improve calculations for the next time*." A standard system also helps overcome the challenges of the aging workforce, capturing the knowledge and expertise of retiring workers so it is not lost but can be leveraged into the future.

Conclusions

To maintain profitability in challenging, global markets companies must aggressively manage costs. At that same time, they must make design decisions in context with other design decisions, making tradeoffs to optimize product features, performance, quality, and cost. "*We do not do product cost optimization only*," says the equipment manufacturer. "*We do value engineering to determine the best solution for the functions and requirements coming out of product management, it takes all kinds of optimizations*."

PCM processes and software help manufactures understand what a product should cost based on what it takes to produce it. Enterprise class PCM tools do this efficiently through centralized data, consistent analysis, reuse, and information sharing. "*In minutes I can come up with a realistic cost based on realistic components and the knowledge of how much different production processes cost*," shares the machinery producer. "*It gives engineers a realistic way to understand and reduce cost*."

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In addition to designing for optimal cost early in the product lifecycle, PCM helps companies negotiate fair prices based on a confident understanding of production costs. "*Some suppliers feel all we want to do is reduce cost by any means, but we explain we are looking for transparency*," says the automotive OEM. "*Every supplier has a right to earn a profit, but we don't want to pay too much*." Cost modeling with PCM is better than RFQs. RFQs are not effective because they only compare commercial prices, not costs. "*If you only put out a request on the market you get a benchmark and don't know what the cost should it be*," offers the equipment manufacturer. "*Only the details and cost structure analysis will tell you what the target should be*."

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Head of Product Cost Optimization, Equipment Manufacturer

Enterprise PCM helps reduce the cost built into designs and allow more open, facts-based discussions on cost and continuous improvement with suppliers. By gaining more insight and control on cost and value with PCM, manufacturers can drive higher levels of profitability.

Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Focus on optimizing cost early in the product lifecycle where designs are more flexible and the windows of opportunity for change are open.
- Keep product cost management in context with other design decisions. "As Making Product Development Tradeoffs cautions, "Not every decision is a least-cost decision"

- Go into detail to analyze costs, considering worldwide cost factors including labor, production location, energy, interest rates, materials, and machines based on economic and technical data for prevalent manufacturing technologies.
- While detail is critical, don't demand 100% cost model accuracy. The goal is to improve designs and start discussions with suppliers to identify inefficiencies. As the machinery producer describes "*The most important thing people need to understand is that 100% correct calculations will not reduce the cost any more. I am not doing calculations, I am doing consulting*."
- Standardize cost calculations to improve efficiency, allow reuse, provide a consistent/credible face to the market, and enable continuous improvement. As the equipment manufacturer shares, "*Our PCM software helps us with knowledge management of fabrication technology. We are able to use the software at different locations by different colleagues and get the same results*."
- Enable PCM with an enterprise-class tool to provide consistency, reuse, continuous improvement, and credibility. The automotive OEM explains, "*We need a tool for efficiency, to ensure our data is high quality, and to make sure our cost is worked out according to logic to support cost discussions with supplier*."

About the Author

Jim Brown is the President of Tech-Clarity, an independent research and consulting firm that specializes in analyzing the business value of software technology and services. Jim has over 20 years of experience in software for the manufacturing industries. He has a broad background including roles in industry, management consulting, the software industry, and research. His experience spans enterprise applications including PLM, ERP, product costing, quality management, service lifecycle management, manufacturing, supply chain management, and more. Jim is passionate about improving product innovation, product development, and engineering performance through the use of software technology.

Jim is an experienced researcher, author, and public speaker and enjoys the opportunity to speak at conferences or anywhere he can engage with people with a passion to improve business performance through software technology.

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