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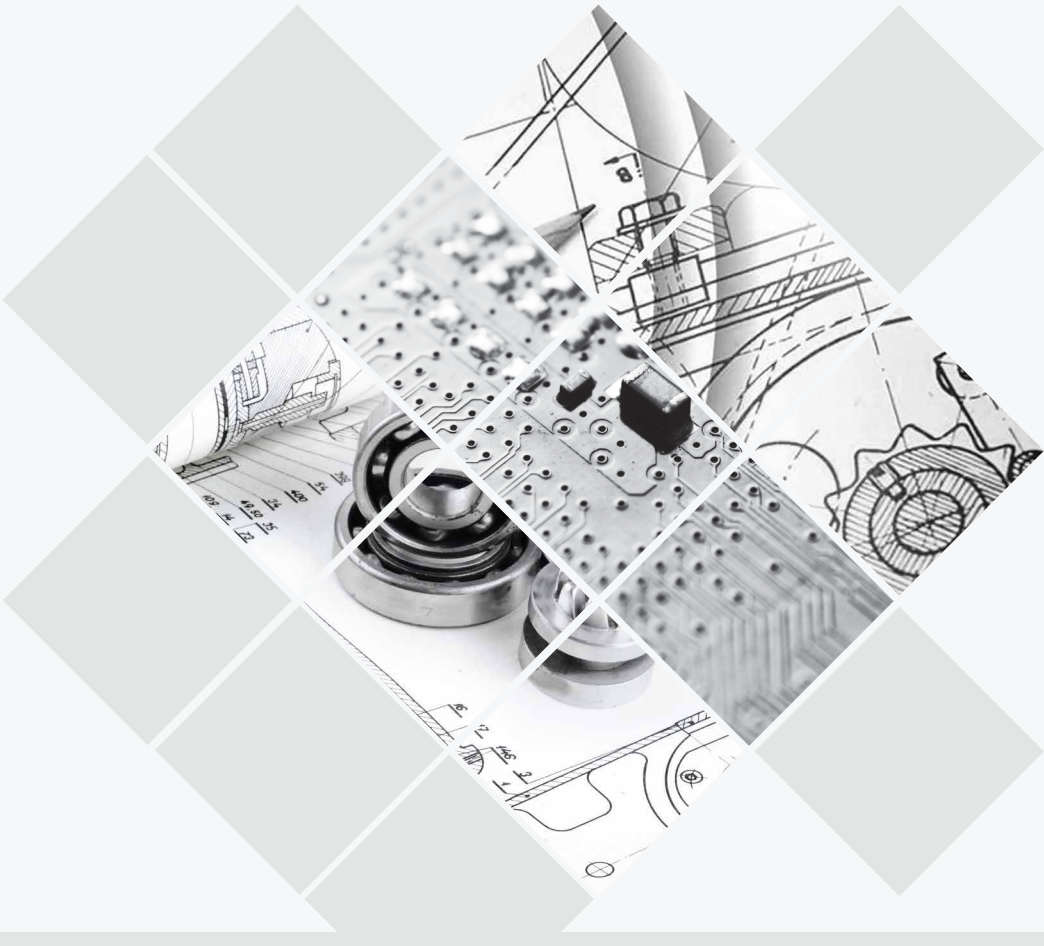
should-cost challenges demystified

A must read for effective cost-management in organizations

Customers today demand products to be developed with shorter lead time to market, higher quality and reliability, faster delivery and service, and affordable price whilst adhering to stringent design requirements.



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Abstract

Customers today demand products to be developed with shorter lead time to market, higher quality and reliability, faster delivery and service, and affordable price whilst adhering to stringent design requirements. Companies that are being forced to meet these challenges, mostly focus on meeting the design requirements. In the process cost gets side-lined. Near the end of the product development cycle, we see surprises and value engineering is deployed to reduce cost. Silos are formed within the company and along with stringent lead times, make the process ineffective to focus on cost impact during the early stages of product development. Sourcing also has challenges to grapple with, such as managing sole suppliers and handling highly engineered commodities, whilst focusing on cost reduction and associated implications. This paper will help to interpret the benefits of Should-Cost Modelling and explain how effectively sourcing and engineering can use this to achieve better cost reductions and overcome challenges.

Challenges Faced by Sourcing Organization

Intense competition and demand for shorter product life cycles, forces all companies to cut product cost, which directly impacts product development. The engineering team is largely accountable for a product's functional aspects and the sourcing team is accountable towards its cost reduction. It is often observed that organizational silos cause flaws in measuring cost factors of the product during the development phase. Sourcing decisions make a direct impact on controlling product costs and maintaining product profitability.

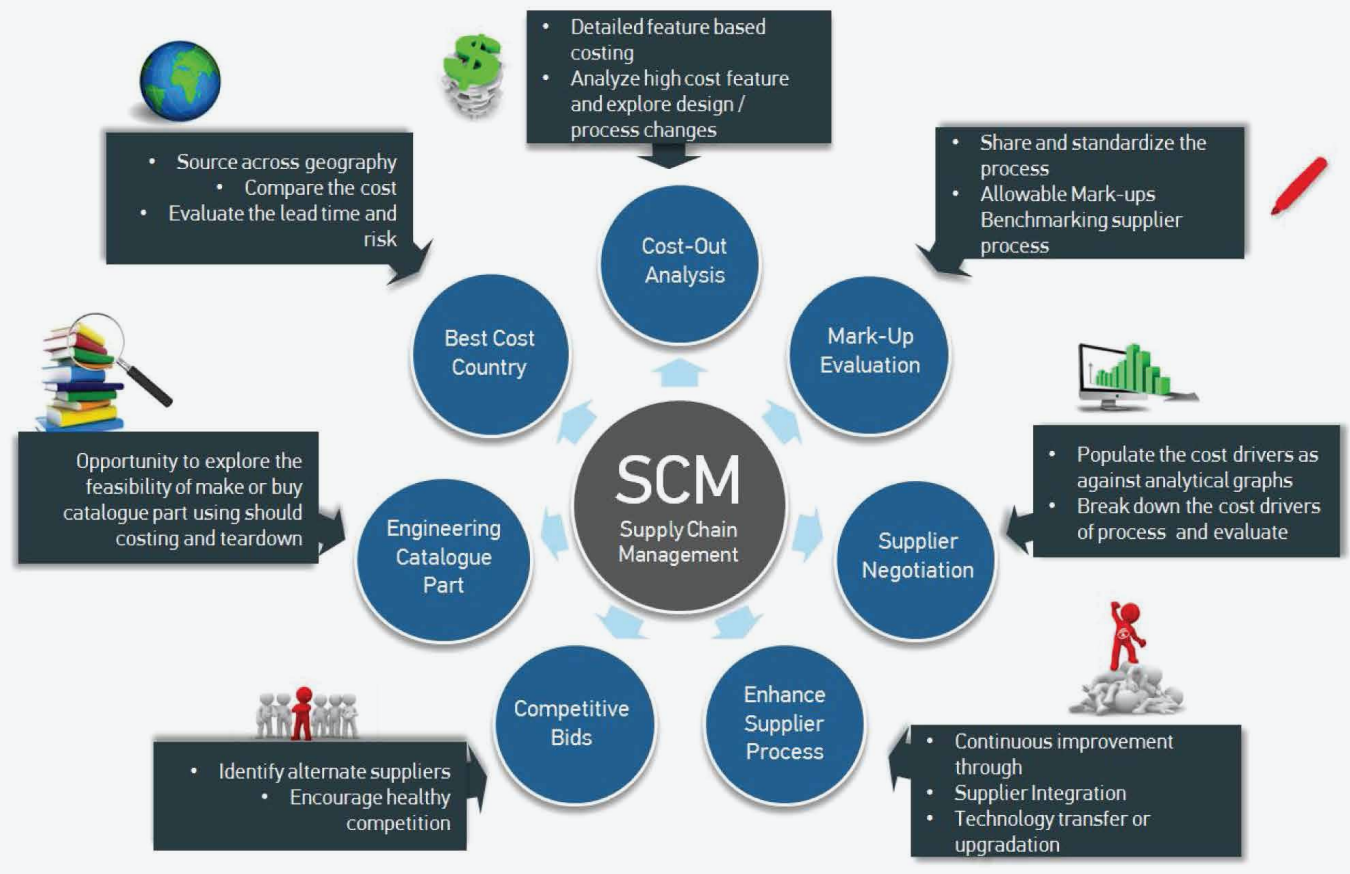
- The cost of product development demanded by rigorous design requirements is often compromised because of the pressure to cut product development costs. Product drawings released for building prototypes by engineering are sent to suppliers to obtain quotations. On receiving quotes and assessing them, sourcing often opts for a supplier with the lowest bid, which helps them cut product development costs
- In the traditional set up, organizational silos have made the process between engineering and sourcing ineffective. Due to this, there was no insight into what the product should actually cost. This kind of product development environment and mindset can lead to surprises later in the development cycle and affect the product, even to the extent of the product launch being aborted

Strategic sourcing is a holistic approach towards decision making for categorizing "make or buy" during product development. It is a choice about making the part internally (in-house) or buy it from an external source (supplier). This can be due to customers demanding reduced lead time to market. Once the preliminary Bill of Material – (BOM) is released by engineering during the conceptual stage, sourcing makes the choice of segregating the make and buy parts as per the project schedules and requirements. Sourcing identifies suppliers based on the specification received from engineering and proceeds to obtain quotes. On receiving quotations, quote comparisons are made against the requirements, price and lead time. Supplier selection is done judiciously based on trade-offs between the various requirements. The major gap in this approach is that it fails to capture what the actual product cost should be.

- Some of the factors that directly influence any organization towards make or buy decisions include, lack of expertise to make the product internally, small volumes, high labor cost and overheads, non-critical items, inferior infrastructure to develop products with the desired quality, usage of proprietary or patented technology, reduced cost, opportunity for innovation and degree of control over lead time
- Some engineering components such as, actuators, compressors, valves, blowers, are purchased from specific vendors who are pioneers in developing them and compete in niche market where they dictate the price. As such, there are limitations for negotiation in these areas as supply-demand is against the customer
- At times certain manufacturing commodities such as machined parts, forged parts, cast parts, mouldings, are often sourced to third parties. In such niche manufacturing service segments suppliers again try to dictate price. Sole suppliers have always been a challenge and the risk associated is obviously high, but there is usually no choice for sourcing to conduct fair negotiations.

Such phenomenal issues and challenges are demystified by the Should-Cost approach. Should-Cost Modelling helps sourcing to overcome such situations by presenting facts and figures to open up better negotiation opportunities with suppliers.

- The cost driver information makes sourcing confident enough to discuss with suppliers the tangible costs and profits over a period. In a contractual relationship with a supplier, organizations can try breakthrough opportunities to cut down product price through a Should-Cost Modelling technique and providing the supplier with a profitable margin considering the overheads, niche skill, quality, delivery and service
- It would help to have a design skill set added to sourcing, which will support thinking from a design and manufacturing cost perspective, and perform proactive cost validations upfront. These skills will help to build an ideal Should-Cost model and optimize the design
- Certain premium engineering components are purchased as an auxiliary system or catalogue part, which is chosen based on design specification. The expected manufacturing cost to make a product to the given design specification can be found by analyzing the Should-Cost Model for a built-to specification design and iterate it. This will help to possess a basic insight of cost drivers and examine if the monetary value is genuine or inflated, and select suppliers accordingly. A deeper study could also be undertaken to switch buy as make after analysis of profits and return on investments.



Takeaways for Sourcing Organization

Should-Cost modelling is highly relevant to sourcing and helps in various aspects:

Cost-Out Analysis: Study the complete feature based cost parameters; identify major cost drivers and analyze if it could be manufactured in a different process. For example, if we have a shaft with flange to be machined, it costs more as we have to consider the largest diameter for raw material requirements. Another way of doing the same feature will be in the form of split entities; machine the flange and shaft individually and integrate by welding.

Mark-up Evaluation: Encourage suppliers to be transparent enough to share the manufacturing process plan currently followed to debate and decide on the best methodology to be adopted. Revisit the mark-ups, analyze the cost and agree upon a fair price, which accommodates a profit percentage for supplier.

Supplier Negotiation: Populate cost drivers against analytical graphs to give a quick summary of the cost drivers and numerical values. Break down the cost drivers of processes; evaluate the process elements essentiality and in-essentiality as against design requirements.

Enhance Supplier Process: Analyze the Should-Cost model process plan and identify process improvements. Engage with the supplier and enforce radical improvement through adopting new technology, which will benefit suppliers and in turn customers.

Competitive Bids: Identify alternate suppliers and compare the cost and manufacturing process approaches, encourage healthy competition.

Supplier Evaluation: Identify supplier deficiencies and focus to improve them through LEAN methodology.

Make or Buy: Find opportunity to make or buy premium engineering catalogue parts, which are usually purchased. A Should-Cost model could be prepared by doing a tear down, ascertaining the product cost and comparing. The organization can have a choice of making the part if the ROI is feasible and worthwhile.

Best Cost Country: Compare Should-Cost models if outsourced to best cost countries such as Romania, Poland, Czech Republic, Brazil, China, Taiwan, Malaysia, Korea, or India. This helps in reducing the labor cost and overheads but logistics has to be evaluated for feasibility.

Challenges Faced by Engineering Teams

On the other hand, engineering teams are working towards the schedules of product development to ensure that the product is released before the deadline as well as meeting the requirements of the customer. Beginning from the conceptual phase, followed by detail design, design verification, acknowledging the service and warranty issue, building prototypes, design validation and test support to meet functional requirements, design refinements and till launch, the chase is on, without any let-off. Leadership will be highly concerned about the budget expenditure and the product cost as the success is realized only if the product is placed in the right position and time in the market with competitive price margins. While the cost is well perceived at top management levels, lower management, who are solely responsible for driving the cost do not have the same understanding as their leadership. On capturing customer requirements in a QFD, engineering teams primarily focus on the product design specification and functional requirements. The definition of cost or its impact on design is inadvertently unconstrained, through the complete phase of product development. A successful product would be a result of achieving customer expectations that were set up front, as the product progresses through its life cycle.

- Eventually, customers keep demanding better products at lesser prices with performance, quality and durability, and shorter lead time to market. Such customer requirements are decided at later stages and can cause scope change and project delays
- Designs are made robust and the cost impact is not evaluated during the development process. The engineering team is more passionate and biased towards meeting the critical to quality aspects of the product as this brings in a bigger impact and if customer requirements are not met the repercussions could damage organization's reputation

- A lot of people talk about concurrent engineering and integrated product development, which is the integration of cross functional teams from respective verticals of the organization. However, it has been observed that this is not effectively practiced due to silos within the organization, which creates major inefficiencies
- Life cycle costing is measured only at the end of the product design stage. Cost factors in the early stages of product development have no focus and are usually an afterthought

The challenges imposed on designers are overcome by the Should-Cost approach. Should-Cost modelling helps designers to focus on cost and deliver designs, which can be optimized considering cost and performance meeting customer expectations.

- Cost could be better controlled during the conceptual phase. Today one has the opportunity to explore CAD integrated, cost modelling add-ons, which help designers to stimulate design and see the price behavior in parallel. Control features that add up cost and de-prioritize them as against essential functional requirements
- Should-Cost modelling encourages designers to compare cost information by optimizing design, varying process or materials, whilst meeting the design requirements and help designers to adopt a design to cost and design to value strategy
- Should-Cost modelling brings top down costing approach to be followed at each phase of design and aim to meet target cost in product development Designers have choice to iterate design, optimize them at each stage gate, study the cost behavior and can plan to meet the set target cost

Takeaways for Engineering Teams

Should-Cost modelling has complete relevance with engineering teams and the information helps in various aspects:

Target Costing: This approach follows top down costing. Target cost is a market driven cost set based on market analysis, before the product could be actually produced. Cost could be analyzed using Should-Cost analysis at each phase of the product development and usually done by designers. Cost is restricted based on the concepts derived and maintained well below the target by performing value engineering and design iterations. These are effective methods followed in the industry to be competitive.

Material Substitution: Should-Cost models can be leveraged to use different materials. Materials play vital role in cost as their mechanical properties such as hardness, ductility, and malleability impact the machining time and tooling required.

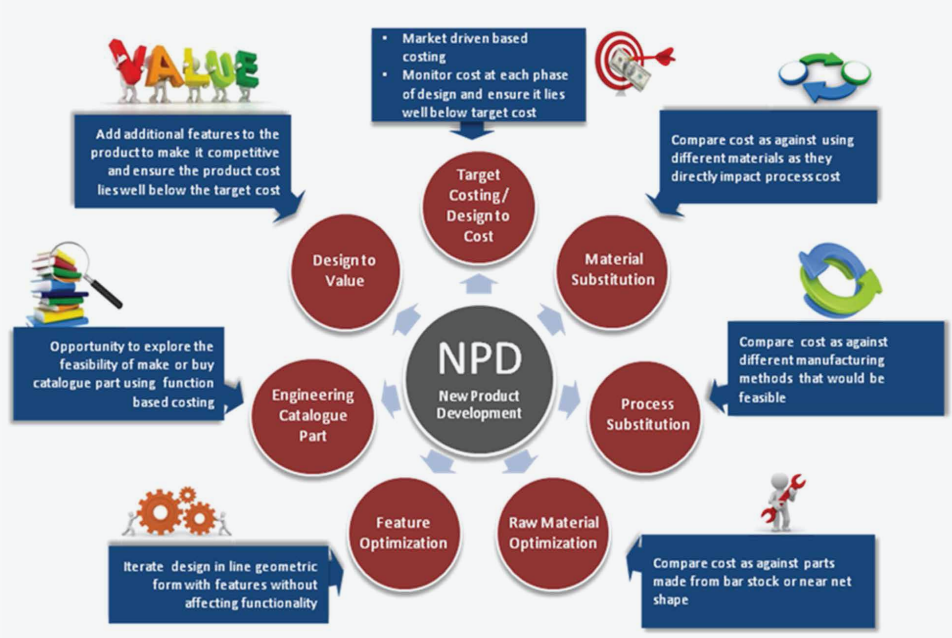
Process Substitution: Should-Cost models that are using different feasible manufacturing processes to produce the same part can be compared. For example, comparing machined components against forged components to near net shape and machined.

Raw Material Optimization: Compare Should-Cost models of parts made from bar stock, cut from part, forged to near net shape, cast to near net shape to ensure the design produces less material scrap and minimizes process cost.

Feature Optimization: Any part is made of features combined as a whole to get the required form that meets the function. Should-Cost analysis helps us to understand the cost involved for each feature. Designers can revisit their design to change features without affecting the function and reduce cost.

Catalogue Parts: One could find opportunity to make or buy highly engineered catalogue parts. A Should-Cost model can be prepared by costing the parts by developing a build-to specification.

Design to Value: This is one of the radical aspects of product development requirements. During the early stage in product development, engineers can arrive at the cost of the product using Should-Cost Models. If the cost estimated is well below the target, designers could think of adding additional features to the product to make it competitive and ensure the product cost lies well below the target cost enhancing customer value.



Companies do face challenges in cost reductions during product development phase due to stringent time to market and hard to integrate cross functional teams across the organization. QuEST has its unique operation and strategies built towards cost realization and is very well aligned with the global industry framework, cutting across different verticals such as Aerospace, Oil & Gas, Power, and Transportation. QuEST uses most tools available today encompassing Boothroyd, aPriori, Pro CALC as should cost, DFMA tools, and Design to Cost evaluation. QuEST believes in demonstrating quality, by leveraging subject matter experts in all fields, which helps in establishing the process plan and engineering requirements more accurately. QuEST synergizes well with customers, across their organization providing cost-out solutions and directions in the complete product life cycle. An established team comprising of SAVE certified professionals, TRIZ professionals, subject matter experts, Manufacturing and Supply Chain specialists, is well poised to offer best opportunities and solutions to improve customerproductivity and cost-out projects.

Conclusion

Should-Cost modelling is being practiced by most companies worldwide and success stories and implementation are available as evidence. It would be beneficial to implement such practices in product development to avoid cost, explore potential opportunities for cost savings. People often criticize the accuracy of cost during should cost and compromise on the advantage it offers. To build an accurate cost model, precise information on manufacturing process is very essential. However, accuracy of cost model is not very essential; but one has to make use of the results and use appropriate directions to avail cost realization benefits. At times, people think that Should-Cost analysis may lead to an unfair advantage by the company against the supplier. This paper describes about how Should-Cost analysis reports help sourcing and engineering to realize cost savings. It gives clear directions on what opportunities are still open for realizing cost savings and brings more confidence to the user. As delineated at the start of this paper about the real world perception about sourcing and engineering stakeholders, the major gap could be bridged by practicing should-costing and encouraging efficient product development and benefit from cost realizations. It is important to understand the facts that would help one in using this methodology in any product development. A well-integrated development team will result in successful product development and delivering a competitive product.

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Author Profile

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Kumar Varadarajan is a Technical Manager at QuEST Global. In this role he supports Should-Costing and VAVE for DMP projects of all GE businesses at QuEST. He supports Design and Development activities for NPI projects of certain specific GE businesses as well. Kumar is a seasoned expert in cost management, manufacturing engineering and product design. In his line of work, he has led various DMP projects for pressure calibration products for GE Measurement& Control systems; DMP project for pressure relief valve for GE Flow and Pressure Technologies; DMP project for subsystem of artificial lifts for GE Oil and Gas Should-Cost & Target Costing for purchased premium engineering parts for GE Power Conversion; and Should-Costing for various steam and gas turbine parts to support sourcing to facilitate negotiation for Nuovo Pignone - GE Energy.

Kumar also has extensive experience in Design and Development of turbo chargers for passenger cars and brakes for passenger cars and commercial vehicles. He holds a master's degree in Product Design Engineering as well. He is based out of Bangalore, India.

About QuEST Global

QuEST Global is a focused global engineering solutions provider with a proven track record of over 17 years serving the product development & production engineering needs of high technology companies. A pioneer in global engineering services, QuEST is a trusted, strategic and long term partner for many Fortune 500 companies in the Aero Engines, Aerospace & Defence, Transportation, Oil & Gas, Power, Healthcare and other high tech industries. The company offers mechanical, electrical, electronics, embedded, engineering software, engineering analytics, manufacturing engineering and supply chain transformative solutions across the complete engineering lifecycle.

QuEST partners with customers to continuously create value through customer-centric culture, continuous improvement mind-set, as well as domain specific engineering capability. Through its local-global model, QuEST provides maximum value engineering interactions locally, along with high quality deliveries at optimal cost from global locations. The company comprises of more than 7,000 passionate engineers of nine different nationalities intent on making a positive impact to the business of world class customers, transforming the way they do engineering.

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