Predicting Total Costs for DOD Programs
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What is more important, performance or cost?

This question is a bit rhetorical and somewhat of a chicken and egg scenario. Some may answer immediately that performance rules, citing one precision bomb saves hundreds of non-precision bombs plus countless collateral damage. Others may quickly point out that MRAP may be the most expensive platform that the Army will ever own, but how can you put a price on all of the lives saved? Yet others will argue that it all boils down to cost. With escalating federal deficits and shaky economic times, the reality is that we need to be very judicious with our spending.

We enter many programs with great intentions on delivering superior performance that will lower casualties and lifecycle costs only to realize later that reaching the end costs triple what we expected with higher unreliability costs. We reach a point of no return that results in fielding half as many products than originally planned.

Nobody wants this, not the DOD, not the war fighter, not the contractor, and not the tax payer. Nobody sets out to do this deliberately. It is not a conspiracy or a fleecing of the government. It is more a lack of understanding of the true total costs required to deliver 100% of the functional requirements along with over-emphasis on subsystem capability as opposed to total system integration and optimization. We are eager to deliver everything, all the time, on both sides of the fence and our enthusiasm often trumps reality. Maybe the 80% solution (usually faster and more reliable) would have served our war fighting efforts better, or maybe the prime should have done a better job integrating systems, or maybe the requirements forced a sub-optimal design. In most cases today these answers are left for hindsight. The fact is, this stuff is hard.

"In the future your estimates must be right because there will be no additional funds."

Brigadier General Michael M. Brogan
Commander, Marine Corps Systems Command
From the NDIA 2008 Combat Vehicles Conference

As BG Michael Brogan said, the DOD will ultimately move to a fixed cost basis. This is a double edged sword. Both sides of the fence must enter the program with realistic expectations or someone will be disappointed – a situation no one can afford.

We must do diligence to ensure that our programs deliver efficiency in terms of "Total Accounted Costs." We must engage an up-front system or mechanism that provides a means to trade risks, performance, costs and design intent more thoroughly and

accurately before we invest in development. We must enter the development process with a higher confidence of successful outcome than we have in the past.

Munro & Associates' only job for 20 years has been improving product reliability and quality, while reducing complexity and "Total Accounted Costs." While it is our customers' job to deliver functionality to the war fighter, our job is to be the voice for producibility, reliability and affordability for all phases of product life for all stakeholders.

In doing this, Munro has developed repeatable methods with consistent metrics that expose, quantify and predict production and lifecycle cost drivers and risks. The key is identifying, measuring and managing the drivers as opposed to dealing with the resultants.

Munro has packaged these capabilities into a standardized suite of tools; Design Profit®, The Wall Process®, and our Benchmarking Information Center®. These methods are deployable for any organization that wants to know the costs, risks and probability of success of a product, or product change before investing in its development.

These tools can be deployed by the DOD to:

- Better evaluate near term, medium and long term solutions to current system fixes or capabilities insertion
- Generate less complex and better integrated design solutions
- Expose operational and serviceability issues early in the development phase so we can design in better end use delight
- Streamline the continuous improvement of your systems with metrics for lower lifecycle costs
- Evaluate producibility, risks and total costs for a proposed product design before investing in its development
- ***Engage with your prime contractors very early in a program with better, consistent tools and metrics to perform trade studies on requirements, integration, serviceability, design alternatives, lifecycle costs, etc. so that all parties enter the development process with higher confidence for success!***

Design Profit® is both a Tool and a Methodology

The Design Profit® method exposes and manages complexity, quality and producibility in products and processes. Design Profit® software is a tool that models and tracks metrics for complexity, quality and producibility throughout the product lifecycle.

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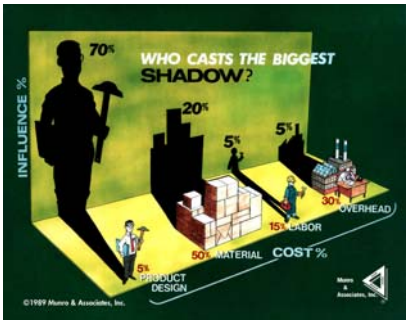
Design Profit® is a common language tool that provides early direction to drive lower lifecycle costs and manages details for quality, producibility, reliability and customer delight throughout the product lifecycle.



Munro & Associates, Inc. has founded our business on the principal that in order to get to the drivers, influencers and root cause of "Total Accounted Cost" you must touch the design of a product. All of our tools and methodologies are dedicated to providing a means to analyze, predict and measure total accounted cost at the design concept phase, driving innovation into the design at the concept phase, and ensuring that producibility, reliability and customer delight are carried through the development lifecycle.

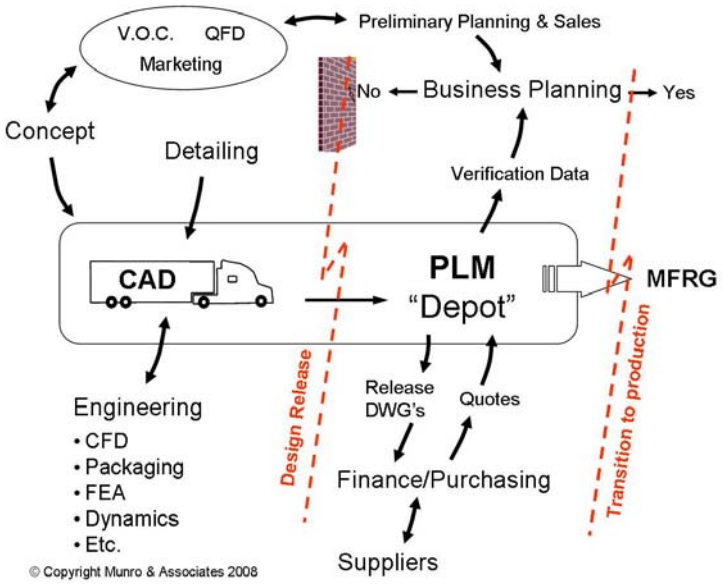
Computer Aided Engineering (CAE) is standard procedure in all product development today. Virtual analysis of performance and functionality is essential to reduce costly physical testing and time to market. In some cases, we could not produce the products today without CAE. No program would dream of proceeding without CAE.

Yet only 30 years ago CAE was in its infancy. Many questioned the validity and accuracy of things such as boundary conditions, element types, geometric approximations and computer requirements. What was unimaginable for many has become mainstream today. CAE provides vital information earlier in the development cycle.

PLM systems from the leading CAD suppliers have further improved our capabilities in managing data through the product development lifecycle.

The central focus for CAE and PLM systems are the CAD parts, performance and functionality.

As we see depicted in the chart on the right, while PLM provides rigor in data control, by the time finance is really involved, the design has already been released. If financial issues arise, going back is almost impossible, so our only option is to move forward with less profit. Another trip point comes as we transition to production, where our next defense comes in the form of lean manufacturing and six sigma quality control to save as much money as possible.



Generalized PLM Process

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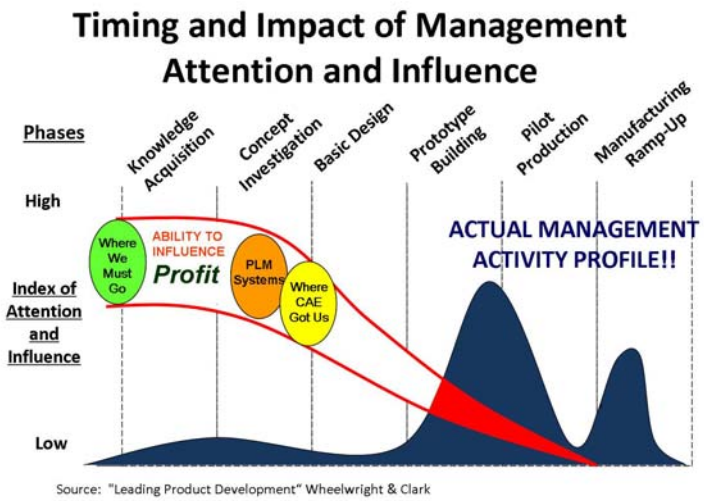
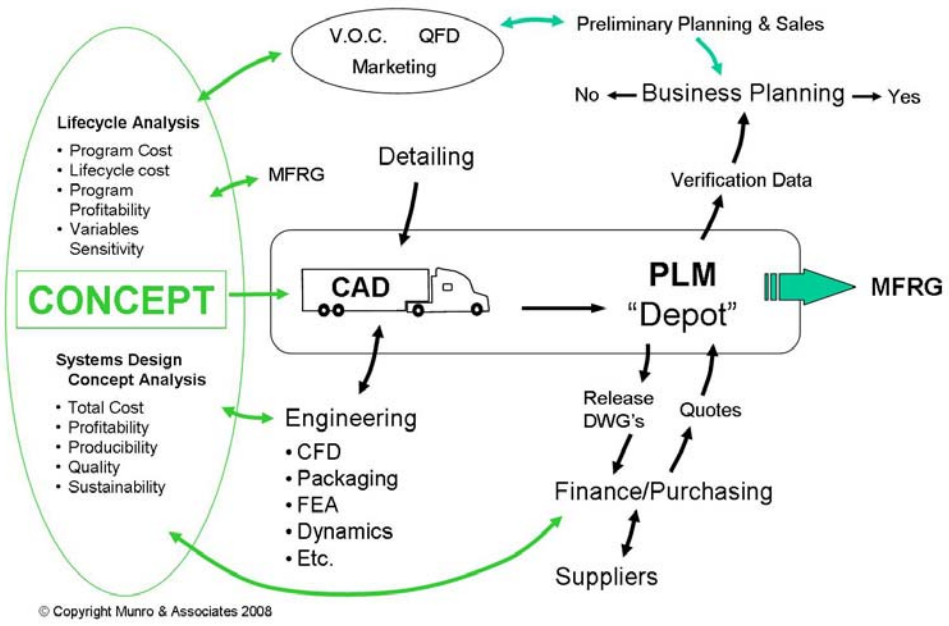
CAE and PLM systems have been a valuable asset for product development. They have helped us by providing more knowledge earlier in the development process and manage the data in a controlled manner to production. The limitation is that they predominantly focus on functionality and performance.



Many charts and studies have shown the need for knowledge earlier in the development process. As depicted in this chart from Wheelwright and Clark, the ability to influence profit (or more bang for your buck for the defense buyer) lies very early in the product development cycle. Yet management involvement and spending escalate during initial production and again at full production. Overlaid on the chart we see where CAE and PLM Systems have moved us up in the process. We see in the green oval that we still have room to move even earlier in the process to DRIVE profit and success.

An area for improvement in the development process is to perform more thorough "Virtual Financial Business Case" analyses before entering into the PLM process. The development process is expensive and a one way trip. We must not enter until we are confident that we will emerge with success in production and sustainment.



As depicted, virtual analysis of the product design for systems and program lifecycle costs, quality, reliability, producibility, etc. will drive success.

Enter the PLM Process with Higher Confidence of Success!

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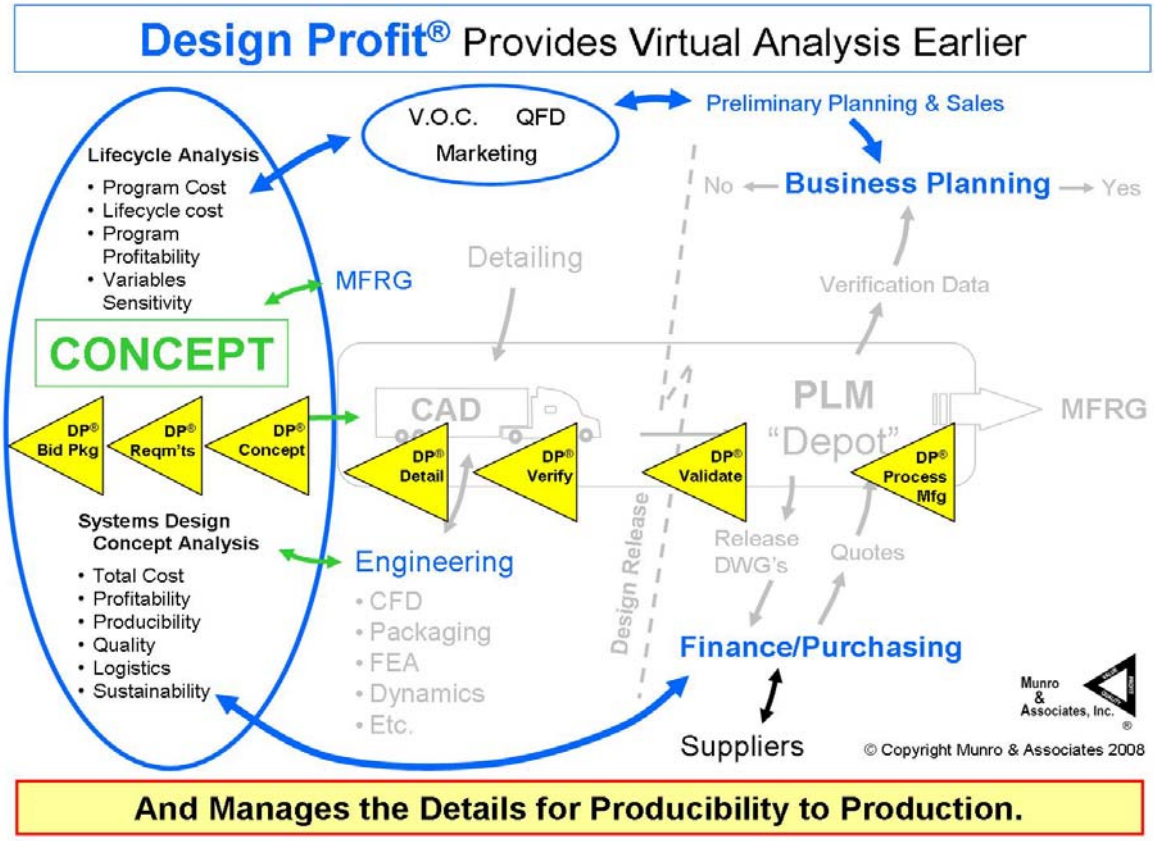
Virtual Financial Business Case analysis that integrates voice of the customer, lifecycle costs, finance, manufacturing, and design concept, before we commit to development, is the next frontier. With budgets getting tighter and fixed cost programs on the horizon, we have no choice but to enter ***only*** into well planned and financially vetted ventures.

Munro & Associates, Inc. has been developing its methods and tools in this up-front virtual business case space for 20 years. Munro has also learned that what we develop in this concept space effort must be nurtured and tracked throughout product development.



Munro's Design Profit® was designed as a method and tool to expose, quantify and predict total accounted cost in the design concept phase. It has been developed and refined to manage the details throughout the development process.

In the concept phase the government and contractor work together to perform a thorough "Virtual Financial Business Case" analyses of the design before entering into the development process.

During execution, Design Profit® tracks and reports metrics back to the contractor and government as a real-time mechanism that exposes potential downstream threats and indicates program's financial status.

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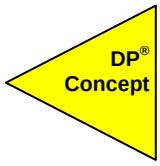
Design Profit® Insertion Points into the Product Development Process

DP® Bid Package – Early estimate of systems integration and overall product cost and risk. Rough labor estimates, material costs, and cost prioritized list of development risks are generated to support business planning, program capture and bidding.

DP® Requirements – Generate design concepts to quantify the cost, quality and reliability impacts of individual requirements. The objective of this iteration is to identify suspect requirements and provide data to the customer to encourage earlier assessment of contract changes to minimize expensive downstream changes and speed development.



DP® Concept – Develop a baseline cost model for initial design and generate redesign concepts using innovation insertion. First pass focuses on systems integration and sub-system content allocation. Subsequent passes focus on individual subsystems. Final pass reintegrates all subsystems and provides a detailed test strategy.

DP® Detail – Update the DP model to include detailed quantification of assembly, manufacturing and quality data. Analysis baseline is the initial Engineered Model. Knowledge gained is used to ensure the final engineered model meets manufacturing and customer requirements from a build and quality / reliability standpoint.

DP® Verify – Update the DP model with supplier quotes and better time estimates. Quotes for Initial Production and Full Rate Production tooling and parts are used to make final refinements. Identify potential Full Rate Production technology evolution.

DP® Validate – Use the model to provide validated, documented evidence of design intent.

DP® Process Mfg – Evolve DP model into manufacturing process model. Perform line balance and identify workstation and headcount requirements accounting for test, rework, etc. Feed manufacturing process sheets, work instructions, etc.

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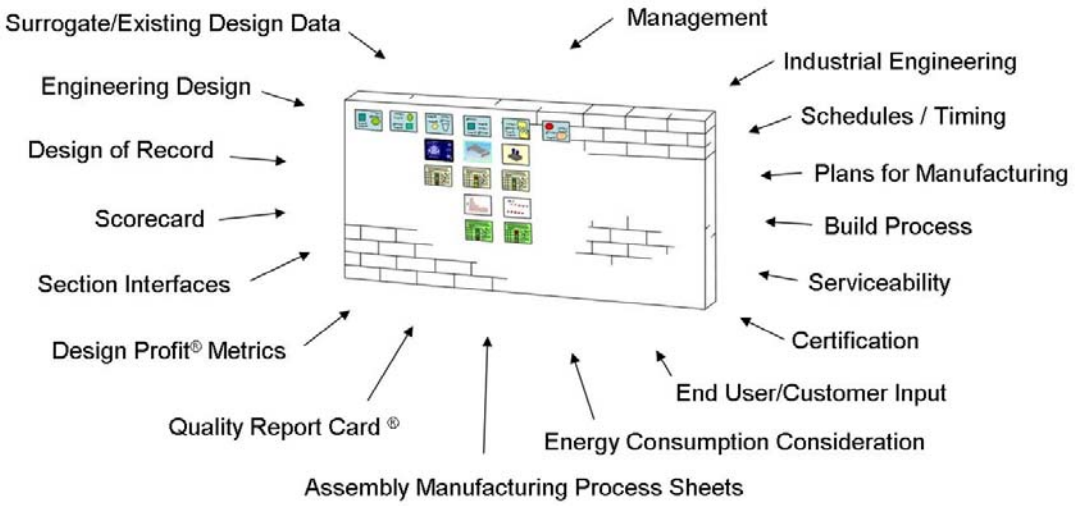
The Wall Process® is a Visual Management of the Build Process

Munro & Associates' Wall Process® is a visual management system to bring downstream voices into the design and development process and expose opportunities for integration among systems.



The Wall Process® is an effective and efficient means to bring people together and display the latest product and process program information in a single venue. It levels accountability among all disciplines, prevents team members from hiding with critical data for any length of time, and exposes systems integration issues and opportunities.

Munro's Benchmarking Information Center® Finds Innovation

Innovation is not free. Good ideas, progressive technology, and clever designs must be sought out. The search includes benchmarking and teardown of products from all industries, supplier community capabilities, latest manufacturing techniques, and new materials. Munro has created an environment for collaboration to nurture and facilitate this exchange of innovation.

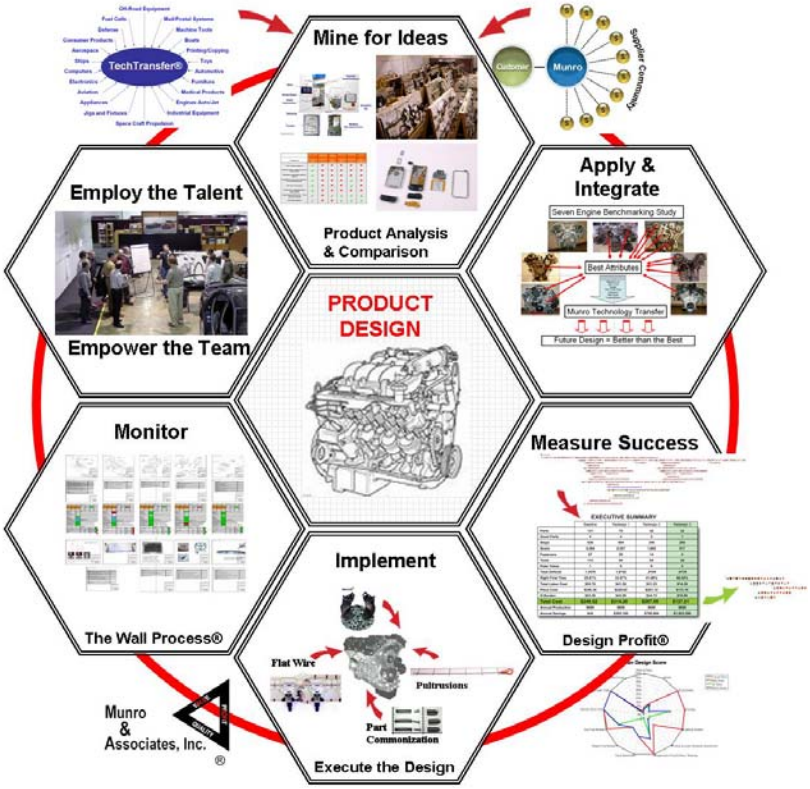
Munro has collected data on competitive and outside industry products to increase the knowledge base and the number of ideas feeding product development to ensure future designs will eclipse the present state and satisfy un-met future customer needs.

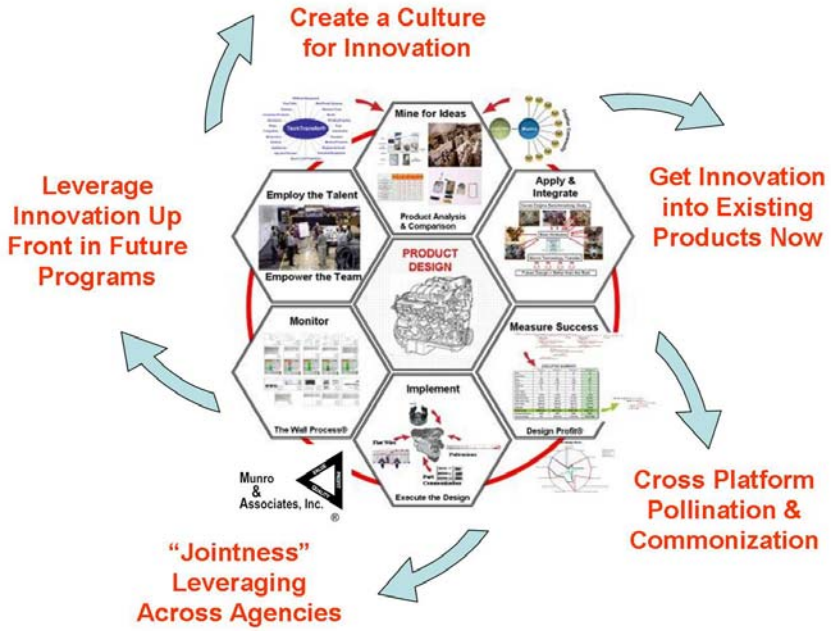
Munro Innovation Roadmap
Bringing it all Together to Drive Innovation Into Products

While "Innovation" is the latest popular trend, it doesn't magically happen and it's not free. Innovation must be nurtured. It requires hard work and dedication, with real and repeatable tools and methods.

Munro has developed a structured approach and strategy for innovation. Refined over 20 years, thousands of programs and dozens of Industries, the basic components include:

- Mine for Ideas
- Apply and Integrate into New Concepts
- Measure for Success
- Implement and Execute
- Monitor and Maintain Execution to Targets
- Employ the Talent, Empower the Team





The best time to get started is NOW! There is no perfect time to engage. The programs are where they are in their lifecycles – we don't get to choose that. Once we begin we can get quick results by implementing "Level 1" ideas into our existing products. We then further leverage that gold across platforms and agencies. Ultimately we will get in front of new programs or product redesign efforts with dramatic progress as we create a culture for Innovation!

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Performance and Cost are Peers of Equal Importance

The traditional trade space in development is dominated by performance, technical risk, subsystem integration and schedule. Over the past 40 years the CAE industry has boomed to support the staggering demand for more information earlier in the development process.

It is time to give cost consideration its equal due. Just as early virtual engineering analysis has become an essential tool, so will early virtual financial business case analysis. To coin a phrase, ***Computer Aided Financial Modeling*** (CAFM) is the next frontier. This will be true for defense and commercial industries alike. We are entering a time where global knowledge and capabilities are forcing greater value for lower costs. Only the strong will survive. It will no longer be good enough to search for cheaper commodities from off shore suppliers. It must be assumed that every manufacture now stands on equal ground because we are all capable of global out reach, six sigma and lean manufacturing. Any program that enters into development without thoroughly analyzing its "Total Accounted Costs," and exposing and predicting where the pit falls and high cost, high risk DRIVERS are hiding, will face an uncertain and dicey future.

The best design space will include the voice of the customer, requirements, cost, performance, risk and schedule as equal players. The organizations that learn to work together in the up-front, virtual space before entering into a one way, one chance development process will survive. This stuff is hard, prepare for battle now.

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