

Selling Systems Engineering - Winning the Fight to do Things Right!

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Abstract

Thanks in large part to the efforts of International Council on Systems Engineering (INCOSE) leaders and membership around the world, Systems Engineering (SE) is now becoming recognized as a legitimate profession.

Unfortunately, though, that recognition does not automatically imply understanding of what we do, nor guarantee acceptance throughout your business organization. No SE effort can hope to be effective without a healthy combination of people, tools, time, and political support- and all of these require a strong business case to obtain and sustain.

Unless you can sell SE to the rest of your organization, you will never have a legitimate opportunity to demonstrate the value of what we as a community can do. Effective management of SE thus requires expertise not only within the discipline, but expertise in *explaining* the discipline as well. This short paper provides important insight that will help you gain the support you need to do things right!

THE CHALLENGE

We Are a New Profession

The logic of SE has been around for centuries, but the title has not. Unlike Mechanical Engineering, Automotive Repair, Nursing, or a thousand other professions whose purpose and value is commonly accepted, the title "System Engineer" does not universally communicate what we do.

Within a subset of the Military Aerospace and NASA community there is familiarity with the term, but even there we are now more widely associated with stacks of documentation than recognized as a valuable and essential design function.

In the commercial sector the title is often confused with that of someone who designs office computer networks and supports them when people have problems. While that is no doubt an increasingly important skill, it in no way conveys the immense potential value we offer to commercial organizations.

An even greater number of people worldwide have never heard of Systems Engineering at all. *In marketing terms, we lack brand recognition.*

Our Product is the Absence of Problems

What we offer is the ability to confidently design complex products of any desired scale. Those with experience in this field understand how incredibly important that statement is, partly because of what it offers, but also because of what it avoids.

The trial and error approach to complex systems is a painfully inefficient and risky way to do business, and the inevitable failures cost not only money and pride but also sometimes lives. Unfortunately, those problems only become "real" once it is too late to avoid them. Wellness is a fuzzy concept, whereas a broken arm is absolutely obvious. Until you've broken your own arm, though, it's something that apparently only happens to other people.

The benefit of risk avoidance is difficult to quantify, particularly if those you are trying to sell to don't understand that they are at risk in the first place.

SE is More Often Imposed by Outsiders than Embraced from Within

Remember when you were a kid and some well intentioned adult told you to "wear a helmet when you ride your bike"? It's unlikely that your response was a rational one of gratitude for their concern about your well-being. More likely you resented what seemed to be their lack of confidence in your ability to avoid falling down, and since you obviously weren't dead yet, the risk must not be very significant. Besides, wearing a helmet can be uncomfortable and you may never need it.

The harder you try to impose something that isn't accepted, the greater the degree of resentment and non-compliance.

We Typically Operate within Manufacturing Derived Management Systems

The goal of Manufacturing is to make as many exact copies of a 100% pre-defined article as possible, and to do so at the lowest possible cost. Product cost and quality are easily quantified, and the manufacturing sequence can be absolutely defined in advance. Even the most beneficial changes are unwelcome, since fixed costs are amortized across the number of units produced. Value is associated with product, and everything else is considered a cost to be minimized.

However effective modern manufacturing methods may be, their success depends upon a very delicate and artificial set of conditions found only within Manufacturing. The power of SE resides in dimensions that have no precedent in the Manufacturing subset of the business life cycle.

SE is an investment whose return must be maximized, not an overhead cost to be minimized or eliminated.

A Poor SE Implementation is Often Worse Than None at All

Whether it is because the people involved lacked skills or training, sufficient lead time to influence design, authority to direct or control the effort, or were not supported by adequate tools, the reality of SE in practice is that there are plenty of examples where a lot of money was spent and nothing of perceived value was obtained as a result.

Problems also commonly arise when a decision is made to implement a complex tool set without proper planning to address the associated process, training, set up, and operational support overhead involved.

Regardless of why the attempts fail, to those who understand what SE can do the message is one of squandered opportunity.

To those who resent a change from business as usual, though, the message is "we tried that once and it didn't work".

The marketplace is, unfortunately, widely tarnished with examples of SE "failure".

DETERMINING WHAT YOU NEED

Day One Presence

Unless the SE function is present immediately after project launch (and preferably exists as a continuation of pre-launch effort) you will find that the project is already operating on ad hoc methods and you will be viewed as a barrier to progress no matter how sound the recommendations you provide.

Critical Mass

SE effort is always on the critical path, and that means you must have enough bandwidth to perform the tasks in the available time. Obviously more time means you can do a larger volume of work with a smaller staff, but be aware that undersized organizations typically lack the capacity to do them well. This is especially critical up front, since delays in establishing System Level requirements will translate into delays in the parallel execution of lower level design effort.

Operating Authority

Unless real authority, formal or informal, is held by the SE function, it will be extremely difficult to gather required information in a timely manner, obtain and retain resources, and ultimately pass results into the larger organization. Many attempts to implement an SE function fail because the effort essentially takes place outside the normal project environment and authority structures. Small wonder, then, that the project continues to operate on a "business as usual" basis.

UNDERSTANDING THE MARKET

Not one, but a Collection of Markets, each with Different Needs and "Price Points"

Experienced SE practitioners commonly speak of the need to tailor SE implementation based on the needs of individual project circumstances. The same is true at a higher level with the different markets we serve.

Military / Aerospace / NASA

This market is defined by clear Customer expectation and imposition of specific SE methodologies and requirements. Still though, different agencies and procurements create a range of "How serious are they about SE?" circumstances that must be balanced against the effort being bid.

In some cases the goal of the Customer is merely to satisfy the contract requirement for an "SE effort" and the will to adequately fund and support that effort is missing. In other cases, a bidder who clearly expresses an understanding of SE methods and presents compelling advantages related to the technical criteria of award will benefit greatly.

Complex Commercial

This market is defined by tasks whose nature would benefit greatly from the core logic of SE practices, but whose management is almost completely unfamiliar with the SE profession.

Expect to encounter a host of simplistic tools and methods being applied "from the ground up" as an attempt to create sustainable innovation processes. Expect also to be treated as a cost to be minimized, and subject to the latest "lean" management fads.

SALES STRATEGIES

Know Your Customer, Start Early

Given the lack of market recognition of either the discipline or the benefit, you'll need to do a lot of "pre-sale" education and support building.

Skip the Jargon

You may think the EIA model is superior to a spiral or waterfall version, but don't expect those terms to automatically communicate value to your customer. The key is to define the potential benefits (radical innovation, predictable quality, manageable and repeatable process, warranty and support cost reduction) without implying extraordinary overhead and accomplishment expense.

A "maximum thought / minimum paper" approach is essential.

Don't Rely Exclusively on Early Adopters

In many ways, the success that SE has enjoyed in the Aerospace community is analogous to that of early computer industry acceptance. Until the message, methods and benefits become universal, we won't have a mass market product.

There needs to be a reasonable expectation, demonstrated by practice, that the methods and concepts can be spread throughout the overall organization to any point where they offer compelling benefit.

Speak of Investment, not Cost

Unlike costs, investments are expenditures upon which you expect to get not only your money back but also an additional benefit. The psychology is particularly important in an era where every Manufacturing-oriented manager is searching for costs to cut.

Finding the best return on investment point is a very different discussion than arguing for increased costs.

Design Challenges Come in Many Forms

You don't need to be designing next generation military aircraft to need SE. Even simple projects can involve a large number of interfaces and sequential baselines, and when the design team isn't co-located the importance of coordination increases enormously.

Emphasize that the Risk Grows with Interfaces, not Dollar Amount

Many people will claim that they don't need formal methods because they didn't use them last time and everything turned out just fine. (A little digging generally reveals that their definition of "fine" is a bit generous...)

Doubling the project value doesn't automatically double the design complexity. Producing twice as many independent units is a very minor change, whereas merging two existing systems may be hundreds of more times more challenging than either by itself.

Beware of Ego and Addiction to Risk

In most organizations, promotions aren't given to those who quietly do perfect work time after time, but rather to those who visibly save the company from some terrible problem.

Many of these so called "fire-fighters" moonlight as arsonists and won't welcome formal systems they feel cramp their style or expose their errors. The larger success of the company, of course, requires just that. Depending upon the level at which the problem managers operate, it is often necessary to secure Senior Management support.

RELATED REFERENCES

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BIOGRAPHY



Mr. Iliff has over 30 years experience working on developmental projects ranging in size from a few thousand to well over a billion dollars, and has participated in all phases of project execution from proposal to close out. He has held Proposal Manager, Project Manager, Systems Engineering Manager, Engineering Manager, and other related titles in multiple industries, and is now the Director of Strategic Innovation and Senior Systems Engineer for Bjorksten | bit 7 in Madison, Wisconsin. He earned his B.S. in Engineering / Industrial Design from Michigan State University, holds an M.S. in Systems Management, Research and Development from the University of Southern California, and received Honorary Fellow appointment at the University of Wisconsin Antarctic Astronomy and Astrophysics Research Institute when he served as the Systems Engineering Manager for the ICECUBE project. Mr. Iliff is a charter member of the International Council On Systems Engineering (INCOSE), founder / prior Chairman of the INCOSE Commercial Practices Working Group, and a member of the Project Management Institute (PMI).

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