



10 Dumb Statements on Estimating

Confessions of a Cost Lifer

White Paper

Abstract

You don't spend 30 years in the cost estimating field without uttering and hearing a fair share of silly, if not plain old stupid remarks. This doesn't refer to the everyday missteps that all humans experience; those are typically one-off innocent mistakes. This presentation deals with the more frequently heard excuses, complaints, and obstacles to estimating that anyone in the field is likely to hear on any given day. Because the statements on the list are often subversive and offered by those with little, if any topical experience, they are deemed to truly deserve the categorization of dumb.

While the subject is covered in a light-hearted way, the intent is to address the psychological battle that estimators must often wage within the community we serve. Ours is not a well respected profession. Our products and methods are often subjected to far more scrutiny and criticism than are the requirements, engineering, and program documents we rely upon for development of an estimate. Learning to accept the situation and to meet the challenge of addressing dumb statements can be the most effective way to gain both respect for estimating and the engagement of reluctant participants.

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10 Dumb Statements on Estimating

Why the List?

You can be forgiven if you decide to pass on reading this because it sounds like a negative piece of work. It is a negative piece of work. It may be a dangerous thing to print – imagine all of the damage a negative piece written by a quasi-satirical (cynical?) author can inject into impressionable cost analysts. Why not write about the 10 most sagacious things said? Maybe, because no one will remember that.

Experience is a great teacher. For most of us, our mistakes and negative experiences linger in our minds far longer than our successes; it is a sad truth about human psychology. How often have you said or heard someone say, “I learned that the hard way” The hard way usually means we learn by erring in an endeavor on the first attempt. But, after picking up the pieces from a failure, or as a result of having to pick up the pieces, we are less likely to make the same error again. It seems that we learn more easily from mistakes than we do from successes. Therefore, it is in the spirit of more profound impact via negativity that these 10 Dumb Statements are offered for your consideration.

#1: The Incredible Talking Model

That's what the model says it will cost - - - Pablo the Parametrician

Pablo, there is an expression that goes like this: “A fool with a tool is still a fool.” Such people are likely to utter dumb statement number 1 on a daily basis. Rather than take control of and responsibility for an estimating problem, they are content to exert the minimum effort possible to round up the minimum information needed to use a cost model to produce an estimate. Once the estimate sees the light of day and a basis for it

requested, the model slave will say, “That’s what I get from the model when I run it.”

Wow! Not only can this model talk, but it can also jog, or sprint. Yo, Pablo – don’t use a model if you don’t understand how it works! No one gains any comfort from dumb statement number 1. And, while it may be tempting to label as fools all who utter this, in fact most are not fools and sadly, many probably have a very sound basis for their estimate and use of their model. Then, why do we hear this dumb expression? A few possible reasons are:

- **Left the expert behind.** Occasionally, the person briefing or defending the estimate will attempt to do so alone. If he/she produced the estimate, this makes sense. But, if he or she is the manager of the person who produced the estimate, this can be disastrous. The calamity usually arises when the recipient of the review asks about the basis of the method used for the estimate. Without a voice to articulate this clearly on the spot, credibility of the estimate and the estimating method are lost. Most managers know this, which is why they bring the method expert along for the review. For those who do not, the only hope is that the head reviewer will show as much disinterest in the estimating method as the manager who shows up naked.
- **To avoid being shot** – not literally, but shot as in shoot the messenger. Let’s face it, very few estimates are ever embraced and welcomed by anyone. If someone likes your number, at least 5 others hate it; 10 if you have a realistic number. An inanimate object like a cost model doesn’t feel belittled and unappreciated if a crowd shoots at it. So, diverting attention away from personal responsibility to the model is an

effective shielding tactic. But, it won't save the credibility of the estimate.

- **To minimize explanation.** Hard as it may seem to believe, not everyone loves cost estimating. An experienced estimator learns that brevity is most often preferred by the consumers of an estimate. Everyone wants a satisfying number with a feel-good pill in 10 words or less. Since, "That's what the model says it will cost," is only eight words, it's a natural for the job.

It is human nature to avoid the unpleasantness of being the bearer of bad tidings and also having to defend those tidings. But, there is far greater discomfort in being dismissed as professionally irrelevant for not accepting accountability for your estimates. Establishing an estimating system based upon a verified cost model supported by up-to-date calibration and a relevant database is not a license for substituting due diligence with dumb statement number 1. There are no shortcuts to patient and thorough explanation of estimate basis.

#2: Invention of the Wheel

This is brand new; nothing like it has ever been done before - - - Darla the Design Engineer

No fair Darla - only the original inventor of the wheel can really say this without getting a dumb button. There are relatives to this statement - see number 5. This particular statement pertains to the technical challenge of a project as opposed to the business challenge. It could be the introduction of a new technology, a new product line, or the magnitude of difference in an evolutionary cycle of a product compared to prior cycles.

There are two contexts for interpreting change pertinent to all of us:

- We judge the amount or impact of change on the basis of our experience with past changes.

- We overestimate the impact of a proposed change whenever we are directly affected by the change.

How much technical content change is there in any one automobile model from year to year? It is probably much less than 10%. According to a 1991 report on the U.S. motor vehicle industry and market by the Volpe National Transportation Systems Center, a "major" model changeover represents 20 percent change in content and takes between two and four years to bring to market. An "all new" model changeover is 50 to 70 percent content change and takes between three to five years to bring to market. What would you say if you were an automobile designer who had spent the past 10 years working on next years model Ford Mustang and are now suddenly tasked with working on the design for the new model to replace Mustang? Could it be statement 2?

The US Army Future Combat System (FCS) has produced other examples of overstated change. The biggest change areas for FCS have probably been in business management, and even those are not really revolutionary (see #5). Many of the assets under FCS development right now are like the "all new automobile;" the next generation of ground mobile vehicles, unpiloted air vehicles, and command and control systems – no more revolutionary than the systems they will replace were when they were developed.

Estimators don't often make dumb statement number 2, but they often hear it as a reason why their methods won't work. "I hope you don't plan to use history as a basis to estimate this project, because it won't work; we are doing something never attempted before," a project advocate will say. You bite your tongue, but you really want to say:

- **How do you know it has never been attempted before?** To the gladiator in the arena, the entire world is reduced to the lion that stalks him. Nothing else matters if the lion can't be

defeated. A similar mind set constrains the universe of the developer tasked with a challenging project. When he or she says that nothing like this has ever been attempted before, a few key words are omitted – I have never attempted anything like this before.

- **Since I can't use history, I'll use catastrophe theory.** Originated by the French mathematician Rene Thom in the 1960s, catastrophe theory is a special branch of dynamical systems theory. It applies to systems that undergo either gradual or sudden changes in behavior (called catastrophes by Thom) due to gradually changing forces. Catastrophe theory has been applied to phenomena such as the stability of ships at sea and their capsizing, bridge collapse, and the fight-or-flight behavior of animals and prison riots. At face value, this might be the best approach to estimating the cost of the brand new product created in the brand new world. It shouldn't be too difficult to get agreement on that from the auditors and independent program reviewers. Good luck.

A respected business associate once told me, "We are estimators, not exacters." To estimate the value of an item that has a value-based transaction history (e.g. prior purchase or sale), use of the transaction history as basis for estimate is sound practice. When there is no such history for an item, the only real basis is to use a surrogate item that has a history together with an appropriate method for measuring the estimated impact of all that is new or different about the new item.

#3: Suits on Sale - One Price Fits All

If I knew how much SLOC I have, I would know the cost/ (or schedule) - - - Software Developer Stan

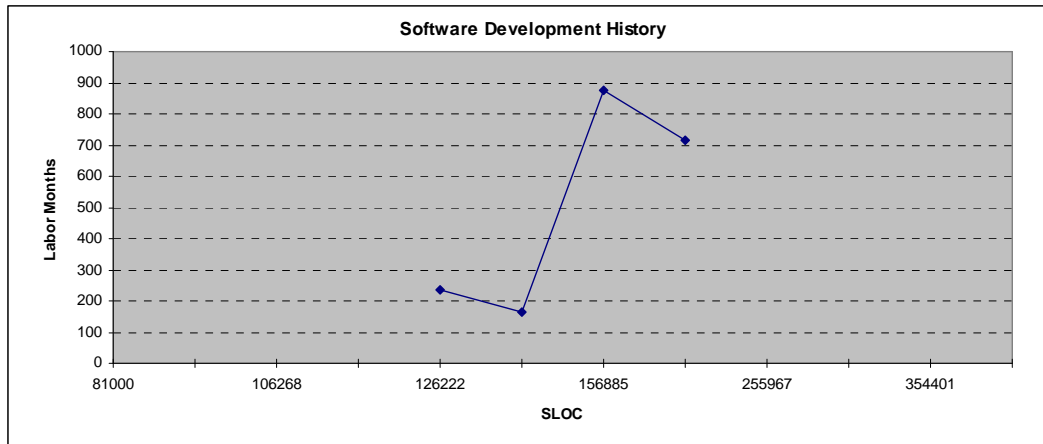
Are you frustrated like Stan knowing that most cost estimating methods for software development require a size metric? If so, join the crowd. This statement has a number of variants dealing with

estimating drivers for hardware projects (weight), building construction (number of rooms), and Systems Engineering (number of requirements). Not every 44L men's suit for sale at Macy's carries the same price and not every item weighing 5 kilograms cost the same. This seems like pretty simple understanding. So, why do some people make statements like number 3?

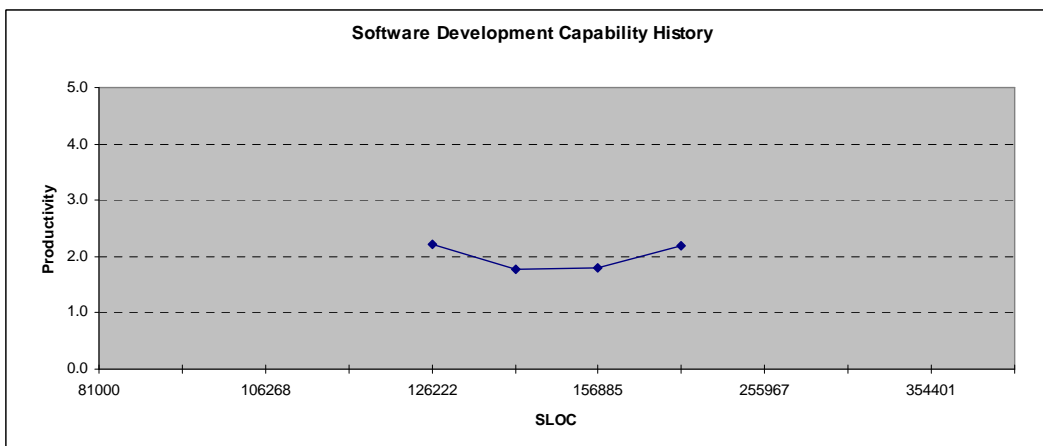
Here again, we have another obstacle presented by someone we need as a partner to our estimate – usually a source of information. The problem is often lack of method understanding by the person making the statement. He or she hears a request for an estimate for software size and immediately presumes that whatever the answer is will be multiplied by a productivity factor to arrive at the effort estimate. Very possibly, the other party may have been wronged by such a simple approach in the past.

One of the best ways to address the protest associated with this statement is to show that you and your estimating method understand that the effort and time required developing software projects of a given size are not necessarily all the same. I don't propose a tour through my technique; rather, a few pointed pictures can be very effective – consider the following:

- Here's a sample of the data base I use.** Notice that the labor months for these 4 projects of similar size (within 33%) vary quite a bit (over 400%). Why? Things like amount of reuse, processing complexity, team skill, and others are different and as a result, so is the development effort. This helps establish at least a small amount of credibility that you may understand the realities of software size as it relates to development effort.



- Here's how my estimating technique deals with this mess.** We want to extend any credibility we have established to include agreement that we have a reasonable way of dealing with real project variations. We don't just take a size and multiply it by productivity constant. Rather, we multiply it by a series of variables, each dealing with the variances in projects. The chart above shows history. A good estimating method will rationally predict history from a measurable capability base that is modulated by the variances representing project realities. The chart below shows how the technique mathematically removes the variances so that we can visualize the measurable capability. The noise in the capability measure is minimal – what we would expect since this data is extracted from the experience base of a single development organization.



Armed with a few well conceived aids to explain estimating technique, we are much more likely to gain the cooperative participation of those with knowledge we need to prepare a good estimate. If a source does not buy-in to the estimating process, any information provided is suspect since the objective of the source is the quickest way to end his/her participation in the estimating process, not the most credible way to end it.

Here's an anecdote related to dumb statement 3. An Engineer (like Stan) once said to an estimator during an interview to help size a circuit card, "I can show you 2 cards with the same weight, but one is gold plated, and your cost method will give me the same price for both – can't be." And, all the estimator did was asked the engineer if he had an estimated weight for the card! As the Engineer sat back, smug with the confidence he had sent the estimator packing, the estimator asked: "Can you show me one of these gold plated cards? I've been all through the inventory of circuit cards we have ever made and have never seen one. Oh, you were speaking hypothetically! Coating a circuit card with gold sounds like a pretty expensive way to prove you can trick an estimating method into giving the wrong answer. I know a lot simpler, less expensive ways to do it. It's easy to mislead a method. But, since my goal is to use methods wisely and with the best information I can get, I generally bypass gaming my methods."

#4: Playing Catch Blindfolded

I'll need you to complete this questionnaire before I can produce an estimate for you. - - - Neilson the Analyst

Neilson has a handy-dandy questionnaire. All you need to do is fill it out and he can produce an estimate for you. Sounds simple, doesn't it? And, it might be simple, until you get a look at his questionnaire and realize you need the help of about a half-dozen people to fill it out accurately. You have a decision to make: do I just wing it and guess for the six people I really need to confer with or do I take the time to do it right? As usual, you decide to do the right thing – consult the experts. But, then you realize that this might take you six weeks, so you change plans and decide to fill out the questionnaire as best you can without consulting others.

Neilson gets your completed questionnaire and uses the data to produce the estimate. He briefs the result to management. They hate the answer, ask to be

shown the basis of estimate, and cringe when Neilson gives them the old number 1 - *That's what the model says it will cost!*

How did things get this bad? Most likely it all started by Neilson insisting that his information source(s) complete a questionnaire. After all, you asked Neilson, "What information do you need from me to do your estimating?" Since he had a questionnaire ready, it seemed like a natural response. But, most non-estimators become intimidated by the amount of information requested on forms. In addition, they don't understand the context of all entries or which ones are the most critical or the least important. Since the questionnaire can't hear or speak, no dialog is possible for clarification. There is a better way.

- **Respond to *What do you need? with, What do you have?*** If you look at an estimating exercise as a one period game, you will need to get all of your information in one bite. But, if you approach it as a multi-period contest, with several give and take sessions, some beneficial things can result. Your source is likely to become more engaged in the estimating process this way, which often results in some amount of assumed ownership for the estimate by the source – always a good thing. He or she will also gain better understanding of those same entry items that are foreign when only the questionnaire is used. You don't gain understanding and buy-in with a form; personal interaction is the way.
- **Use the form to document.** There is a place for questionnaires and forms for data collection to support estimating. It is toward the end of the process when all impacts of answers to questions are understood and misunderstandings about what is being asked are corrected. Only then will the estimator have confidence that he/she has the best data available from the source. At that point it is not only preferable, but almost mandatory that the data used for the estimate be clearly documented. Artifacts such as the

Parametric Data Collection Form (previously the DD 2089) and the various CARs (Cost Analysis Requirements Document) popular with government agencies are excellent for documentation purposes.

#5: Revolutionary Evolution

Your estimate won't be any good if you base it on history because we intend to do this job differently; no more of the old stuff – we're going to be doing business a new way. - - - Fidel the Program Manager

Fidel's compatriots might alter this statement a bit; something like, "this isn't business as usual; we are going to run this project under a new way of doing business." That new way of doing business is presumably a better way; the speaker knows because he or she read about it in business journal or trade best seller.

In fact, unless there is revolution involving warfare, a sudden change to any new order is very unlikely. Change is usually gradual and requires turnover of at least one generation before it is culturally integrated and accepted. By then, further new change has probably been introduced as some form of alteration of the evolved order. What we call new ideas, new procedures, and new ways of doing things are often nothing more than naturally evolving changes. When we read about them many years after the fact, we see this clearly. But, when it involves us and we are in the midst of change, any newness captures our attention in a disproportionate way.

The US Army Future Combat System (FCS) was offered earlier as an example of over-stated change in weapon system newness. When first introduced over 5 years ago, FCS was tagged as an acquisition revolution in every way: from specifying performance needs instead of specific systems to spiral/incremental development to a strange partnering of the Army with industry under something known as the Lead System Integrator (LSI), everything was now different. Actually, a case can be made that all of

these pronouncements were stated recognition of what military acquisition had already become – contractor management of government asset creation in an unstable requirements environment caused by rapidly changing threats.

As with the newness issue raised with statement 2, folks stricken with the "New" bug need a dose of objectivity that is unconstrained by their surroundings. Anything you can do to painlessly inject the medicine will help. Examples from others experiences with revolutions in the workplace can be most effective; things like:

- **Introduction of Ada in 1979** – Ada was designed to combat the high cost of other computer languages in use within embedded software systems. With its structure to more efficiently perform exception handling, data abstraction, parallel processing, and object oriented design, it was as much a new software design process as it was a new language. Yet, it was not until developers understood the intricacies of Ada that it became a more productive and higher quality standard for software development. One of the major problems cited with early use was implementation of Ada with a JOVIAL (the language most often replaced by Ada) mentality.
- **Introduction of DOD Standard 2167 in 1985** - The fact that this standard was followed within 2 years by a clarifying modification (2167a) indicates the underwhelming acceptability and understanding of this change to the standard by which all US DOD software was to be developed. In defining terminology (of things like CSC and CSCI) so that software projects might be better managed, the unfortunate result was interpretation of the standard as being rigid in always demanding adoption of the waterfall development process. It was only through establishment of an overriding standard in 1994 (Mil-Std-498), which emphasized tailored

adoption of defined phases that the intent of 2167 was finally understood.

The point of these examples is that no matter how much an individual wants to embrace a change, organizational change is a team sport. Unless a critical mass is behind a change and has adapted behavior to the new order of the change, the process will be slow and inefficient at first. Pronouncements by executives have little, if any effect on group behavior. It is best to avoid the pitfall of trying to estimate cost under a new business model until that model begins to show its face as a reality.

#6: Any Number Will Do...You In

This is just a rough order of magnitude estimate. - - - Customer Contract Representative Cleo

Cleo doesn't know she has been asked to issue dumb statement 6. The customer technical representative is the one who initiates the request for a Rough-Order-of-Magnitude (ROM) estimate. He may be starting the next phase of acquisition planning and needs an amount to submit for budgetary purposes. The organization working on the current phase of acquisition is a logical choice for development of the ROM. Adhering to contract matters communication protocol, the technical representative tasks Cleo to formally request the ROM through her contractor counterpart.

The request for ROM comes with all kinds of qualifications designed to quell any nervousness about any commitments that may be assumed:

- While the ROM should be representative of expected value, it is not expected to be as precise or as accurate a representation as a formal bid.
- The ROM will serve as the initial estimate of budget required so that planning can begin.
- The ROM will carry no commitment, implied or otherwise, of delivery on your behalf.

These statements, or ones close to them, are standard fare with every request for a ROM. They fall

in the same category as the vote of confidence and political office candidate assurance on holding the spending and taxing lines – wrong-way words.

It is just about certain that you will see your ROM come back to you in the form of a Not-to-exceed target for a requested bid. Think about it. If the customer submits a budget based upon the ROM, why should anyone expect that an authorization to spend more will be issued? Even though the circumstances surrounding an acquisition change many times in the period between ROM submission and bid submission, it does not mean that the budget changes with it. Even if a budget change is requested, it is unlikely to be approved. Why? It takes too much time to justify a change. This is the first and only law of ROMs – it is impossible to kill a ROM; you are stuck with it forever.

Since you must learn to live with a ROM, there are two actions that can offer some degree of relief from the discomfort it will cause:

- **Ignore the commitment disclaimers and treat the exercise as you would a bid.** Use every bit of relevant data and the most dependable applicable estimating methods to produce the ROM. This will probably require more time for ROM preparation that you have been given. But, this is usually one time when you can push back and get more time. The customer hasn't issued a request for proposal with all of its attendant instructions and deadlines. The ROM request is usually made with a simple one page letter. The letter will specify a date by which the ROM is requested and you will meet resistance to demanding more time. But, if ever an estimator is in the driver's seat, this is it. Your estimate is needed. You need time to do it right. Demand that you get it.
- **Deliver a range rather than a value.** Remember the, we are estimators, not exactors quote cited earlier? How can an estimator be expected to produce a single prediction value that has any

chance of being correct? It defies logic, yet we produce point estimates every day. We do so because the Great Funding Authority says we must work to a budget and a budget is just one number, not a range of numbers. If we try to submit a bid price via a range, we will probably be disregarded from the competition for non-compliance. But, we can get away with submitting a range for a ROM submission. I'm not saying we will make friends and impress people, but we can force the customer into at least a minor role in playing ROM roulette. By delivering a table of values and probabilities of cost being at or below those values, the onus of selecting a single point rests with the ROM recipient.

#7: Looking For Prairie Dogs in New York City

*Once we get the data, we can crank out our estimate.
- - - Skippy the Estimator*

I just finished reading a paper dealing with integrating system performance modeling with cost modeling to produce an effective design decision apparatus early in a program life-cycle. Here is what the author of that paper had to say about the ease of getting data, Skippy: *Cost data is still the Achilles heel in the cost modeling process. Getting enough reliable data to develop and calibrate the model is still a difficult problem.*

While this quote deals with historical data to build, adapt, or calibrate a model, the lack of available data is a situation that is commonly faced when seeking input to use for already calibrated or otherwise developed models. Strangely enough, not everyone seems to understand this. There is even a belief in a data conspiracy by some in the community – I have heard it expressed.

The data problem is ugly. Few will talk about it; it's almost taboo. Only a cost lifer sufficiently scarred by the data problem would dare address the problem. Here goes.

- **There is too much cost data.** Contrary to common complaints about there not being enough cost data, there is actually too much; so much that it is almost impossible to trace every cost item to its end product or to even verify that every cost item that needs to be included is actually included. Take the case of the missing main rotor, recently relayed by an estimating acquaintance. He referred to an incident involving the Bill of Materials (BOM) for a helicopter. The BOM was an impressive 2-foot stack of itemized part costs. It sure looked good – until someone discovered that the main rotor (tough to fly a helicopter without one of those) was missing. It wasn't caught until after contract award! It makes you wonder how many BOMs get the seal of approval with like mistakes.
- **Cost data is often tarnished.** An estimator was tasked with estimating Systems Engineering for a weapon system bid. The account was subdivided into recurring and non-recurring Systems Engineering. Since the estimate was for the production phase of the system, the estimator asked for development cost history of the recurring and non-recurring systems engineering. Was he surprised when the report showed no labor hours for non-recurring. Fortunately, he found the Cost Account Manager, who told him that the charge number and instructions for charging non-recurring had been overlooked by the Chief Systems Engineer; hence, no cost for that account. When you see zero cost for something you know consumes resources, it's an obvious indication of a data problem. More insidious conditions occur when a work order is opened with unclear charging instructions or when charging is approved without careful review. When a breakdown in process occurs, what is captured under an account has little resemblance to fact. Unfortunately, process breakdowns are quite common.

- **Government procurement practices provide little incentive for reliable data collection.** From source selection practices to contracting and auditing, the priority of contractors is expense recovery at the top line. Make sure we are paid for every ounce of labor and every bit we purchase to deliver on a contract. The US government has made several attempts to adopt new procedures to overcome the shortcomings of this mindset, but the fact that revisions in procurement practices are so frequent is proof enough that not much has really changed. With so many people working on such complicated systems in so engineering intensive an environment, it shouldn't be a surprise that the fidelity of second, third and lower levels of cost data recording take a back seat to getting the recording correct at the top level. Everything below the top line is detail that doesn't get the attention needed to be a good basis for a cost model. Yet, this lower level information is exactly the data we get.
- **There is no cost data conspiracy.** The conspiracy theory of some buyers is that the suppliers know cost contents for their products in exacting detail, but employ practices that conceal it from the buyer. This is too close to illegal for most businesses to even attempt. Remember, the supplier is the point at which all of this impure cost data originates. Rather than risk embarrassment by admitting that they really don't have the records to show exact cost contents, suppliers revert to overly complicated and convoluted explanations of what they think they know about cost contents. This can only raise suspicions and fuel the data conspiracy theory.
- **Cost records support accounting, not estimating.** As if the situation for reliable cost data collection isn't already handicapped enough, we throw this final blow. Look at a balance sheet – it's going to be one page whether you make paper clips or

space ships. If this isn't top line stuff, I don't know what is. The data an estimator needs to do a credible job is structured more around the end product or service than it is the balance sheet. An accounting structure doesn't really care about the type of business being accounted for.

Waiting for cost data to come to you is like waiting for water to freeze in a lit oven. You have to dig it out of people who are familiar with the situation – those who worked on programs you are collecting history for and those who are working on the program you are estimating. They are the best hope for bringing tempered reality to the cost data you seek.

#8: Fire up the Time Machine

What is the accuracy of your model? - - - Clair Voyant the Customer

This question can be posed in other forms: "How good are your estimates?" or "How does your estimating method work?" As much as you may want to respond, "It works great!" you really do have to address the issue with as much professionalism as you can muster.

Statement 8 isn't always a dumb one. One needs to probe Clair to know whether the question deals more with validation than accuracy. Validation is to confirm or establish the appropriateness of something, while accuracy deals with freedom from mistake or error (reference: *Webster's Ninth New College Dictionary*). Accuracy and validation may mean the same thing to some people. That's OK. We are not interested in debating the meaning of words here, just in establishing the context in which statement #8 is considered to be dumb. The contention is that it is not only appropriate to ask about validation of an estimating method, but dumb for one to use an estimating method that hasn't been validated.

Validation of an estimating method exposes the mathematics employed, the history referenced and the results of testing the derived method on related

objects that were not part of the referenced history. Validation will establish criteria for satisfaction before testing is undertaken; sometimes criteria are established before history is studied and method development begins. Thus, validation is very much a learning process based upon the study and evaluation of history. As the philosopher George Santayana is so often quoted, *those who cannot remember the past are condemned to repeat it*. Since we have already panned ignorance of and disdain for history in other statements, we are clearly pro-validation in this camp.

It is the concept that there is history-free accuracy that is just plain dumb. Yet another anecdote exemplifies this. An October 1982 Congressional Budget Office (CBO) Staff Working Paper examining potential production cost overruns for the Advanced Medium Range Air-to-Air Missile (AMRAAM), contained the following:

AIM-9L seems to be a clearcut case of poor estimation of production costs. It was not until the missile actually entered production that the true costs became known, at nearly double the original estimate. About half the growth in AIM-7M appears to be for the same reason. It is not clear what happened in the case of AIM-7F. However, the description implies that this case was similar to that of the AIM-9L; estimates of price and schedules were revised sharply upward as empirical information became available which proved the old estimates inaccurate.

This conclusion led the CBO to examine the flawed estimating system. In so doing, the CBO discovered that the flaw was not in the estimating system but in the belief that estimates from one year to the next are comparable. In the case of AMRAAM, a requirement change in targeting from pilot guided to autonomous (i.e. self-guided) resulted in:

- Additional electronic and sensing hardware for target detection and guidance;

- Longer range capability for beyond line of sight targets;
- With no allowable increase in missile profile (size and weight).

There were other changes that caused additional program perturbations. And as always seems to be the case, there was the unending cycle of buy-lot quantity reductions in reaction to each unit production cost increase. As the CBO concluded after examining the environment in which AMRAAM production costs had been estimated over its years of development history, *practically the only thing not to have changed about the program was its name*.

A costing method built around history provides a sound basis for estimates. But, it cannot overcome inaccuracies due to lack of foresight as to what the end item being estimated will actually be. Unless there are no program changes during the progression, it is impossible for any credible estimating method to be accurate.

#9: The World is Flat

You can manipulate the inputs to get any answer you want out of that model. - - - Business Manager Bernardo

Guess what Bernardo? That's one of the big reasons I use it! If I don't have a tool that can give me a response to every what-if question asked about a project, I can't do my job very well. And, I don't want a tool that can't be tailored to what I know about the answer to all what-ifs. So, Bernardo, I not only need to be able to manipulate inputs, I also need to be able to manipulate model response to input changes so that I get the answer I want.

The Bernardo's of the world issue statement 9 in the context of the answer being an estimate for a planned program. My retort to the statement is in the context of the answer being a known historical fact. In that context, manipulation is calibration or tailoring of empirical inputs to the model to match

the history. The purpose is to provide a sound historical basis for answering what-if questions on new program estimates. If there is a sound basis for manipulating an input, the answer should be viewed as a consequence, not a target hit by crafting a set of unsubstantiated input. Why doesn't Bernardo see it this way? Possible answers include:

- **Unclear presentation of estimate results.** There is a Dutch saying – *That which is not clearly stated is not clearly understood*. Every consumer of an estimate deserves a clear explanation of the basis. And, it should not require a degree in cost modeling, mathematics, or statistics on the part of the consumer to, “get it.” The pressure to produce a popular estimate is great. Some estimators bow to that pressure. Bernardo has probably seen a few cases of this. Some estimators may not understand a model well enough to use it. If so, they may issue statement 1 (*that's what the model says it will cost*), which begets statement 9. Regardless of the circumstance, lack of clear presentation of estimating basis raises suspicions about the integrity of the results.
- **Passivity of the consumer.** Don't you welcome a challenge to your work when you know you've done a good job? Anyone who believes that respect is an earned quality knows that the fastest path to gaining others' respect is through meeting and overcoming challenges. If you are confronted with statement 9 and can show sound basis from history for every input manipulation you have made, you will succeed in altering the context of the challenger's statement; at least for the honest challenger you will be successful – the closed minded antagonist requires other means of handling. If statement 9 is not accompanied by 4 words, *show me I'm wrong*, you probably need to raise them yourself. If there is still no reaction to open the challenge for addressing, you are likely dealing with a passive consumer – one who feels no obligation

to understanding your estimate. Being critical is always an easier path than being inquisitive.

Perhaps the best response to statement 9 is, “but why would I do that?” This forces the other party to either admit he/she doesn't trust you or to hem and haw so that you can suggest an audit of the input together. Either way, a place is set at the table for Bernardo to eat with you or substantiate that the statement is nothing more than the wallowing of false critic.

#10: A Legend in his Own Mind

The fastest route to fame and fortune is to become a cost estimator. - - - Bruce the Author

It only seems fair to self-inflict the parting shot. In fact, I have made many, if not all of these statements at least once myself. If there is fame and fortune to be had as a cost estimator, I missed that turn on the road. On the other hand, there are enough objective, well meaning professionals who understand the dumb statements and will work through them with any motivated estimator in striving for credibility and respect – two of the most valued attributes of individual achievement.

Conclusion

Scientific Method

Estimating is a unique combination of art and science. Most of the artistry deals with experience. Wherever possible, the scientific method should be adopted to produce knowledge and process from experience.

The Scientific Method envisaged by Sir Isaac Newton is fundamental to the investigation and acquisition of new knowledge based upon physical evidence. Scientists use observations, hypotheses, and logic to propose explanations for natural phenomena in the form of theories. Predictions from these theories that can be reproducibly tested by experiment are the basis for developing new technology.

The essential elements of the scientific method are:

- Characterizations (Quantifications, observations and measurements)
- Hypotheses (theoretical, hypothetical explanations of observations and measurements)
- Predictions (reasoning including logical deduction from hypotheses and theories)
- Experiments (tests of all of the above)

Nine of the 10 statements (number 10 being the exception) presented here are dumb because they are contextually separated from one or more of the 4 essential elements. As presented, there is no apparent literal separation at all in any of the statements. That is the paradox of the estimator's environment – seemingly logical statements made without context or relevance that create a dangerous minefield for the estimator to navigate in reaching acceptance for the credibility of his/her work.

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Bruce Fad is Member/owner of PRICE Systems, LLC and directs all activities of PRICE Systems Professional Services Division, which includes: parametric cost estimating model and general estimating topic training course development, PRICE models technical support to licensing clients, and PRICE Systems Americas consulting services, Bruce maintains an active role in services through instructing and by supporting consulting engagements as either a project director or individual contributor as a Subject Matter Expert (SME). He frequently prepares and delivers presentations on the subject of cost estimating and analysis for professional society conferences.



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