

FUNCTION ANALYSIS AVOIDS TQM'S TRAPS

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ABSTRACT

Through examples, this paper demonstrates how function analysis and FAST helps them and their customers avoid traps by defining quality in a given context; specifying what levels of quality are required and understanding what each costs; and, determining if their efforts are being applied to the right things.

INTRODUCTION

"Quality is conforming to requirements," is an accepted definition. A colleague says, "Quality is a philosophy, not a methodology." Biblical Israel and a shopping trip with my 80 year old mother to help her look for a bath robe makes the philosophical problem clear. Dancing angels, drywall, astronauts, washing machine gears, my community's high school, and eating in a Chinese restaurant furnishes the background for illustrating how Function Analysis helps overcome TQM's traps.

TRAP ONE: WHAT IS QUALITY? DEFINING THE UNDEFINABLE

In Biblical times, the ancient Hebrews believed the name of God so powerful that it could only be uttered by the High Priest when he entered the Holy of Holies of the Temple in Jerusalem on the Day of Atonement, the most sacred day of the year. A variety of pseudonyms, such as Lord and King, were used by all others in sacred texts and prayer.

After the Roman destruction of the Temple in Jerusalem and their exile, Jews considered even these proxies so Holy that they would never actually write or speak them. Only holy scribes copying the sacred books of the Bible and commentary could actually write the pseudonyms. To this day, orthodox Jews only utter the proxies during prayer. During ordinary conversation, scholarly discussions, and practice of prayer melodies or their secular use (such as in recordings), the pseudonyms are given proxies, so Holy are even the original pseudonyms considered.

Remember 'Raiders of the Lost Ark?' The scene where the Nazis opened the Ark of the Covenant, and what happened when the lost name of God was to be uttered? Steven Spielberg and special effects gave us one whopping interpretation of the power of the word. But we never did learn that ancient name for God.

"Quality" is like that ancient lost name of God. It evokes powerful imagery without definition. Quality is talked about as if it has universal meaning, shared in the history of human experience, which we respond to from deep within our collective psyches.

A dictionary or thesaurus gives many pseudonyms for quality, including attribute, property, excellence, trait, characteristic. Quality is always defined in terms of other similar amorphous descriptors. The inability to precisely define quality hampers our every day and professional lives.

When I took my mother shopping, she gave me her specifications so I could help her look for a bathrobe: not too long, zipper not tie closure, medium weight. While she was wandering among the racks, I found several robes which I thought matched her specifications. She looked at each, eyed the color, noted the zipper, the style and cut. She felt the material.

"What do you think?" I asked hoping for a quick purchase and an even quicker exit from the lingerie department.

"These are not the same quality as the one I saw last month," she answered. ("And did not buy," I thought to myself.)

"What do you mean?" I queried? "They are not too long, they have zippers, the colors are nice and the weight seems just what you are looking for."

"You know," mother responded, "Its just not the same quality."

"Okay," I thought, "I will try again."

"If you can be more specific," I said to her, "it will help me help you look for what you want. What does 'quality' mean to you?"

Mother looked at the robe I had hung in front of her; felt the material; examined the seams. "Its just not the same quality."

I learned two things from the experience. First, it is not my interpretation of quality that matters; it is the customers. Second, customers have difficulty defining quality, no matter their experience, insight or intelligence.

If customers cannot tell facility managers, architects, engineers and designers what they mean by a quality facility, how can these professionals deliver it to them? To deliver a quality project, first identify who is the customer. Second, the customer must be helped to clearly articulate their requirements in easily understandable and measurable terms. Function Analysis and FAST are the tools to do it!

Identifying the customer is easy. I suggest using the Modified Golden Rule: "Them that has the gold, makes the rules." But rules sometimes need to be broken and assumptions by them that has the gold should always be questioned.

The CEO of a health care management firm asked us to facilitate a top management discussion to select which of three existing suburban buildings to relocate to. We asked the CEO and her top executives to define why they wanted to move the company. To "Improve Operations," was the consensus.

Next we had the team spell out how the new location was expected to help "Improve Operations." We helped the team build a FAST diagram. In addition to following the How? -Why? logic, they had to separate their criteria between performance requirements really NEEDED to Improve Operations and others which were WANTED to make the improved operations work better.

About one-half an hour into the exercise, the "Aha!" happened. The Human Resources Director suddenly exclaimed that the company did not have to move just to "Improve Operations." Operations could be improved at the current location just by rearranging offices, staff, and equipment. The current facility did not mirror their excellent capabilities, reputation and track record. They were losing business when potential clients paid them a visit as part of proposal evaluation. Conclusion: a new site was required to Increase Sales. The team agreed. The CEO was delighted."

With this changed focus for their work, the team went on to finish their FAST diagram and specify exactly how they expected the new location could help the company "Increase Sales." (Figure 1.)

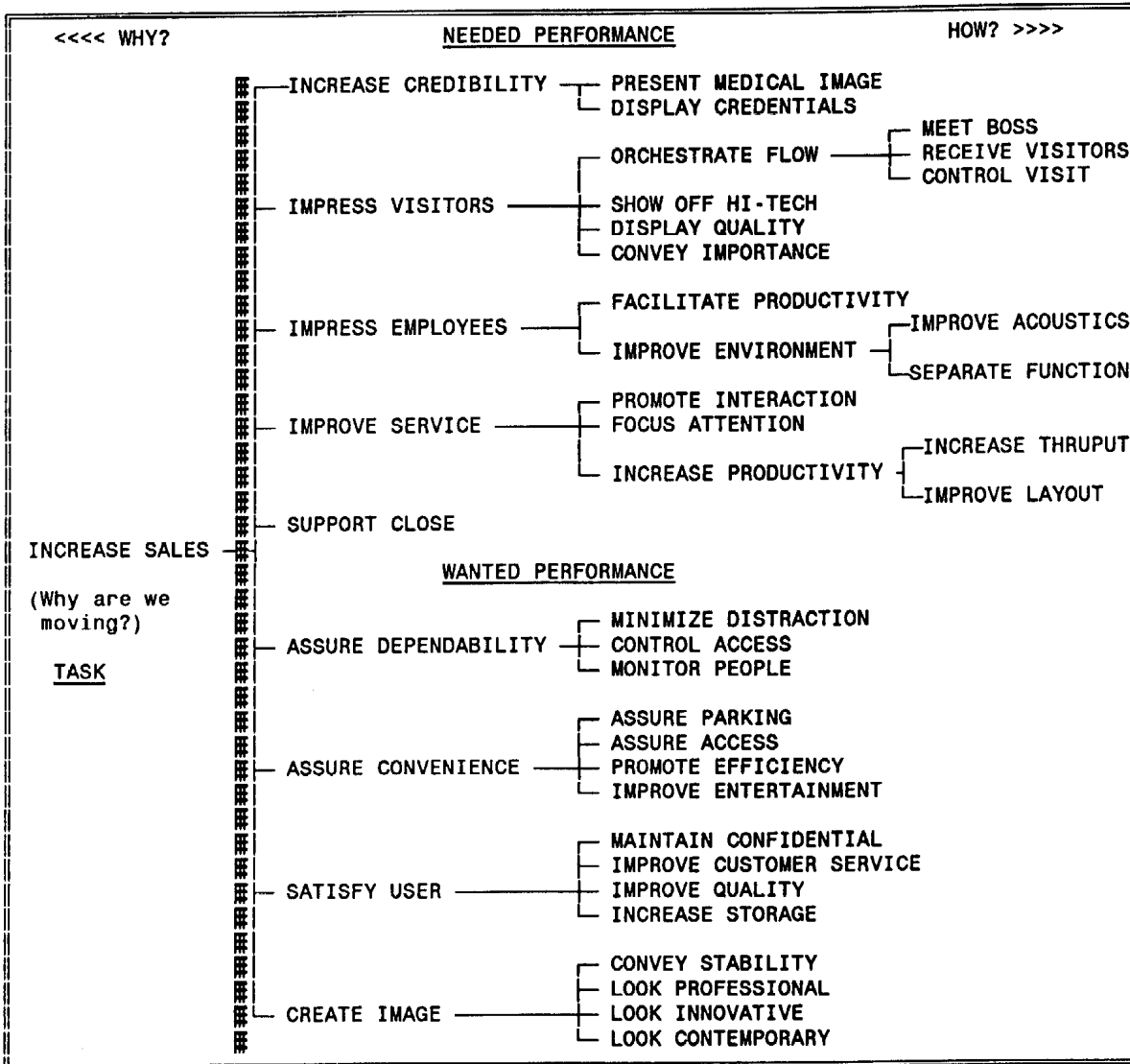


Figure 1 FAST Diagram for a Corporate Move

The team compared and then ranked their primary performance requirements (functions) relative to one another. Using an evaluation matrix, they reviewed how well each site fulfilled each function and concluded that none of the sites were appropriate! They decided to search for other buildings which would present a

more positive corporate image of their professionalism and capabilities, pseudonyms had been eliminated another matrix on which they indicated which performance requirements should be fulfilled in the design for each major space or activity area. (Figure 2.)

REQUIRED PERFORMANCE (Partial list)	ACTIVITIES/SPACES (Partial list)				
	Claims Preprocessing				
	Customer Service				
	Provider Relations				
	Direct Management				
	Reception				
Present medical image			0		0
Display credentials			0		0
Receive visitors	0	0	0	0	
Control visit	0	0	0	0	0
Show off hi-tech	0	0	0	0	0
Facilitate productivity	0	0	0	0	0
Separate functions		0	0		
Promote interaction		0	0		
Focus attention	0	0	0		
Increase thruput	0	0	0		
Improve layout	0	0	0	0	
Support close					0
Minimize distraction	0	0	0		0
Control access	0			0	0

Figure 2: Functions Allocated to Activities and Spaces to Create Design Criteria for a Corporate Move

The specific quality objectives and performance levels were defined. A bad decision based on a wrong assumption was avoided.

A secondary benefit of the exercise was development of program requirements to help the architect design each space and

activity area of the new offices. The team created another matrix which functions should be fulfilled in the design for each major space or activity area. (figure 3) The architect hired to design the project participated in the discussion, quickly gaining valuable insight into his client's .

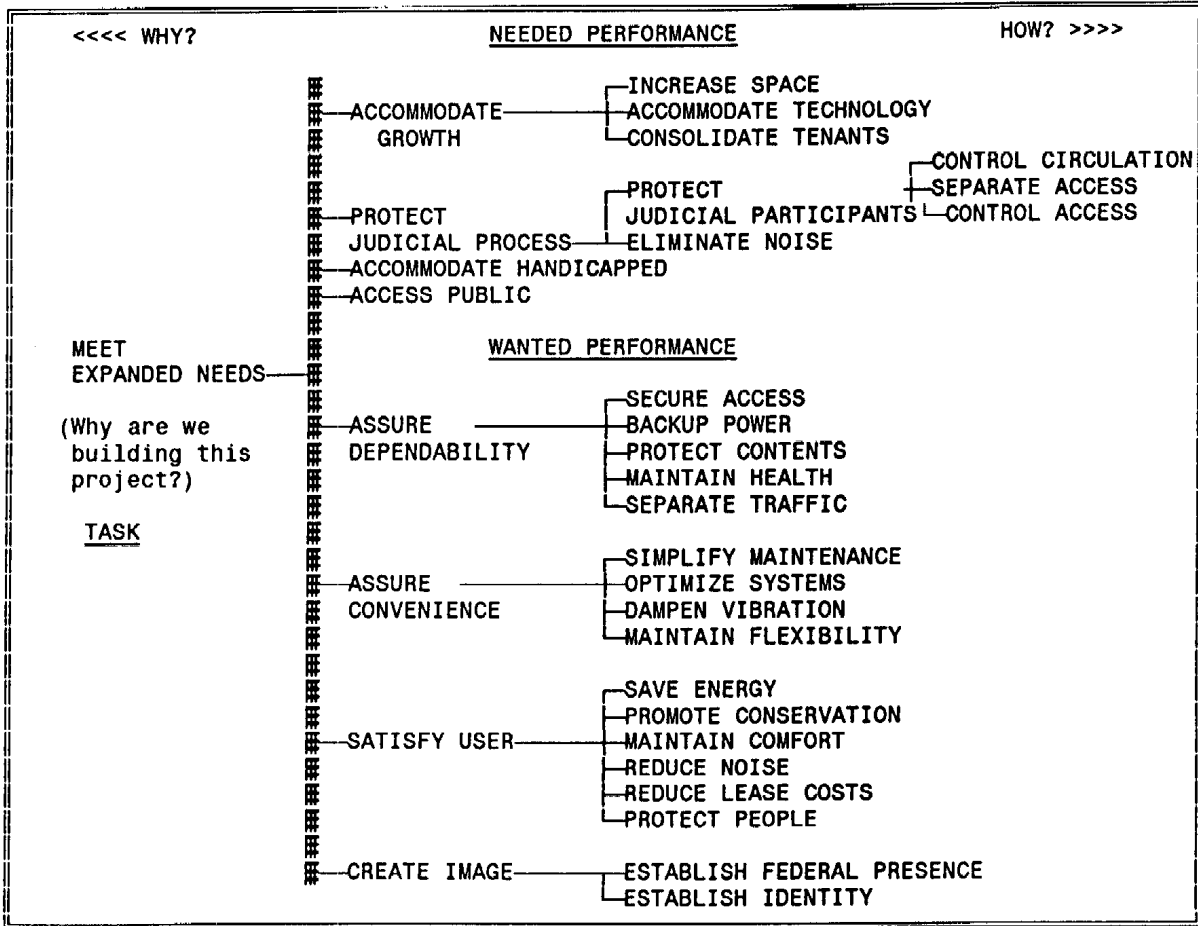


Figure 3: FAST Diagram for a New Federal Courthouse and Office Building

TRAP TWO: THE COST OF QUALITY

"How many angels can dance on the head of pin?" was a favorite debate topic for Medieval scholars. The cost of quality is a favorite topic of discussion among producers and consumers of all kinds of services and products (not to mention consultants!) The two are related because they deal with questions of perception and specification.

What is an angel? How big is an angel? How much room does an angel need to dance? What kind of dance? What kind of

pin? What is quantifiable and what is not? Angels and their dancing is beyond the scope of mere Value Engineers. Helping our customers Identify the cost to achieve varying quality levels in facilities is not.

During a VE study of a new Federal courthouse, the owner-user-architect team constructed the FAST diagram shown in Figure 4. The estimated cost of drywall partitions was \$238,000. Just over \$100,000 of the cost was for high sound attenuation walls enclosing the jury assembly rooms and offices for Social Security, probation officers, the Congressman, marshals and judges.

<u>RATING/ CONSTRUCTION</u>	<u>PERFORMANCE AND LEVEL</u>	<u>PRICE PER LINEAR FOOT</u>
FSTC 37 1 layer GWB each side	REDUCE NOISE Normal conversation audible; loud speech intelligible	\$35.50
FSTC 42 1 layer GWB each side; insulated	REDUCE NOISE Normal conversation barely audible; loud speech audible but not intelligible	\$51.35
FSTC 47 2 layers GWB each side; insulated	REDUCE NOISE Normal conversation inaudible; loud speech muffled	\$64.20
FSTC 52 Double stud wall; 2 layers GWB each side; insulated	ELIMINATE NOISE Normal conversation inaudible; loud speech barely audible	\$77.50

Figure 4: Comparison of Sound Attenuation Partition Construction, Costs and Function

Using their FAST diagram, the team identified "Control Circulation," "Separate Access," "Control Access," and "Eliminate Noise" as function performed by the partitions. The sound attenuation capability of a wall relates directly to only the functions "Eliminate Noise," a function NEEDED to "Protect Judicial Process." By comparison, "Reduce Noise," is WANTED to "Satisfy User."

There is a qualitative and quantitative difference between conforming to the requirements of *Eliminate Noise* and *Reduce Noise*. The quantitative difference ranges between \$35.50 and \$77.50 per linear foot of partition depending upon the required sound attenuation. (Figure 4.)

Based on a discussion of attenuation required to "Protect Judicial Process," as well as where that protection was needed, the team agreed to revise the qualitative requirements for the partitions at the Jury Assembly Rooms, judges, marshal, U.S. Attorney, and congressman's offices from ones which permitted loud and normal conversation to be inaudible to a system which muffled loud speech, and kept only normal conversation inaudible. Design criteria for partitions around the other spaces was also changed to allow loud speech to be heard but not be intelligible, and normal conversation to be barely audible, but not understood. Estimated savings from changes to meet actual performance levels was just over \$21,600, or nine percent of drywall partition direct costs. Conclusion: The cost to achieve higher than required quality levels of sound attenuation was 21,000 angels dancing on the head of a drywall screw.

The team followed the VE Job Plan and completed a rigorous Function Analysis to answer the question, "What is the cost of quality?" One, the customer defined their performance requirements using Function Analysis and a FAST diagram; two, the team reviewed materials and systems and identified which performance

requirements and what level each was supposed to achieve and why; three, the architect and engineers identified alternative materials or systems, and their costs to meet each actual level of required performance. This clearly showed the customer the cost to meet the various quality levels specified for the partitions.

TRAP THREE: THE RIGHT STUFF.

I have an excellent video tape on Total Quality Management (TQM). The producers took their camera into the factory of a major appliance manufacturer and filmed in the conference room and on the factory floor as a TQM program was set up. One segment describes the introduction of Statistical Process Control (SPC) to the manufacturing floor. The star is a 25 year veteran employee who has been machining a washing machine main drive gear for as long as he can remember. The problem is that not all the gears are up to snuff and there are lots of rejects. By applying TQM and SPC, the gears are shaped up and more are shipped out. Rejects drop dramatically, production and profits increase. End of story. Not quite.

By applying TQM, the gear was made right. But just making the stuff right begs the real question of what is the right stuff to make.

As I watched the tape, I wanted to know what the gear does; what functions does it perform; are they necessary; and, what else can do the job? I was really wondering if the gear could be eliminated or at the least dramatically changed to reduce cost and maintain or improve performance. I was asking VE's most elementary question: "What is the function?"

The danger with just emphasizing doing the stuff RIGHT, is that we may overlook the larger issue of whether we are really doing the right STUFF!

Quality may be conforming to requirements, but the

validity of the requirements should still be challenged. A better description of how to achieve quality is doing the RIGHT STUFF RIGHT. It can be more cost effective than just doing the stuff right.

Recently we guided a VA team of administrators, staff and faculty through a study of their high school's Book Distribution Center operations. The center buys, stores and then loans text books and related materials to students.

After completing a FAST diagram of existing functions (Figure 5.), noting the costs to achieve them, and identifying and correcting the mismatches between costs in and results out, the team recommended six proposals to the superintendent netting 10 percent savings of controllable costs over a three year period. One proposal was modified by the superintendent. As originally presented, it is an excellent example of doing stuff right... even though the stuff may not need doing!

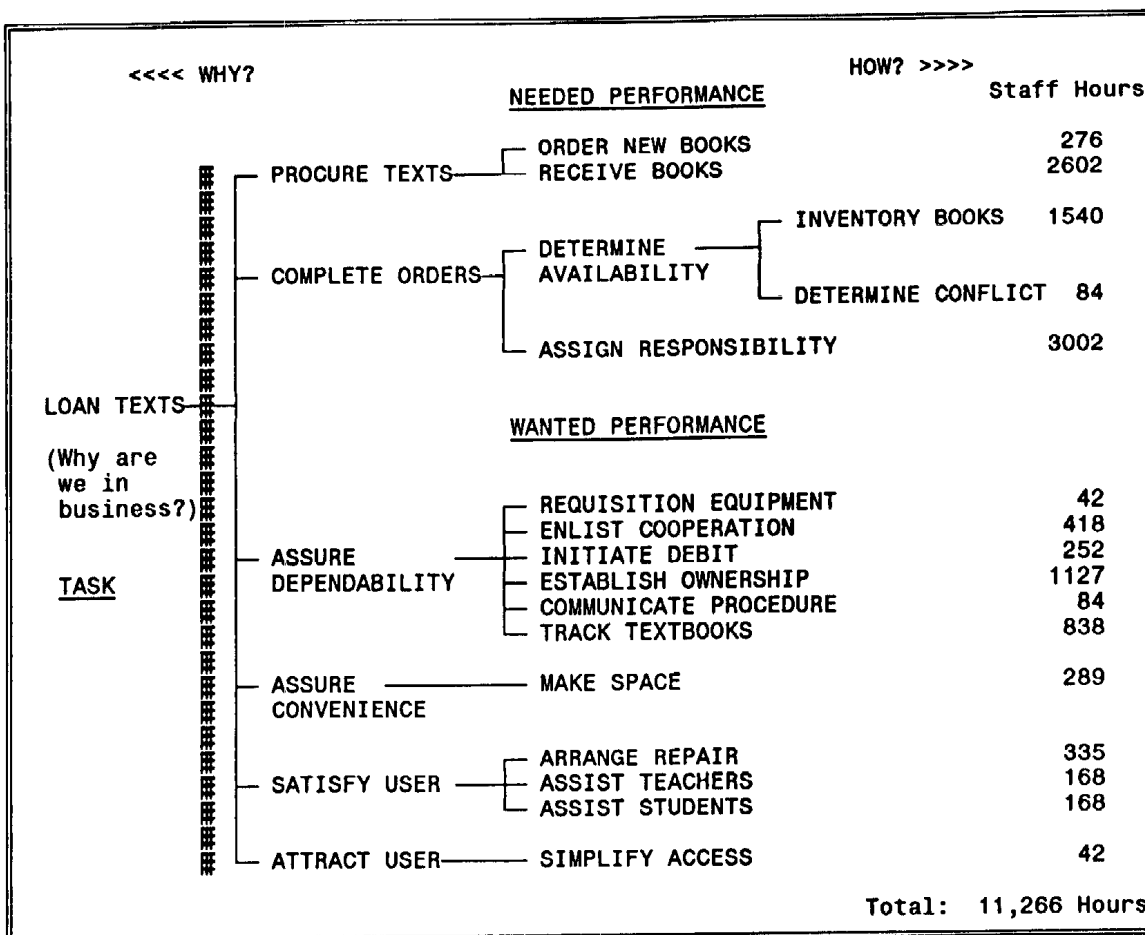


Figure 5: FAST Diagram of High School Book Distribution Center Operations

The team discovered that 1540 hours, nearly fourteen percent of staff time, was spent during the calendar year to "Inventory Books," yet an inventory had never been completed! The inventory helped the Book Center staff "Determine Availability" of books so they could "Complete Orders" for teachers. During the inventory, books are examined and those needing repair or beyond repair are removed from stock. The net shortage is made up by new orders.

The team recommended using hand held bar code readers (to be purchased under another proposal) to perform the inventory, eliminating the need to physically remove books from shelves to a table for scanning.

Books would still be examined to determine their condition. A net time savings results from doing the *right*. Presented with this idea, the superintendent asked, "Why do the inventory

at all?" (Are we doing the right *stuff*?) The team was amazed at the superintendent's insight!

The team compared the inventory cost to the replacement cost for the small number of books yearly removed from circulation through loss or damage. They concluded the inventory a costly way to manage for an exception. The team agreed the yearly inventory could be eliminated. Extra copies of heavily used text books will be ordered. *Doing the right stuff (eliminating the inventory) nearly doubles the savings of doing the stuff right (using hand scanners)!*

TRAP FOUR: EATING IN A CHINESE RESTAURANT

My wife and I have a problem when just the two of us eat in a Chinese restaurant. She has always managed to eat just enough to fill her up, and then stop. I have recently learned to do that. But there are always so many things we want to try - especially our first time in a particular restaurant. And its worse if I eat alone!

The answer of course is not to go myself or just with my wife. We invite others; several others! Each will have a preference; and that is what makes it fun. We cooperate to order so the tastes are compatible yet different enough to allow a representative sample of the cook's skill, while satisfying each person's individual preference.

Sometimes negotiations are necessary to reach an acceptable mix of dishes. The waiter may facilitate decision making by suggesting new and interesting combinations. If the meal has been successful, everyone will agree the food was good, the mix of dishes appropriate and the price reasonable.

Like a satisfying meal in a Chinese restaurant, achieving quality in projects depends upon having the right people around the table.

In each of the preceding examples, VE study team members had specific project knowledge to help overcome individual prejudices.

Users representatives on the team were decisionmakers in their particular area. Collectively the team had the responsibility, resources and authority to implement their ideas whether or not they had final approval of them. Each was a stakeholder in the outcome. A cooperative spirit was built through working together on unfamiliar tasks - completing a rigorous Function Analysis including a FAST diagram.

CONCLUSION

To achieve quality projects, Value Engineers can use Function Analysis and FAST to open communications between managers, customers and architects. The defined functions are specific quality performance requirements in the context of a given project.

Prod VE team members to articulate and defend both their definitions of quality and required quality levels for every piece of the project. Determine costs for each quality level specified. Question rules and assumptions to make sure you are doing the right stuff right.

And do not eat alone in a Chinese restaurant.