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ASK MAGAZINE

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"Take away my people, but leave my factories, and soon grass will grow on the factory floors. Take away my factories, but leave my people, and soon we will have a new and better factory."

Andrew Carnegie

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Flexibility, Adaptability and More by Todd Post

Todd Post
is the editor of ASK Magazine and a member of Edutech Ltd, a diversified management consulting firm providing technical services to Government and private sector clients. He has written for many publications both in print and online. To contact Todd send him an email at tpost@edutechltd.com
and tell him what you think about this issue of ASK.

Ideally, no project would ever change from planning to implementation. That means no requirements revised, no budgets revisited, no schedules missed, no personnel reassigned, no reason to worry...at least on paper...right!

I'm reminded of that rock and roll song by Aerosmith, *Dream On*. Anybody see my trampoline?

In fact, the real world of projects requires managers to do major somersaults throughout. I've always figured that being able to adapt to the changing circumstances created by a slew of factors no one has the clairvoyance to see at the start of a project is what Management (note the capital 'M') is all about. When I asked Joan Salute in our interview for this month's issue about the most important characteristic of a successful project manager, she replied, "I don't know about the most important, but one of the things I feel strongly about is readjustment. You can have the best plan in the world, but if it doesn't work out, your ability to readjust and recover probably has more value than your ability to plan it."

She said it, and the stories this issue, I believe, show it in a Big Way.

In Volume Three of ASK we feature some of the supplest practitioners of flexibility in the NASA world of project management. We at ASK want to be flexible too, so with Dougal Maclise's story "What's A Ceiling?" about teaching a blind boy to walk from home to school by himself, we offer our readers a metaphorical approach to project management. Maybe this will create some space to talk about your own subjects a little too close to home.

Again, we're always interested in hearing from you. Let me know what you think about these articles, or anything that strikes a chord in ASK Volume Three.

Todd Post

A Furious Hunger by Dr. Edward Hoffman

Dr. Edward Hoffman
is Director of the NASA Academy of Program and Project Leadership. He is responsible for the development of program and project leaders and teams within NASA. Dr. Hoffman develops training curricula, consulting services, research projects and special studies in program and project management. He works both within NASA and externally with leaders of industry, academia, and other government agencies to enhance capabilities in program and project management. Dr. Hoffman holds a Doctorate as well as Master of Arts and Master of Science from Columbia University in the area of social and organizational psychology.

Societies move by great people. Behind every accomplishment is a person who had a soaring presence to energize the rest of us to do great things. Carolyn Griner has been one of those people for NASA.

At Carolyn's retirement party the other night, I was struck by how the crowd there represented NASA's past, present and future, a veritable who's who in every direction, all gathered to honor and offer warm wishes to a great leader.

I have attended many such events, but have never felt so impressed or humbled. This was more than "thanks for the nice job," but a reflection of admiration, respect and love for a special person. Fueling it all, or certainly the better part, was a furious hunger. A hunger that we have for genuine leadership.

For the last few years I was fortunate to work for Carolyn as a member of the Project Management Council Working Group. In my two decades at NASA there have been just a handful of leaders I worked with who blew me away. Each one inspired in me a desire for more ... a furious hunger either to keep working for them, or to find another as good.

Some people pull it all together and make great things happen. You watch them, try to learn from them and still wonder how they do what they do. Steal a page from Carolyn's playbook, I thought ... I wish it were that simple.

During my time around Carolyn I found myself watching closely for tips. What makes her so good? The strengths are obvious – monumental competency and smarts, focus, nurturing, and a broad perspective (the rare perspective of what benefits NASA as opposed to just the local sandbox). However, what makes her so distinct is her honesty (or integrity). Honesty that you can learn from by observing her behavior. The consistency between her words and deeds is Carolyn's hallmark.

The evening was special because so many people brought thanks to a person who for so many years satisfied our furious hunger for the elusive elixir of leadership. Genuine leaders are rare. Thanks, Carolyn, for being one for so long.

From Planned Football to Spontaneous Basketball

by Dr. Alexander Laufer

Every year, all North Atlantic Treaty Organization (NATO) members prove their ability to repair the military airfields that support the Supreme Headquarters Allied Powers Europe (SHAPE). Teams have exactly three hours to complete the more-than 140 tasks necessary to get the airfield operational.

The following story, about one such team, has very significant lessons applicable to many projects nowadays. The circumstances surrounding this military project differ sharply from most other projects discussed in ASK, yet, as we will see later, the implications are relevant, and crucial, for all projects.

Dr. Alexander Laufer
is the Editor-in-Chief of ASK Magazine, a member of the Advisory Board of the NASA Academy of Program and Project Leadership, and a member of the Editorial Review Board for Project Management Journal and Construction Management and Economics. He is a visiting professor in the Civil Engineering Department of the University of Maryland at College Park and a Professor on the Faculty of Civil Engineering at Technion - Israel Institute of Technology. During the last 20 years, Dr. Laufer has conducted research, taught, and consulted in the area of project and change management. He has authored or co-authored four books: most recently, Project Management Success Stories: Lessons of Project Leaders (Wiley, 2000), and Simultaneous Management: Managing Projects in a Dynamic Environment (American Management Association, 1996).

The story is told by Capt. Smith, the officer in charge of the military exercise.

Lights, Camera, ...

Fog had rolled in at about 0600 hours that cold, damp, May morning. Forty Air Force Engineers had quietly attended to all the morning rituals. I looked at my watch: 0730, just 30 minutes until showtime. At 0745 the first bomb went off. We all dove for the bunker.

While I tried to maintain a collected posture, my NCOs went over their game plans for the last time. I looked across the dark bunker and saw Airman Gavey. Jeff was a pudgy little guy who never seemed to get overly motivated and he always seemed to be taking a relaxing smoke break when I thought he should be working. This time he was doing his best steamroller act.

"Hey, Cap'n, how we gonna do?"

Swallowing my nervousness, I coolly uttered, "Fine, if everyone remembers their jobs."

"How could they forget?" he laughed, "For more than four months now, you've asked everyone of us, 'What're your first three jobs?'"

I chuckled. He was right. The secret to making our certification time was the overlapping of tasks. We had just three hours to complete the more-than 140 tasks necessary to get the airfield operational. Aircraft needed to launch before the enemy sent in its second wave!

Sequential execution would fail miserably – just the way last year's team did – and they'd had four hours! I thought the best way to instill this concept was to ensure that everyone knew his first three jobs, at least. I wanted my team to go from task to task without directives and to think about the process and the other activities going on around them. Only then would they understand how their performance affected everyone else. What they didn't know was that through their recitations I was learning all the tasks and was, in essence, managing the interface between them.

"I wanted my team to go from task to task without directives and to think about the process and the other activities going on around them."

"Bravo 1, this is control. Mobilize and stage your team, we have runway damage."

The sudden radio squawk interrupted my train of thought. "Bravo 1, copy," I replied.

All thoughts of the fog and failure dissipated as my men scrambled out of the bunker and headed toward their equipment. Adrenaline was surging as the roar of engines coming to life filled the valley.

I thought I'd take one last walk down the equipment line and fire everybody up. "Remember, no smoking during certification!" I barked. This policy was to ensure that Jeff and his cohorts wouldn't take breaks – every minute was critical and we didn't have the time to smoke!

As I was returning to the starting line again, the gun went off. While waving my crew on, I noticed that nearly 200 people were watching from the sidelines. "Let's give 'em a real show today!" I cheered.

We were ready. My team was well prepared. Two days of monthly home-station training culminated in two weeks of intensive practice, and now the week here in Germany. We were ready!

As my NCOIC and I confidently strode down the mock airfield, we surveyed the damage. "Looks like the two taxiway holes are about 4 and 10 meters each and the runway craters look like 8 and a 12-meter each," he estimated. I smiled. I had come to rely on C. B. Winton more than I realized.

As we continued, I started to think out loud, "OK, the small taxiway mat is under assembly, the larger one will go about there. The first crater is cleared, the lines are out and the saws are about to start. That's real clockwork!"

At 0855, the first runway crater was nearing completion. I realized that it was the best we'd ever done. So did the team – confidence was surging. We might break two hours at this rate.

As I headed for the runway repairs, I noticed a general lack of equipment

around the second hole, which was the larger, more difficult 12-meter crater. I started to run. I rounded the corner of the dump truck to see C. B. on his knees tearing one of our concrete saws apart.

"What's wrong? Can you fix it? What do you need? Should we ask for another?" I blurted out, without pausing long enough for anyone to respond.

"Give me five minutes to look at it." He responded reassuringly. "Seems we twisted off an arbor. If we can get the broken one out, we shouldn't lose any more than 10 minutes." I sighed and walked away. I had learned a long time ago that when C. B. was deep in a project, I just let him go.

Mistake number two. The first was getting too confident as we finished the first crater. This one was more costly. This was an uncommon breakdown warranting replacement of the saw by the evaluating staff -- I just had to ask. We thought we could fix it. I had made a critical error at a bottleneck operation. Time lost here rippled exponentially downstream.

Twenty minutes later, the saw was repaired. I didn't know our time exactly, but I knew we were cutting it close. By the time the broken saw was operational, the working saw was cutting the third side of the square. The other operators were doing their best to bring in their equipment to remove and clear the upheaval and debris, but time was slipping.

Returning to the 8-meter crater, I instructed Jon, my slab chief, to go orchestrate the 12-meter and let Ramirez finish this one. I needed Jon's leadership to resolve the chaos surrounding the 12.

"Nothing more to do here. C. B., I'm going to check the other teams."

I looked toward the taxiway just in time to see the 54-by-78-foot, 22,000-pound mat jump four feet into the air. Steel cables snapped like sewing thread. "Oh no! What now?"

"Murphy's Law had bitten us, but training and the overlapping of tasks had given us the time to recover."

I found the taxiway chief and the mat chief pointing fingers and blaming each other. "Damn, I thought we were over that!" I silently filed this away for later chastising.

The grader and loader operators were already making the repairs -- at least somebody listened! I stepped in. "Look guys, break out the sub-teams and get the airfield lighting and MAAS installations underway." My look of worry and anger snapped them back to the task at hand.

"The key to certification is the overlapping of tasks," they recited almost simultaneously. I smiled, "I think we're going to make it!" Things were coming together again.

Jon was really at his height. The team closed out the crater in 30 minutes, largely due to his leadership. As the team rolled off the airfield, Jon was completing the surface roughness check while an evaluator was closely inspecting over his shoulder. The evaluator looked at me and shook his head. "What?" I yelled.

"A plane can't land on that, its too high," he replied.

"Oh damn! Where's Gavey and that vib roller? He can reset them. That should bring it into tolerance."

We looked up and saw no one -- C. B., Jon, and I, were alone in the middle of a concrete plain. The vib roller was at the other end of the strip.

"Jeff is probably having a cigarette," I muttered. I grabbed the radio's microphone and barked to the mat chief standing near the equipment to send Gavey back down here, ASAP.

"What was that, Bravo 1? I didn't copy," he replied.

I screamed, "Get Gavey and that *#@!^&*! roller back down here, and fast!" C. B. started laughing, "Bet he heard you that time!"

"He didn't need the radio to hear that!" Jon chimed in. Jeff's red cheeks could be seen through the cab of the roller as he nearly ran us over.

"I didn't know that thing could go that fast!" I laughed.

"One can see how Capt. Smith successfully overcame the immense challenges of this exercise by employing both early preparation AND ongoing adaptation."

The slabs were reset and passed inspection. Meanwhile, the final pieces of the lighting system were added,and as C. B. and I jogged down the strip, we heard the generator start up. The clock would stop when, and only when,the lights came on. One bad connection out of the 100 wired connections would keep the lights out. We crossed the safety line and gave the lighting team the nod.

The switch was flipped. The lights came on! We did it! Murphy's Law had bitten us, but training and the overlapping of tasks had given us the time to recover. Even though the 20 minutes lost with the saw had multiplied into 45, we finished with 12 minutes to spare!

Implications

This story provides two avenues for learning. First we can learn from the remarkable **behavior** exhibited by Capt. Smith and his crew. One can see how Capt. Smith successfully overcame the immense challenges of this exercise by employing both early preparation AND ongoing adaptation. He successfully integrated detailed planning, meticulous training, and building a team with esprit de corps, with intensive communication and control by "moving about." The second avenue for learning may come from focusing on the **type of project** that Capt. Smith and his crew faced.

While admittedly the project had to meet an extremely tight schedule, at the same time it enjoyed several extremely favorable opening conditions, which, in our era, are seldom enjoyed by ordinary projects.

To start, the objectives of the project were clear and well known in advance so that all the required means could be acquired ahead of time. The objectives did not change throughout the exercise, and the entire project lasted only three

hours. The participants had worked with each other for a long time prior to this project, and were able to spend considerable time together on training and dry runs for this specific project. Moreover, it was not a "first time project" for the organization. For many years the United States Air Force, as well as every other air force in the world, has expended a great deal of resources -- research and development, capital, training, publications etc. – on Rapid Runway Repair Operations.

The amazing moral of this story is that even with all these favorable conditions, this exercise, which was rehearsed like a symphony orchestra and planned like a football game, quickly turned into a spontaneous basketball game and soon transformed into improvised jazz.

Since today's projects rarely enjoy the favorable conditions that surrounded the military exercise, we should expect to see a shift toward spontaneous basketball very often, even when project schedules are not so tight. Indeed, in today's projects, "putting out fires" occurs more often than the old mindset of rational, scientific management would like us to believe.

LESSON

To succeed in today's unfavorable conditions, one must create a culture that fosters planning and adaptation. One should nurture people to plan *and* attempt to anticipate, and at the same time to develop a state of readiness to respond quickly to frequent and unanticipated events.

Chaos is the Fraternal Twin of Creativity

by Charlie Stegemoeller

Have you ever walked into work one day thinking that you had a situation well in hand to be met with something far beyond your wildest imagination?

Something like this happened to me in the late summer of 1993. We were ready to implement the upcoming Space Life Sciences (SLS-2) Spacelab mission on the Shuttle. Crews were finishing training and preflight activities. Ground teams were readying for the conduct of the mission. Management was finalizing reviews to assure readiness for flight. We had done several Spacelab flights including a not-so-distant SLS-1 flight. At last it looked like Space Life Sciences research was on the "right"track. The entire team was well versed in the upcoming flight because the tasks, procedures, and approaches had all matured.

At the same time, a parallel universe was unfolding. The US had entered into a bi-lateral arrangement with Russia of flying a US astronaut on the Mir Orbital Station as well as establishing the working infrastructure in support of the emerging International Space Station reconfiguration. Our small science payloads management team had been tasked with initiating and developing the processes and techniques for interfacing with the Russian team for the integration of US research.

"...it wasn't that we couldn't apply Systems Engineering practices, we just had never encountered them in this format."

We were made up of a young team of project leads and engineers that was used to the Space Shuttle/Spacelab processes. In fact, we had developed Systems Engineering tools that helped govern the team's success on previous Shuttle flights. But we were not experienced in Russian culture, technical styles and standards, and in approaches for long duration space flight.

As a single flight to Mir expanded to 10 flights, including expanded research objectives and outfitting Russian modules with 2000 kilograms of gear, none of us were ready for the chaos that erupted when we realized the extent of the work required to implement the Phase 1 Mir Research program on the schedule laid before us.

Now, try not to read too much into this ... it wasn't that we couldn't apply Systems Engineering practices, we just had never encountered them in this format.

For starters we had no translated or agreed upon process and requirements documentation to work from. Our hardware was still in fabrication. Our protocols for identifying scope were "in principal" at best and not fully laid out. We were also dealing with significant differences in culture and technical approaches for space flight.

Common sense dictated an implementation plan with schedules and templates and interdependencies. We tried, but each day was a new dawn. In some cases, several dawns occurred over a 24-hour period—nine time zones separated Houston from Moscow. Schedules obviously had to be written in pencil.

Most days, my desk was where I was standing – running. The key documentation that governed Russian standards for hardware acceptance and integration into the Mir were mistranslated. This fact was not fully understood until 3 months later and much closer to flight. The templates established for joint review of technical content were optimistic and unaware of the hidden time lags because of translation problems and failure to account for travel between the US and Russia.

None of our prior experiences prepared us for the Russian Acceptance Tests. The scope and purpose of the documents were laborious and unclear but still had

Charlie Stegemoeller
is currently Manager for Human Space Life Sciences Programs Office at Johnson Space Center, responsible for the organization and direction of the Human Exploration and Development in Space Enterprise Lead Center programs for Biomedical Research and Countermeasure, Advanced Human Support Technology, and the Space Medicine crosscutting function. He graduated from Texas A&M University in 1985 with a B.S in Industrial Engineering and began work at Johnson Space Center that June in the Comptroller's Office. Charlie is also an esteemed member of the ASK Review Board.

to be reviewed in detail prior to physical testing. Testing standards were always subject to interpretation by the Russian representative. This was further exacerbated by the unstated, unavailable, and indeterminable electrical standards for grounding and electromagnetic interference.

All aspects of the tasks were challenging. Hardware that was previously approved for Shuttle flights had to be reworked, certified and accepted for use on Mir. Procedures for operating the devices had to be translated and then reworked to Russian standards and acceptance. Crew training approaches had to be realigned and ground processing of payloads occurred twice–once to US standards, once to Russian. The shipment of payloads had to endure temperatures from negative 50 to plus 50 degrees Celsius and shock loads of up to 20 g's as well as the ever evolving Russian Customs departments. None of these were US Shuttle standard experiences.

Negotiations and deliberations had to be conducted on both sides of the Atlantic using State Department processes for invitations, travel, and clearances, done of course with the use of translators and interpreters. And this was all happening at the same time we were learning to communicate, understand,and trust each other as to our respective intentions, motivations, and expectations.

And yet we made it! We conducted an impressively successful research effort on Mir, and without incurring any significant international incidents. How was this possible?

I believe that we were successful because the US and Russian teams quickly realized that success was the outcome we both sought. Despite all our other differences, we both held high standards for processing flight payloads for missions and believed that reaching an understanding of the payloads components and function was achievable. Despite all other differences, we both recognized that the value of collaboration in pursuit of our national objectives was a more productive approach than inflexibility in standards and approaches. And, despite often feeling like strangers in a strange land, our US team recognized that we were guests on their platform and thus had to put forward the good will required to get over so many procedural hurdles.

"I believe that we were successful because the US and Russian teams quickly realized that success was the outcome we both sought."

As for the standard project practices, there were zealots on the US and Russian sides that demanded total compliance to pre-existing rules. Indeed we had to initiate calculated measures to stretch the letter of the rule to allow for innovation and forgiveness. Processes for hardware development required management teams on both sides to rethink their tactical perspective of "does it stay compliant with all previous required standards"to "how does this process aid this payload to successfully move through the system"; it required engineers to rethink their "solving problems via technical solutions first" to "knowing the counterpart socially then together tackling technical solutions together"; and, most of all, it required a great deal of flexibility in NASA management to allow choice regarding adherence to formal practices versus a requirement. Russian management teams also had to yield from rigid structures to flexible approaches to assure the intent of the agreed upon flight program to succeed.

Our team eventually saw the chaos we experienced as a gateway into a new and unknown environment. Through our deliberate efforts to explore and understand these new conditions, we found that chaos could be managed and remolded to accomplish the objective.

There were many other details, frustrations overcome, and challenges worked on the fly for the team and project to be successful. But we stayed focused on the end goal and chose to ride the wave we were on. So then, take a walk on the wild side of practice. You may never know what creativity you can forge out of chaos.

LESSONS LEARNED

1 In uncertain and changing situations the only way to win is to adopt a win-win approach.

2. Successful teams have long recognized that ongoing collaboration, based on recognition of mutual interdependence, is required in order to adapt easily to new requirements, respond quickly to frequent problems, and avoid conflicts.

QUESTION

Would you say that the lessons are applicable only to a few similar cases? Or, would you say that while the specifics of the situation differ from project to project, many underlying root causes that demand cooperation and adaptability are quite common?

Pin the Deputy's Badge On Me

by James Barrowman

Deputized

I'm not sure I knew what I was getting myself into, but it seemed like a reasonable way to deal with the pressures our program was under. At the time manpower levels and budgets were being slashed left and right, and it wasn't just our Explorers Program at Goddard Space Fight Center (GSFC). The whole NASA community was being downsized, and yet we were still expected to run effective programs.

As a Program Manager, you must try to create as much synergy as appropriate between projects. You look for ways that your Project Managers can share resources, ways they can work together and develop common solutions to management and technical problems. I was able to achieve these goals and others by taking on a unique role.

Each project was given only so many slots, FTEs (Full-time equivalent personnel), and I deliberately wanted to spend those slots on good technical people such as instrument systems managers, systems engineers, and resource analysists, the folks who accomplish the real work on the project. To maximize our technical resources and keep the program overhead down, I decided we would keep a thin layer of management. The management layer I thought we could manage without was the Deputy Program Manager and Deputy Project Managers. I told each Project Manager that I would act as his or her deputy.

In addition to reducing our overhead while maintaining technical positions, I felt this would change my relationship with the Project Managers from boss to supporter. It would give them a beneficial reason to keep me regularly informed on their projects' status and issues. I could be a consultant and make recommendations without threatening their authority or accountability. Finally, it would give them an additional resource during periods of peak demands on their time.

"The main obstacle in my role as deputy turned out to be people's attitudes as to how a Program Manager was supposed to be treated on the floor."

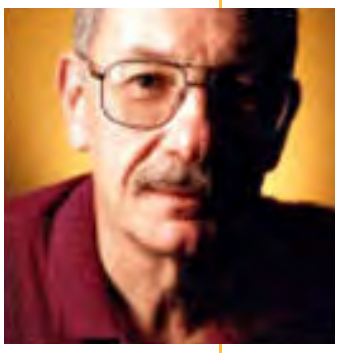
Pounding the Beat

It seemed like a plausible solution. Of course, I was not totally naive as to the difficulties. My time was hardly at a premium.No Program Manager can predict the exigencies that can pop up month-to-month, week-to-week, and even

day-to-day. I believed, however, I could handle the added responsibility and still lead an effective program.

The key to running a successful program is getting good people to work with you, and I had an excellent cadre of Project Managers. Also, I had hired a Program Business Manager with a keen understanding of the technical end of the program. This proved to be an enormous help to me, as I could rely on him to deal with the broader issues of the program when I was involved in specific project issues.

The main obstacle in my role as deputy turned out to be people's attitudes as to how a Program Manager was supposed to be treated on the floor. A few staff members at first seemed nervous and disoriented. There was even a bit of that old careful-what-you-say attitude. Eventually, as I became a familiar presence, they were able to relate to me as they would any other deputy.



James Barrowman
is the Deputy Director of the GSFC Space Sciences Directorate. He has been a project manager with the Goddard Space Flight Center (GSFC) Flight Projects Directorate since 1985, managing attached shuttle payloads, the Explorers Program, and the Hubble Space Telescope Program. Mr. Barrowman was twice awarded NASA's Exceptional Service Medal. Recently, he received the GSFC Award of Merit, Goddard's highest honor. He is a member of the American Institute of Aeronautics and Astronautics, a member of the Federal Executive Institute Alumni Association, and past National President of the National Association of Rocketry.

With the Project Managers, there was never any nervousness over how I should be handled. I suspect this was due in large part to the kind of working relationship we had already established. On the XTE project, for instance, when the Project Manager, Dale Schulz, asked me to address a problem concerning the interface between one of the major instruments and the spacecraft, he knew I would not blindside him by doing something we hadn't agreed on beforehand. I also kept him informed every step of the way.

If I did sometimes second guess a Project Manager, and there were indeed times I had a difference of opinion on matters, I never did so publicly. My approach was always to discuss it with the Project Manager privately, and what I had to say never was meant as a directive; it was always part of the exchange that occurs normally between a Project Manager and his or her deputy; and if I made my recommendation and the Project Manager felt differently, that was fine. I respected my Project Managers. Naturally, I would not have hired them otherwise.

Quick Change Artist

One episode during this period highlights the quick-change art I had to sometimes practice. When it was necessary, the program Manager would step to the

fore and the Deputy Project Manager stand in his shadow.

At one point, while XTE and another of our high profile projects, ACE, were still under development, Headquarters wanted us to start operating on a fixed price basis, what we now refer to as cost-cap missions. In return they promised to guarantee that funding would be available as needed.

The Project Managers were uncomfortable with engaging so directly with Headquarters, and understandably so. They were worried it would turn into something much too intrusive, and do more to disrupt our work on the projects than facilitate any kind of useful partnership. I felt differently, and here's where my leadership as a Program Manager had to come forward.

I understood what a benefit it would be to our program to form a partnership with Headquarters. I had been working with Headquarters for some time, at one point spending up to a day per week there, interfacing with Program Executives, Division Chiefs, discipline scientists, and others to cue them in on what was going on back at the Center (GSFC), all in an effort to improve communications. While it was an expensive loss of time in the short run, I knew in the long run the dividends it would pay were enormous.

I had to work with my Project Managers and their staffs to convince them that this was a good deal. Ultimately, I succeeded, and in the end I would say the arrangement we struck with Headquarters was very successful. It forced us to bring our projects in a box, as it were, and that was as important a team building exercise for Explorers as anything. We dug out those things that were not absolutely necessary from the budget and took the funding that was associated with them and put it back into the reserve fund, allocating the reserves to the subsystems and instruments, where it could do the most good.

"I understood what a benefit it would be to our program to form a partnership with Headquarters."

I use this example to highlight that my team was willing to follow me because I had earned their trust working closely with everyone on all the projects. I don't know how many Program Managers would have had the same success with their teams, and I don't mean to suggest that I had a better relationship with my managers and staff than other Program Managers did with theirs; but I believe I had the advantage of being involved in each project and had built a level of trust with the Project Managers and their teams, and this made it possible for me to occasionally lead them where they were not prepared yet to goon their own. Certainly they would have gone along as the program Manager directed, but how effective a leader are you if they are only going half-heartedly or, worse, harboring a grudge?

Reflection

That I was able to handle the dual responsibilities of a Program Manager and a deputy Project Manager, I believe, is a testament to the talent we have in Explorers. Even with the many projects we had going, I never once felt over-

burdened.That's because few problems degenerated into a crisis. We had competent professionals on staff to solve problems before they ever reached this stage.

Certainly, accepting the responsibilities of a deputy Project Manager added demands on my time, but that meant I had to refine my time management skills, and so I did. I juggled what I needed and we got the job done. In the end the Project Managers and their staffs were satisfied, I was satisfied, and we were all able to operate an effective and efficient program.

LESSONS LEARNED

1. This age of paradox that requires you to do more with less demands paradoxical solutions, for example, the need to serve at the same time as the leader and the follower.

2. "Adaptive leadership" is required to help the organization do what it has never done before.

3. Soft is hard. Gaining the trust of your followers will grant you more influence than any formal authority.

QUESTION

Nowadays, contradictions *and* paradoxes are central to project management, for example, formal *and* informal processes, inward *and* outward attention, enabling *and* intervening leadership, and relying on analysis *and* intuition. Can you share with us how, and when, you became more aware of the need to manage contradictions? Can you share with us examples of paradoxical solutions that you have seen employed by successful project managers, or that you have employed in your own projects?

"What's a Ceiling?" by Dougal Maclise

Dougal Maclise
is currently the manager of the Integrated Systems Health Management Systems Engineering Team at Ames Research Center. He has managed a wide variety of projects from a high-resolution digital imaging payload on the Pathfinder solar-powered aircraft to the consolidation of five different chargeback databases into one common database. He was also the co-manager for the database consolidation project, Consolidated Chargeback Systems, that combined seven legacy, business-tracking databases into one.

After I graduated from college, I worked for two years with the Portland Public Schools as an equipment designer for handicapped children. One of the boys I worked with was named Bobby Smith. Blind since birth,Bobby was about to start attending a new school. In Portland at that time, most of the students with disabilities were being integrated into the regular schools. My task was to help the District's Mobility Expert, Mr. Thompson, teach Bobby how to get to and from school and around the school grounds on his own.

We started out by meeting Bobby and his mother at their house. It was a small, older house on the east side of Portland on a quiet street about four blocks from the school. The route Bobby would have to learn to negotiate was straightforward and looked fairly safe to me. I saw that the sidewalks were well kept and clear, the intersections were regulated by stop signs, and traffic on the streets was pretty light. I told Mr. Thompson that this seemed like it would be relatively easy to teach the route to Bobby, and he should be getting along on his own pretty quickly. Mr. Thompson just smiled.

Mrs. Smith greeted us at the door and took us into the kitchen to meet Bobby, who was just finishing his morning snack. Bobby got up from the table and walked up to his mother as we all said hello. Mrs. Smith put her arm around Bobby and walked with him into the living room so we could sit down and talk. As Mr. Thompson mapped out his strategy and schedule for working with Bobby, I sat back and observed.

"Bobby said, 'What's a ceiling?' Mrs. Smith said from the doorway, 'I guess we never talked about it, so he doesn't know what it is.'"

Bobby behaved much like most blind kids that I'd seen. He listened a while, weaving his head around and sitting close to his mom on the couch. Soon he became bored and started to reach for things to play with. He first played with a throw pillow, feeling the textures and edges. Then he reached towards the coffee table to find something else to play with. His mom gently reached over, found his hands and held them in her own in her lap. After awhile he began to play with the edge of her sweater and then went back to the throw pillow.

Mr. Thompson began to ask Bobby some questions. He asked if he knew who his teacher would be and if he was excited about school. Bobby was very excited about school, but didn't know the name of his teacher.

Next, Mr. Thompson asked Bobby to walk over to him. He got up and walked around the coffee table and over to the chairs where we were sitting. Then, we asked him to go to the kitchen and back. He went to the kitchen table, turned around and came right back. While he was doing this Mrs. Smith had gotten up and walked over to the doorway to watch him.

Mr. Thompson asked Bobby to stand in front of him and asked him to point to the door. Bobby turned and pointed to the front door of the house. He then asked him to point to the doorway to the kitchen. After some hesitation, Bobby pointed towards the kitchen, but a little to the left of the doorway.

"Where is the wall?"

Bobby pointed towards and above the couch.

"And how about the ceiling?"

Bobby said, "What's a ceiling?"

That hit me. Bobby's pointing had been skewed and not what I would have expected from a sighted child, but surely he knew what a ceiling was. Mrs. Smith said from the doorway, "I guess we never talked about it, so he doesn't know what it is."

Mr. Thompson then asked Bobby to run to his room and back. "We don't allow running in the house," said Mrs. Smith.

"Where can he run?"

"In the back yard, on the lawn," she said.

"Anywhere else?"

"Sometimes we run together at the park, but usually we play on the swings."

"How about the slide?"

"I like the slide!" Bobby piped up.

"I help him," said his mother.

"Where does Bobby play on his own?" I asked.

"Usually in his room or in the kitchen if I'm there cooking."

"I heard you say it was against the rules, but does he ever run in the house?"

"No, it's just too risky."

"We'll have to change that," said Mr. Thompson.

The next few months we all worked with Bobby to help him explore his world. Being fairly tall, I was called upon to lift him up to the higher places like the ceiling and the rain gutters. Mrs. Smith started to let him take greater risks, but she wanted to pad all the doorways. She soon found that that was not really needed because Bobby was a cautious explorer.

It was hard to get Bobby to let go of our hand when we started to explore outside and to rehearse the route to his school. He had his cane to help "look" in front of him, but he still wanted to be in contact with a guide, usually someone with him, or a wall or fence. We managed to get him to a point where he could

make it all the way around the block without holding onto someone or trailing his hand along the fences or hedges.

Crossing the street was another thing. Mr. Thompson taught him to listen for the cars and to raise his cane so the drivers could see that he was blind. We'd practice by having one of us cross with him while the other drove up in our car. He became very adept at letting us know when we could cross, but he just would not let go of his guide and cross on his own.

"I hoped that play would accomplish what we had not been able to do up to this point, to get Bobby to venture away from his known guides."

Bobby was already going to school while we were working with him. His mom guided him to and from or just drove him to the front drop-off. He could make it from there to the school entrance, but he was very tentative. Inside the school, he always went down the halls trailing a hand along one of the walls until he found his classroom.

During recess he played on the jungle gym, the swings or the slide, but he was not running around with the other kids. He tried to play tag, but wouldn't stray very far from the walls or the fences. He was developing some new friends, though.

One day I had an idea. I found a stuffed ball and a beeper. Putting the beeper in the ball and closing it up with Velcro, I had a toy that Bobby could use to play with his friends. It would occupy both his hands so he would have to let go of his 'guide' to be able to play, and it was soft enough that he wouldn't be hurt by it. I hoped that play would accomplish what we had not been able to do up to this point, to get Bobby to venture away from his known guides.

Bobby was thrilled! He and his mom played with the ball for much longer than she wanted in their back yard. The next day, he took it to school to show to his class. That afternoon Bobby returned home with a slight black eye. Apparently, when he was playing with one of his friends, he dropped his ball when a friend had tossed it to him. They both ran to get it and bumped heads. As Mrs. Smith was tending to his eye, she couldn't help but notice his excitement as he told her all the details of the incident.

"I wonder how to tell the Mrs. Smiths elsewhere that a few black eyes won't kill the patient."

She asked him, "Didn't it hurt?"

He said, "I guess so, but, Mom, I ran! I ran right into Chris! And then we started laughing. He says we can play soccer now! Can I? Is that okay? Please?"

"I guess we'll have to find a way, won't we."

And they did. Bobby played soccer, and he played other sports too.

Mrs. Smith had to let go of her own anxiety, and to her credit she did. So did other parents whose children, whether blind or disabled in some way, were integrated into playtime at the school. You could see at first they were scared to let their children go, but they helped each other to accept the risks of letting go, and eventually they shared in the joy their children felt.

Epilogue

I often think about this episode as I manage projects. The main part of the job seems to be managing the risks, weighing the safe choice against the more risky one. Whenever I think of the new worlds of doorways, ceilings and soccer that Bobby found by taking more risks, I wonder what I might find if I take, or allow my team, to take more risks. On the other hand, I also wonder how to tell the Mrs. Smiths elsewhere that a few black eyes won't kill the patient.

LESSON

Overprotecting the weak often serves to protect only the protector. Ideally, protection enables the weak to develop gradually by increasing their exposure to risk.

QUESTION

Do you have your own example or metaphor that shows how “zero failure equals zero progress”?

PI-in-a-Box by Dr. Silvano Colombano

The PI Comes Calling

Projects often have many goals. Some are stated explicitly, some aren't. You would like for all the goals to be in alignment right from the start, but sometimes it takes time for the different customers to work together to make that happen.

An Artificial Intelligence (AI) project I managed from 1986 through '93 typified this kind of situation. The name we chose for the project was PI-in-a-Box, as our task was basically to put the Principal Investigator's brain in a laptop computer, figuratively speaking of course, and send it into space. That name was deemed "too cute" by some at Headquarters, so ASA (Astronaut Science Advisor) was used officially until the flight. PI-in-a-Box however continued to be used as the nickname, and was re-established as the official project name after my departure.

Dr. Silvano Colombano
works in the Computational Sciences Division at NASA's Ames Research Center, where he leads a group in "Evolutionary Biotronics." Projects cover Evolutionary Hardware, Modular Cooperative Robotics, and Artificial Life. Dr. Colombano has spent most of his working career at Ames, first, as a researcher in Closed Ecological Life Support Systems (CELSS) and, later, in Artificial Intelligence. He received an M.A. in Physics and a Ph.D. in Biophysical Sciences from the State University of New York at Buffalo. He began the development work on the Astronaut Science Advisor (a.k.a. PI-in-a-box) and managed the project until its deployment on SLS-2 (Space Shuttle STS -58) in 1993.

Officially, the goal of the project was to improve the scientific return of experiments by providing the astronaut-experimenters with direct feedback while conducting their experiments. An "intelligent assistant," the software in the box, tried to encapsulate as much as possible the relevant domain knowledge commanded by the PI on the ground.

PI-in-a-Box was intended to offer some flexibility in the experiment's protocol by way of a set of instructions delivered over a laptop computer screen as they were doing the experiment. The astronaut-experimenters were physicians and life-science professionals, but they were not scientists in the particular area of this experiment. You couldn't expect them to change the protocol on the spot if something unexpected occurred.

Goals

The official goal of the project was understood by everyone very clearly. "Unofficial goals" were also clear to those of us involved in the project. For my team, the unofficial goal was to show that NASA's recent investment in AI was worthwhile and that we could help. As we were a relatively new division at NASA, we were delighted to be on a high profile mission—it would be the first intelligent assistant, or expert system, used in space—and if the project went well, we knew it would certainly be a big boost in our status.

For the payload integration group we were working with at Johnson Space Center (JSC), their goal was to facilitate a safe and successful mission in the manner they knew how to do. Some of the folks in charge of figuring out how this and the other experiments were done on board the spacecraft were far less enamored of AI than I was. I could understand their point of view. I was asking them to do new things that they hadn't planned on. The experiment itself, designed to test how humans transfer visual cues to inner cues, was going to take place on the mission regardless of whether our PI-in-a-Box made it on board. With this new "unknown" added into the equation, there was one more factor that could go wrong.

I had to do a considerable amount of work to convince them that it would be really helpful to the astronauts to have this "intelligent assistant" on board. To their credit, they listened to me and told me exactly what I needed to do to ensure the system would work as promised. However, we had to jump through countless numbers of hoops to convince them that the system wouldn't cause any problems in space. At times it seemed impossible for us to meet all their requirements. Frequent communication was important in developing a good working relationship, but adaptation was even more critical.

"For my team, the unofficial goal was to show that NASA's recent investment in AI was worthwhile and that we could help."

Then there were the astronauts. They were tough customers too, as well they should be. One of the things the experiment was trying to answer was why we get sick in space and ultimately how to remedy that. The astronauts would look into a rotating drum painted with colored dots and, as the dots rotated, they would feel themselves rotate too – and (sometimes, unfortunately) get sick.

There was a lot of stuff going on at once, and that meant plenty of opportunities for something to screw up. This was just one of many experiments they were going to do on the mission, and one of many PIs they were working with. Given the nature of our experiment, you can imagine it was one they would not miss if it never occurred.

The astronauts helped us in building a better system by teaching us how to understand their needs. Again, it was communication and adaptation. In a software project sometimes, a developer thinks that the user is going to need this or want that, and then it turns out that the user in fact couldn't care less. With astro-

nauts, because their time is so valuable, the user interface must always be on your mind. It was a good lesson for us to try and understand what was important to them, which sometimes meant compromising on the loftier AI goals.

Coping with Expectations

Lest we forget too quickly, it is worth reiterating that this project was not merely about conducting a scientific experiment; it was also an experiment in how an experiment in space could be conducted. The parties involved knew they were part of something original and far ahead of its time, and we could all take pride in our accomplishment. Indeed there is nothing that brings people together like success.

When at last the mission flew, not all parts of the system were exercised. The diagnostic capability, while important, wasn't used simply because, luckily, the experimental equipment performed flawlessly. Interestingly, this success was viewed as a shortcoming by people who sought to justify this technology mainly because of its diagnostic capabilities. Again, goals and expectations need to be tailored to the limitation inherent in "one shot" space technology experiments.

"Frequent communication was important in developing a good working relationship, but adaptation was even more critical."

Interpretations for success were based on expectations. Some called the project only a partial success because the diagnostic capability wasn't deployed. To my team's way of thinking, it was a tremendous success. The important point is that we had succeeded in achieving the goal of helping astronauts conduct a difficult experiment in space and obtain the best possible data in the allotted time.

PI-in-a-Box enjoys the distinction of being the first expert system used in space. My involvement ended there. By then I was ready to move on. I had devoted seven years to this project. A later version of PI-in-a-Box was adapted to a sleep experiment and flown again on "Neurolab" in 1998.

LESSONS LEARNED

Projects often have many goals. Some are stated explicitly, some aren't. You would like for all the goals to be in alignment right from the start, but sometimes it takes time and for the different customers to work together to make that happen.

Your role on a project is to be aware of and sensitive to and adapt to the different needs of the customers throughout the life of the project.

QUESTION

This story calls our attention to two diverging views on project objectives. In one view the objectives are well defined and the parties are able to align them very early on. In the second view, the objectives compete with one another and remain in flux until the end. On your projects, which view are you closer to?

Lessons From the Great Masters

by Dr. Michelle Collins

Lessons from Leonardo and Company

At a recent meeting of NASA Project Managers (PMs), I noticed a striking similarity between an exercise in project management and what I had learned in a drawing class only a few days earlier. The art instructor gave a pre-class lecture on drawing live subjects and showed us the following drawings. (See figures below.)

Fig. 1"Nude on Horseback" by Leonardo da Vinci (Royal Library, Windsor)

Fig. 2 "Christ Rising from the Tomb" by Michelangelo (Louvre, Paris)

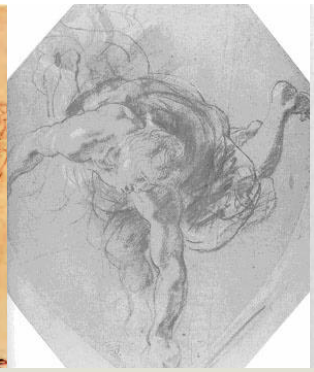


Fig. 3 "Study for Mercury Descending" by Peter Paul Rubens (Victoria and Albert Museum, London)

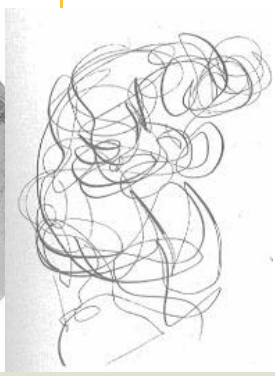


Fig. 4 A student drawing

The instructor asked the class to pay particular attention to the horse's legs in the drawing (figure 1) by the great master (and scientist) Leonardo da Vinci. The class had to chuckle because it appeared that Leonardo couldn't decide where to place the horse's legs. The instructor then asked the class to look closely at a Michelangelo drawing (figure 2) and try to determine which parts were arms and legs.

Next, the instructor presented a drawing by another great master, Peter Paul Rubens (figure 3), and asked the class to guess how many limbs Mercury had in this drawing. She then asked why the class thought these Great Masters would have made such drawings? The class pondered at length and offered their opinions, but by and large they were all surprised at the answer. It seemed strikingly self-evident. The Great Masters knew that they needed to leave their options open until the very last.

The placement of such important parts, such crucial parts as the arms and

legs, was so critical to the success of the piece that the artists devoted the bulk of their time and attention to this. The details such as the fingernails were easy for the Master to draw and thus received the least amount of time and effort. But more importantly, the details are left for last for a much more significant reason. If the artist were to draw say the ear in all its glory and detail, and found the head was not sized appropriately for the rest of the body or was slightly out of position, then the time the artist spent on the ear would have been completely wasted and may have required him to scrap the entire piece.

Dr. Michelle Collins
is the Managing Editor of ASK Magazine. She is currently on a one-year detail to NASA Headquarters from Kennedy Space Center where for the past five years she has conducted research on air pollution control technology. She also is responsible for the Knowledge Sharing Initiative within NASA's Academy of Program & Project Leadership. Dr. Collins has worked for NASA and NASA contractors since 1985 as a facilities engineer, researcher, and project/program engineer.

The human eye and brain are extremely discerning and capable of detecting the slightest misplacement or disproportion. Hence, the artist must spend the bulk of his energies in placement and sizing.

Armed with this powerful insight, the class was instructed to spend the next two hours drawing a live model.

At the end of 1 1/2 hours, the instructor had the class pause to review each other's drawings. Many were working diligently on their details such as the ankle, the jaw, the hands, etc. She brought the class's attention to one individual's drawing and said, "this is what an advanced student's drawing should look like at this point" (see figure 4).

"The Great Masters knew that they needed to leave their options open until the very last"

The instructor directed the class to step back from their drawings and look at them from a few feet away. Sure enough there were legs floating in air, arms looking emaciated in comparison to the trunk of the body, and heads grossly under and oversized for the body; but they had all added too much detail to move or resize the figure. The instructor reminded the class - "you can add the details only after you have worked out the placement and size ... the master artist will leave his options open until the very last."

The following is from a textbook. "It doesn't matter where you begin to draw, with what part of the figure, because immediately you are drawing the whole thing, and during the minute that you draw you will be constantly passing from one end of the body to the other and from one part to another."

This sentence was taken directly from a book on drawing. Note how applica-

ble it sounds with just a few words changed to make it relevant to NASA projects.

"You will find by experience that the first things to note are the largest elements you have to deal with - the shape and proportion of the entire project, the arrangement and proportion of the various major components, the relation of the major components to the request for this project, and the funding source."

It was stunning to me to think about such similarities.

Lessons from NASA Project Managers

At the meeting of NASA PMs, the group was involved in an exercise, presented by one of the group, on *Requirements* The exercise was as follows: "You are given a project to develop the software for an Automatic Teller Machine (ATM). Write four requirements."

The exercise followed a discussion by this presenter on software requirements. The group was a mix of senior and junior PMs. We broke into pairs to come up with the four requirements for the ATM, and then we regrouped to discuss our findings.

Several of the pairs consisted of one senior PM and one junior PM. In three of these pairs, there was a consistent difference in how the senior and junior PM defined their requirements. All three senior PMs gave requirements that were extremely brief and general; the junior PMs offered lengthy and fairly explicit requirements.

An example of a pair of responses is provided here.

SENIOR PM REQUIREMENTS	JUNIOR PM REQUIREMENTS
Functionality	Provide money in the form of $20's with no fee and warn Home Office of empty condition at least one hour in advance of becoming empty.
Reliability	With minimal annual maintenance, the ATM does not break down.
Security	The ATM communicates with the Home Office continuously including a video feed.
User-friendly	The ATM accepts at least 10 major credit cards and operates in 6 major languages with complete instructions provided where a withdrawal transaction, including printing the receipt, occurs in less than 60 seconds.

"All three senior PMs gave requirements that were extremely brief and general; the junior PMs offered lengthy and fairly explicit requirements."

As in the case of the art class, the less experienced practitioners can easily fall into the trap of specifying too quickly and thus minimizing or eliminating flexibility. As the senior practitioners observed, and so did the *Great Masters*, it is wise to leave your options open to the very last.

LESSON

You should keep your focus on the entire figure (project) and you *should keep the whole thing going at once* (visualize the entire project as a whole, not separate pieces).

QUESTION

Did the Great Masters discover an underlying fundamental truth that can be used by anybody, or are these techniques that can be successfully welded by experts? Can you think of other endeavors where you should practice the art of retaining flexibility?

What Did You Do At Work Today? by W. Scott Cameron

W. Scott Cameron
is Capital Systems Manager for the Food & Beverage Global Business Unit of Procter & Gamble. He has been managing capital projects and mentoring other capital management practitioners for the past 20 years at Procter & Gamble within its Beauty Care, Health Care, Food & Beverage, and Fabric & Home Care Businesses.

I am blessed to be the father of nine-year-old triplet daughters. As you might imagine, there are unique aspects to this blessing. When I come home at night each girl usually asks me what I did at work that day. Thus, I have the opportunity to answer this question about 650 times a year!

To be truthful, this is a hard question to answer because most of what I do at work involves either sitting in other people's meetings or running project meetings. How do you explain a meeting to a nine year old?

Their question, however, got me thinking about what goes on during these meetings and how effectively they are managed. Since I believe a core competency of project management is to run highly effective meetings, I sat back and evaluated some of the meetings I recently attended or ran and came away with the following observations.

Why Am I Here?

Even though there were written agendas listing the topics to be covered, about 75% of the meetings I attended and/or ran had no stated meeting purpose nor shared expectations of what the meeting was supposed to accomplish.

Why Aren't We Starting or Ending on Time?

About 90% of the time, meetings started and ended later than scheduled. People did not expect the meeting to start on time and offered no excuses on why they were late. About half the time the meeting manager stopped the meeting to bring the late arrivals "up to speed," thus penalizing those who arrived on time.

Why is Multi-tasking so Popular?

I've concluded about 20% of meeting time is effectively used by all participants. Thus, the remaining 80% is available for meeting participants to use as they see fit. I observe more and more people multi-tasking in meetings, and in

fact the meeting rooms are now being designed to allow people the opportunity to "plug in their computers" and multi-task to their heart's content.

Are meetings not hitting their mark, or is multi-tasking during meetings the future norm? I've also noted when there is a hierarchical review meeting or presentation the percentage of people multi-tasking during the meeting is greatly reduced. Is this a coincidence?

What Have I Resolved to Do?

These observations have caused me to revisit my trusty meeting management handbook and dust off some old habits to better manage my own meetings.

At my meetings I will:

• Start and finish on time. If someone is late, the others won't be penalized.

• Send meeting agendas and pre-work out two days prior to the meeting and expect people to have read it prior to the meeting.

• Encourage multi-tasking during the meeting but manage meeting "flow" so the individuals will not want to multi-task.

• Limit meetings to a maximum of two hours. I will also modify the agenda to ensure the topics can be covered in the allotted time.

In meetings I attend I will:

• Arrive and depart at the stated times.

• Demand an agenda and pre-work be issued prior to the agenda. Multi- until the meeting requires my full attention.

These changes should allow me more time to answer and ponder the next question my daughters ask me 650 times.

The Big Briefing

by Terry Little

It was my first big briefing as a program manager, a program status briefing to some senior "big-wigs." I was pretty comfortable because things were going well with the program's technical progress and schedule. However, I was concerned about the amount of money we were spending.

Even though we were only about 20% of the way through the program, we had already spent about 30% of the money and there were some significant technical hurdles ahead of us. I debated what to say about this and finally concluded that I would just be candid about what I saw as an impending problem with having enough money to complete the program.

Terry Little
is in the civil service with the Department of the Air Force, where he has been a program manager for five major defense acquisition efforts. He entered the Air Force in 1967 and served on active duty until 1975. As a civilian employee, Mr. Little has been an operations research analyst, a program director for a classified program, a deputy program director for both a large, multiple-program office and a Navy-led joint program office, and a weapons development planning manager.

As my boss reviewed the briefing, it was evident that he was quite pleased with what I had to say until we got to the slide on the money problem. He looked at it for a moment and then turned to me and said, "You can't tell them that!"

"Why not?" I replied. "It's the truth."

"I know it's the truth," he declared, "but you have to be careful how you phrase it. First, you need to tell them that having enough money to finish is a 'challenge'rather than a 'problem.' Don't tell them how big the problem is. Then you need to tell them that you and the contractor are 'working aggressively'to get the costs in line with the work. If you don't do that then your program will either become a problem that they will feel compelled to help you fix. Cancellation is not out of the realm of possibility. Neither one of us wants that to happen! And besides, we don't know for sure that there really will be a money problem."

I acquiesced to the changes my boss suggested. I gave the briefing and everyone was happy with how well the program was progressing. My boss congratulated me on the briefing and pointed out that the money slide had barely raised an eyebrow.

Two years later the money problem became obvious. But, by then, we had

accomplished enough and readily got the additional money we needed to finish the program.

Reflecting on what I had done, I wondered if the ends had justified the means. I hadn't lied (or at least I rationalized that I hadn't), but I had deliberately miscommunicated so that my audience wouldn't comprehend the import of what I was saying. I had "fuzzed-up" the message.

This happened many years ago. I have subsequently observed that what I had done is a practice that is all too common. Whether it's because of lack of confidence in senior management, an aversion to conflict, an example of the "bandwagon effect," or fear of being blamed ... I don't know. What I do know is that I was wrong.

I let down the senior leadership who had entrusted me with my position. I had compromised my integrity by not making sure that my audience clearly understood the true message. Luckily for my career, no one but me ever figured that out!

Editor's Note: Years later now, Mr. Little has become one of the most accomplished acquisition managers in the DoD and is currently a member of the Senior Executive Service.

Knowledge Sharing East & West: All Requirements Are Not Equal

by Todd Post

Todd Post is the editor of ASK Magazine and works for Edutech Ltd out of Silver Spring, Maryland. He has written for many publications in print and online.

In my last Conference Report, I told you about the KS East and West Meetings in December. March 12-15 found KS Participants back in Atlanta for the East meeting and, instead of San Francisco, we were in Pasadena this time for the West.

Requirements figured heavily on the agenda in both locations. At East and West, Walker Royce, Vice President and General Manager at Rational Software Corporation and author of *Software Project Management*, delivered a lively keynote on the management renaissance taking place within the software industry. 'Paradigm shift' is generally a facile expression to describe any kind of change taking place these days, but if Royce is reconnoitering the software industry with 20-20 vision that usage here might be right on target.

What Royce sees is an industry, hardly by itself, doing things faster than ever

Author and project manager Walker Royce gave presentations in both Atlanta and Pasadena for participants at Knowledge Sharing East and West.

before, with the traditional approach to the software development lifecycle process just no longer able to keep up. Traditionally, requirements are defined early in the development process and done with after that. Royce says this was never really satisfactory to anyone, but then that's another matter.

What he has observed taking place instead of the traditional approach is an iterative model, whereby requirements are redefined simultaneously during design and development. In his book, Royce lays out the foundation of this new approach by categorizing it into ten principles, the principles of modern software management, and these are:

1. Focus the process on the architecture first
2. Attack risks early with an iterative life cycle
3. Emphasize component-based development
4. Change management of all artifacts

5. Simplify change freedom with round-trip engineering
6. Use rigorous, model-based design notation
7. Instrument the process for objective quality control
8. Emphasize demonstration-based assessment
9. Plan releases with evolving levels of detail
10. Establish a scalable, configurable process

Naturally, we heard a lot about all ten principles at the meetings. Royce is a commanding speaker, and he brought impressive evidence to back up his arguments that a change is upon us, and that when applied right will make a difference for managers who are keen on implementing it.

How applicable is all this to NASA project managers? Many who attended seemed to think it was very, as they peppered Royce with questions about how to apply an iterative approach to their own scenarios.

Can it work for you? It's all in the application. Remember principle 10: *Establish a scalable,configurable process*. In his book,Royce called this 'Tailoring the process!' That is, it all depends on the situation. Context is the key.

Alex Laufer picked up on this theme in his presentation, "Tailoring Project Processes," delivered in both Atlanta and Pasadena, which included several examples of how successful project managers from the Navy and Coast Guard, as well as other federal agencies, practice tailoring. The interesting questions raised by

ASK Editor-in-Chief Alex Laufer and Managing Editor Michelle Collins strategizing.

Laufer's presentation went far beyond tailoring any one situation to rethinking what organizations might be like if tailoring were accepted as the appropriate response to the amazing variety of situations managers confront daily.

In Atlanta we also heard from Linda Rosenberg, one of NASA's own software experts, who presented an exercise on defining requirements. (See Michelle Collins' story in this issue, *Lessons From the Great Masters*) The problems with most requirements are mirrored in their documentation, she argued. At one point Rosenberg displayed a graphic depicting a bizarre amalgam of a zebra, a cat, and a skunk. "If you don't do requirements properly, this is what you get," she said, an unrecognizable species of beast you're not sure whether to offer up to science or straight out euthanize.

Then in Pasadena we heard another take on requirements from John Allmen, Deputy Division Chief of the Space Projects Division at NASA's Ames Research Center. Allmen's presentation "Better: the Enemy of Good Enough?" focused

heavily on how to stave off requirements creep. (See how Allmen converted his presentation into a Practice for this issue of ASK on the following pages) Like Royce and Rosenberg, Allmen believes clear requirements play a critical role in a project's success. Allmen would allow mangers room to improve on requirements, but he would also treat each improvement as a micro project with a separate budget and schedule of its own. First meet the minimum, then you can press on. "A requirement is intended to tell you when you've finished your job on a particular aspect of the project: Good Enough. Go for a better requirement if you know you can afford to, but remember to maintain sight of the original requirement and its original budget allocation as you make better."

Overall there was plenty to learn from the four speakers, and from the other NASA project managers who spoke at the conference and whose stories will probably be featured in one of the future issues of ASK

Talk with you again after the Master's Forum over the summer.

Knowledge Sharing East presenter Linda Rosenberg and Jo Gunderson enjoy a break between presentations in Atlanta.

In praise of Walter Ryce's book **Software Project Management,** Barry Boehm, Director of the Center for Software Engineering at the University of Southern California, writes "It has been difficult to find a fully articulated alternative management approach for dealing with such issues as commercial component integration, software reuse, and risk management. This book provides a new experience-tested framework and set of guidelines on how to proceed."

Better: The Enemy of Good Enough?

by John Allmen

John Allmen
is the Deputy Division Chief of the Space Projects Division at NASA's Ames Research Center, providing project management, flight integration and operations for space and earth sciences activities. Mr. Allmen has served as the Business Manager for redefining operating paradigm for NASA Ames Research Center's wind tunnels and as the Deputy Chief for wind tunnel operations. He has also served as the Project Manager for the 40x80 Aeroacoustic Project, the Construction Manager for the NFAC wind tunnel project, and Structural Group Leader for the Modification of the 40x80 Foot Wind Tunnel project.

Background

In our zeal to solve problems in new and innovative ways, project managers must be prudent not to allow requirements creep or design solutions to bankrupt the whole project. This is why I encourage all project managers to know when and how Better becomes the expensive enemy of Good Enough. By no means is this intended to sound like a battle cry for mediocrity.Just be aware that making something 'Better' can become the enemy of 'Good Enough' when 'Better' has a systematic negative impact on project cost and schedule. During NASA's austere times, we have to be aware of all of our tools for successfully managing requirements creep, budget and schedule. Design trade offs and R&D are important but must be managed against solid requirements. Knowing what is good enough should be understood at all working levels of the project. A requirement is intended to tell you when you've finished your job on a particular aspect of the project: good enough. Go for Better if you know you can afford to, but heed this advice: "Maintain sight of the original requirement and its original budget allocation as you make better."

Procedures

1. Differentiate your goal from your requirement. Your requirement is your performance floor, your goal the ceiling.

2. Identify the risk involved in pursuing the goal and determine how you are going to address it. For instance, pose the goal to your engineers and proceed beyond the requirement only when they can explain how to minimize the risk in reaching the goal.

3. Once you are satisfied that the risk is manageable, establish a separate budget and schedule for addressing the goal.

4. Once you meet the requirement, and if there is still time and funding available in what you have set aside, then decide whether you still want to try and reach the goal. Realize that it might be prudent to spend those resources on some other part of the project.

Example

One of the requirements for the 40x80 Aeroacoustic Modification Project at NASA/Ames Research Center consisted of adding a 48-inch deep acoustic liner that could provide up to90% absorptivity over 80-20,000 Hz in a 300-knot wind tunnel environment. The only problem was no one had ever tried to do this before, so the project had to develop an entirely new and inventive way of addressing this unique requirement. I explained to my boss that this was going to be a difficult problem to solve, and made it clear that I was not sure yet how we could do it.

A separate budget and schedule was established to develop the new liner. R&D, design studies and trade offs were made to successfully accomplish the requirement in the development phase. Development included full-scale component studies, a full-scale prototype installed in the wind tunnel, development of shop fabrication techniques and in-plant surveys of fabricators who could perform the work. Using the philosophy of better is the enemy of good enough, the project intentionally ended development and declared the liner configuration "good enough" when sound attenuation and aerodynamics met the performance floor with a minimum of 5% or more margin on acoustic and aerodynamic requirements.

The project had another opportunity to evaluate better and good enough for the acoustic liner when the fabrication contractor ran into production problems. Once again this key principle was applied to the fabricator's production processes and what was "good enough" for the acceptable performance of the delivered product. By determining which of the fabricator's processes were good enough and which did not have to be made better, reliable trade offs for manufacturing tolerances and acoustic performance were made to provide an outstanding product that continued to meet the performance floor.

This technique was used on many aspects of the project to help engineers at all working levels. It became a working motto to successfully maintain performance that met requirements, manage cost against the performance goals, and maintain schedule for successful project completion.

"Better is the enemy of good enough" is not the only tool a project manager should use to manage a successful project. It is however a means of focusing all team members to comfortably finish a task and move on to the next.

"Satellite in Space," monoprint chine colle by Lonny Schiff is an abstract rendition of the future Space Station.

ASK talks with Joan Salute

ASK: Often when people think about what is it that makes for a successful project manager (PM), they think,'Well, she should be able to do this, this, this, and this.' What they've got is a list of things. I understand once you decided to put together a list of qualifications for a project manager (PM), and your list turned out to be somewhat unconventional. Can you tell me about that?

Salute: The list was designed to help assign managers to new projects that came up at Ames. I was deputy division chief of a projects division, and we'd have principal investigators (PIs) coming by saying 'my proposal just got funded and I need a PM.' Our job was to get them a PM. If there was anything unconventional about what I was doing, it's that my list consisted of behavioral characteristics. Most lists start with things like writing a schedule, putting together a budget, writing a WBS. Those are the kinds of things you can learn in formal training or on the job, but they weren't what I thought was most important. What I was concerned about was what's the tacit knowledge you need. Things like trust, respect, doing whatever it takes to get things done, conveying the passion, being able to engender a team spirit.

Joan Salute
is the Associate Director of Aerospace at Ames Research Center. During her 19 years at NASA Ames, she has managed many NASA projects in a variety of technical areas. She has managed two flight projects to demonstrate the flight performance of ultra-high temperature thermal protection materials; projects to market and commercialize NASA developed technology; commercial applications of remote sensing projects including a project with Robert Mondavi Winery and a commercial potato grower; and remote sensing basic science research projects. Joan has an MBA degree in High Technology Management from Golden Gate University, and a B.S. in Mathematical Sciences from Purdue University. She is married and has a daughter who is a sophomore at USC. Joan's hobbies include running (she ran her first marathon in April) and cooking.

ASK: Let's consider one of these behavioral characteristics. How about trust? How does that figure into how you would pair a PI with a PM?

Salute: Very often you can observe them together and tell whether they're mutually respectful of each other, or is one continuously trying to second guess the other. We've had PIs who basically don't believe anything a PM says. I can remember a case where the PI said openly to me that he did not trust the PM, and that did not change despite the best efforts of the PM to try and change it. Whether it's a credibility issue or it's based on their past experience together or whatever, there are some people who automatically trust another person and there are some people who put people through the ringer to earn their trust.

ASK: Don't you have to spend time with both parties?

Salute: Sometimes it's clear right off the bat, but in a lot of cases it's not, and the more time you can spend with each getting to know their personalities the better.

ASK: What do you consider the most important characteristic of a PM?

Salute: I don't know about the most important, but one of the things I feel strongly about is readjustment. You can have the best plan in the world, but if it doesn't work out your ability to readjust and recover probably has more value than your ability to plan it. For instance, at Ames one of our largest projects, a biological research project, is looking at up to a 70 percent budget cut next year (based on the current rumor mill). The majority of things they planned are (maybe) just not going to happen. I think those that prefer to 'stay the course' as a way of life, don't make good PMs.

ASK: When you came to NASA did you intend to pursue a career in management?

Salute: I had no specific career plan. I was doing science, remote sensing, and very happy at it. The only plan was to have a job in which I wasn't doing the same thing day in and day out. In that sense, I've been tremendously successful. Later on I got an MBA. By that point I felt like management was where I would be able to make the most contribution, not in science any longer, but this was years later.

"You can have the best plan in the world, but if it doesn't work out your ability to readjust and recover probably has more value than your ability to plan it."

ASK: At what point then did you start seeing yourself as management material?

Salute: When I progressed from managing my own tasks to managing tasks where I didn't have the specific scientific knowledge in that field. That was a huge moment for me. I looked around the room and saw a bunch of other people like me—each of us had our own disciplines—and I asked myself why did I get chosen to manage their tasks. The reason, I believe, is because I was good at communicating between management and the scientists. They don't talk to each other very well sometimes. In particular, I could see the scientists trying to talk to management but not getting anywhere. And the scientists didn't appear to 'hear'(understand) messages from management. I was able to find some middle ground that was satisfactory to both sides. My division chief recognized this and began to give me opportunities to apply it on a broader scale.

ASK: It sounds like you have to be assertive in a situation like that.

Salute: I've learned to be assertive. Part of it is due to the fact that I was a single mother for several years. You grow up quickly that way, because of the responsibility you carry.

ASK: How have you matured as a manager?

Salute: I've learned a lot from observing other managers, by talking with them, and from my own experiences of course. The difference between how I

manage now and how I managed earlier in my career is that now I trust my gut more. An expert may tell me something and if I don't buy it I'm not afraid to call him on it. They may say, 'Don't worry, I've got it covered. You don't need to be worried about it.' My tendency is that when you hire someone as an expert in an area, you'd better let that person be the expert. But there are times when I've said to myself, 'What they're saying just doesn't add up,' and that's when I've brought in some other reviewers or went through it some more with other people until I felt right about it. On one flight project, there was a piece of electronics equipment that was the wrong capacity. 'It's only one out of three pieces that's not right,' the engineers said. "It's going to be fine, we don't have to replace it and compress the schedule." I'm sorry, but two out of three was just not good enough for me. Even though they were the electronics experts and were saying it was okay, we were not going to fly until that piece was replaced. They weren't happy about that because I was second-guessing their judgment. In the end, everyone was glad the part was replaced before flight, and it gave us the full range of data we needed.

ASK: One of the behavioral characteristics you said that's important in a manager is being able to engender a team spirit. How do you go about creating a team?

Salute: I've always believed this is a critical component of any project. People have told me I'm wrong, that all someone has to worry about is his or her little specific aspect of the project, but I don't believe that. I want people on a project to help each other and solve problems together, to 'buy into the whole' if you will. If the thermal expert is having a problem, sometimes you can still contribute to solving the problem even if you're not a thermal expert yourself. I don't want one of my team members sitting there saying she's got a problem but I'm not going there because that's not my problem. That kind of attitude doesn't help anyone feel like they're part of a team. I will actually have people sit down at a table and I'll go around asking each one, 'How would you solve this problem?' If we're just brainstorming, I won't accept as an answer 'I don't know.' If it's a procurement issue and somebody knows nothing about procurement, I can understand that they might be hesitant, but at least we're creating an understanding that this is about teamwork. It's so crucial that people understand that the team's goal takes precedence over any individual's goal. Otherwise those individual goals can pull the project in different directions.

"The difference between how I manage now and how I managed earlier in my career is that now I trust my gut more."

ASK: What do you do to put people at ease when they don't have the expertise in a subject, say like in procurement, and are skittish about offering an opinion?

Salute: I tell them that they're smart people, and I value their opinion. We wouldn't have hired you on this project if we didn't believe that. And you don't just say this; you model it every day. It's always going to pay off for you in the

long run.

ASK: How about with the team? What can you do to engender a spirit of collective trust among team members?

Salute: Here's one example. I'm involved with mentoring a group of new employees at Ames. It's a year-long program and we're meeting five times together during the year for a day and a half each time. The first time we met we had a team start-up checklist we were using. One thing on the list that caught my eye was the question 'How might your weaknesses effect your contributions on this team?' Something I've learned while a PM is that trust among team members means being able to expose your vulnerabilities. Until you can do this and feel safe about it, you're hardly much of a team. Nobody wanted to deal with this question—obviously we weren't much of a team yet—so I started by telling them what I thought my own weaknesses were and how that could affect the outcome of the team. Each of them then shared a weakness. When we got through, we had moved three months on the 'bonding curve'in less than an hour. People were looking at each other like human beings who they cared about now. They even reported back to the people who were facilitating the group that it was amazing how quickly we cared about each other. Soon after you could see this, for instance, if one person got sick and was out of work we all rallied around that person to help out.

ASK: Is this something you learned during an experience where you were mentored yourself, or is it something you just know, as you said earlier, in your gut?

Salute: It gets back to what I was saying about the behavioral characteristics of a good PM. What makes people trust you? One thing is showing that you don't have it all figured out. Don't be afraid to admit that you don't know something. It just makes it so much easier for people to believe that you're for real. These are things you know how to do through your experience as a person, not because you've taken a management course. Although management courses have been useful to me, it's been a continuous process of learning through a variety of experiences, both life and work experiences.

Letters on Issue One

ASK is off to a great start! The mix of practical engineering problem solving ("Garage-Style Engineering" by Michael Jansen) and organizational/cultural problem solving ("Open the Door and They Will Come" by Hector Delgado) covers the range of specific technical challenges to broader managerial issues. I must say, however, that I found the article by Steven Gonzalez ("It's All About Passion") to be particularly poignant. Because of years of government downsizing and the fact that we no longer have the strong national push for a common goal for the space program as we did during the Apollo era, it is too easy to lose the passion. Without passion, your work becomes a job, which is not what drew most of us to NASA in the first place.

Finally, many thanks for the PDF version!

Maria Littlefield

Kennedy Space Center

ASK subscriber Jerry Mulenburg (Ames Research Center) wished to share these remarks about a book he recently finished, *Simplicity: The New Competitive Advantage in a World of More, Better, Faster.* (Jensen, W.D.(2000). Perseus Publishing: Cambridge, MA.)

This is, as the title indicates, a book "...designed for and dedicated to you, the organizational, project, and team leaders who are changing the rules of knowledge work." The author goes on to describe projects as, "...the exact place and time where corporate, personal, team, and customer needs converge," and that, "project design is really about organizing choices."

The need for simplicity lies in how to deal with information overload in a world of infinite choices. The book is intended to help organizations work smarter by working simpler. Many of the author's insights are directly applicable to NASA project and knowledge management.

Jensen identifies four causes of complexity: 1) integrating change, 2) unclear goals and objectives, 3) ineffective communication, and 4) knowledge management. Regarding communication, the author states that, "storytelling is a universal translator. It's like the Rosetta stone. ...it's the one filter people all have in common." The two guiding tenets of the book are to "use time differently" and to "work backwards from what people need." The author describes in detail how to "navigate" from chaotic complexity to simplicity by using tacit knowledge from "conversations."

The book is full of tips and guiding information applicable to program and project management. An easy read (but not simplistic), this book uses data from a study of 460 companies and 2500 participants.

You Can Close the Loop

ASK Magazine is always glad to share useful knowledge provided by our readers. If you've got a book review or some other information that you think will be helpful to project and program managers, the Loop section is your vehicle for making that information public. We invite all readers to contribute.

Send comments or questions to: tpost@edutechltd.com

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