

The Golden Age

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George Fox Lang's editorials blend of great humor and terrific knowledge are always a wonderful treat. Reading through George's last epic, I was reminded that he and I were both exceptionally fortunate to have joined this profession during its golden age.

Dr. Bob Abernethy delivered a captivating keynote presentation describing the development and flights of the SR-71 during the Solutions 2.0 conference in November 2009 at Daytona Beach, FL. As a young engineer, Abernethy worked on the engine design and holds the patent for the ingenious by-pass system that allows the SR-71 engines to deliver power at high Mach numbers. His words described the challenge that led to the bypass system:

With conventional engines "at Mach 2.5, the exhaust pressure equaled inlet pressure, the compressor was deep in surge, and there was no cool air to cool the afterburner liner that would therefore melt. This is not good. It took me seven months to convince my boss that the recover-bleed-air concept would work, he convinced Bill Brown (head of engine design) in a few minutes, Brown called Kelly Johnson (chief of Lockheed Skunk Works) on a Monday in April 1959, and Kelly flew to Washington that day and got the funding by Friday. The airplane flew with J75 engines two years later and three years later with my J58s! Can you imagine clean sheet to first flight of a totally revolutionary design in two years! The decisions were almost instantaneous – today the same decisions would take months, maybe years."

Dr. Abernethy's presentation transformed everyone back to the golden age of aerospace, when developments were coming fast and furiously; development teams were small, highly cohesive and totally committed. There wasn't any bureaucratic review process with endless conflicting objectives. One or two people could essentially make all decisions within a highly complex, revolutionary project; technical achievement was everything and cost basically no object. The drive to go higher and faster, the missile and space race (who recalls IRIG standards that governed data acquisition?) accelerated massive developments that form the foundation for today's technological miracles.

Although it may be hard to believe, the first real spectrum analyzer, a swept filter attached mechanically by chain to a strip-chart recorder, was still offered commercially in the early '70s. The heterodyne real-time analyzer was a major step forward,

quickly followed by the FFT. Beginning in the early 1980s, microprocessor technology and the PC revolutionized the field of dynamic signal measurements. The explosive development of analytical instrumentation during the golden age is detailed in an excellent article by Joe Deery in the January 2007, 40th anniversary, issue of *Sound & Vibration*.

One famous story that illustrates the total dedication of engineers during those wonderful years of technical advancement took place at a technical society meeting in San Francisco shortly after the topless revolution hit North Beach. Someone wondered what the maximum g's might be at a key antinode during a "performance." A performer with ample attributes was hired and duly instrumented with an accelerometer in a location felt to have the highest acceleration. Music cranked up and away she went. The display was positioned in view of the dancer; serendipitously creating bio-feedback. As the dancer exerted maximum effort to increase deflection (everything was time domain in those days), engineers with eyes glued to the video display and their backs to the dancer were exclaiming, "wow, did you see that – 4 g's," or whatever the number was!

In those golden glory days, technology succeeded for technology's sake. Better, faster, more innovative features and greater power produced by creative, clever developers often working alone or in small teams translated directly to sales for instrumentation companies at the leading edge. Laboratories, test and development engineers and in-plant experts purchased the latest for the extraordinary insight offered into programs and problems. It was a highly symbiotic relationship; challenges and problems drove technological development – technological development led to new frontiers, new challenges, and new problems to solve.

Needless to say we'll never again experience the dedication to purpose, excitement, rapidity of technological development or the engaging anecdotes that made for such an interesting time. Confucius would have been proud.

Over the past decade or two, times have changed. In this age of iPods, net books, social networking around the clock and all the intended and unintended consequences of these marvels, technology applied to industry is somewhat discredited. Cost is not just one thing; it is often the only thing. Value and return are subordinated to "how much does it cost?" Junk science and peripheral issues often trump technology and

technological success.

At the Solutions 2.0 conference, one of the winners of a 2009 best program received a text message just a few minutes before being called to the stage to receive the award. The text informed him that he, his program and the people responsible for the award had all been terminated as a "cost reduction" measure! From great pride in accomplishment to total shock in just a few minutes. He and his entire team were ashen – all knew they had produced great value, were a valuable asset and, until a few minutes earlier, certain that company management were fully aware of that value.

A year or so ago the CEO of a company that advertises in S&V wondered why vibration analysis, condition monitoring and condition-based maintenance have never been accepted beyond the technical community – who incidentally no longer has much, if any, authority for purchasing instrumentation. The answer is simple. Solutions to today's challenges are dominated by managers and bureaucrats solely concerned with cost or other issues, such as political and environmental. Thanks to technologists, equipment problems in the industry that remains in North America have been significantly reduced, but that leads to another problem. "We haven't had a machine problem in years, why do we need a vibration monitoring program" is heard frequently. Worse, "in the current downturn, availability has no value; therefore, get rid of all people and programs working to improve availability."

In fairness, the entire fault isn't due solely to shortsighted companies and organizations who are potential beneficiaries of technology. Too often, purveyors of technology solutions capable of great benefits have convinced themselves that aggressive "closers" are the secret to increasing sales. This "hunter-killer" is considered best able to quickly identify targets and close the deal.

However, selling technical solutions, hardware and software, is quite different from a used car going for \$6,995, today only, where a slick talking, aggressive salesperson can turn a "looker" into a sale in hours by withholding potty privileges!

In technical sales, the dazzled looker doesn't usually have any spending authority. Complex technical solutions costing bushels of bucks typically have to pass through the corporate budget sieve, where cost is scrutinized by those in the green eyeshades. And many projects, all promising marvelous benefits with a variety of political influences, must compete for limited

funds. Selling complex technical solutions requires patience, a person capable of gaining trust, identifying real needs and then presenting a solution in terms of direct, tangible benefits to the purchaser.

And that's just the beginning. Complex technical solutions require continuous post-sales follow-up support to assure the client achieves the success and satisfaction necessary to garner the five-star references that are essential for additional business. In our small technical community, failure to deliver on promises is known immediately. Dissatisfied purchasers are not a bit bashful about airing grievances publicly. Success in technology sales is more equivalent to farming than hunting!

Our challenge today is that few technology companies and technical practitioners still employed seem to worry or even care much about the current environment. The primary interest of many, if not most, technical professionals is directed to the tools and practices that help them do their jobs better. Thus, articles, papers, societies and entire conferences focus on practice and technology without any real emphasis on the environment. How to sell improved technology to a fundamentally disinterested financial executive whose association with science and technology might have ended in

sixth grade? We're a frog in a pan of water and the water is heating. Do we hop out or dangerously assume everything will be better in a warmer climate?

A recent report described where a highly experienced technologist responded to a proposal made during a meeting for improving automobile efficiency by commenting, "to do that, you'd have to repeal some laws of physics." To which his probably young, certainly technically ignorant, interlocutor asked: "where are these laws; which code? With our majorities in Congress and the importance of the issue, we will have them repealed." If life were only so simple!

So what is the message? The golden age of technology is gone, likely never to reappear. There won't be any more large, spectacular technical tours de force, X-planes and the SR-71 pushing speed and altitude higher than anyone could have imagined only a few years earlier. (The SR-71 was reportedly flown at Mach 3.44 on at least two occasions; once to outrun a missile with unfriendly intentions!) There won't be another Concorde or probably a development as revolutionary as the microprocessor. Another manned moon landing by the U.S. is unlikely in our lifetimes. Funding priorities have the spectacular exoplanet exploration and landings under pressure. Why should

we be exploring Mars, Jupiter or Saturn when we have poverty at home?

Technology and the trajectory and speed of technological advancement are likely to be determined by consumer sales, lawyers and bureaucrats for whom technology, or lack thereof, is not a perceived obstacle to attain an environmental or societal objective. Wind power replacing coal and CO₂ removal from stack gas serve as two recent, highly publicized examples. "It's only technology, right?"

In our small professional space, we must always keep uppermost in mind that financial return is now everything. Zillions have been and will be spent pursuing elusive environmental goals. Keeping basic industries alive in North America (the entire high-wage, highly regulated portion of the globe for that matter) that are responsible for generating the wealth that allows us to focus on societal issues mandates a globally competitive financial return. So we must shift our focus from technology for technology's sake to gaining real financial return from technology. That clearly mandates making our industries, institutions, laboratories and personal efforts more efficient, more effective and entirely focused on profitability.

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