Pittsburgh
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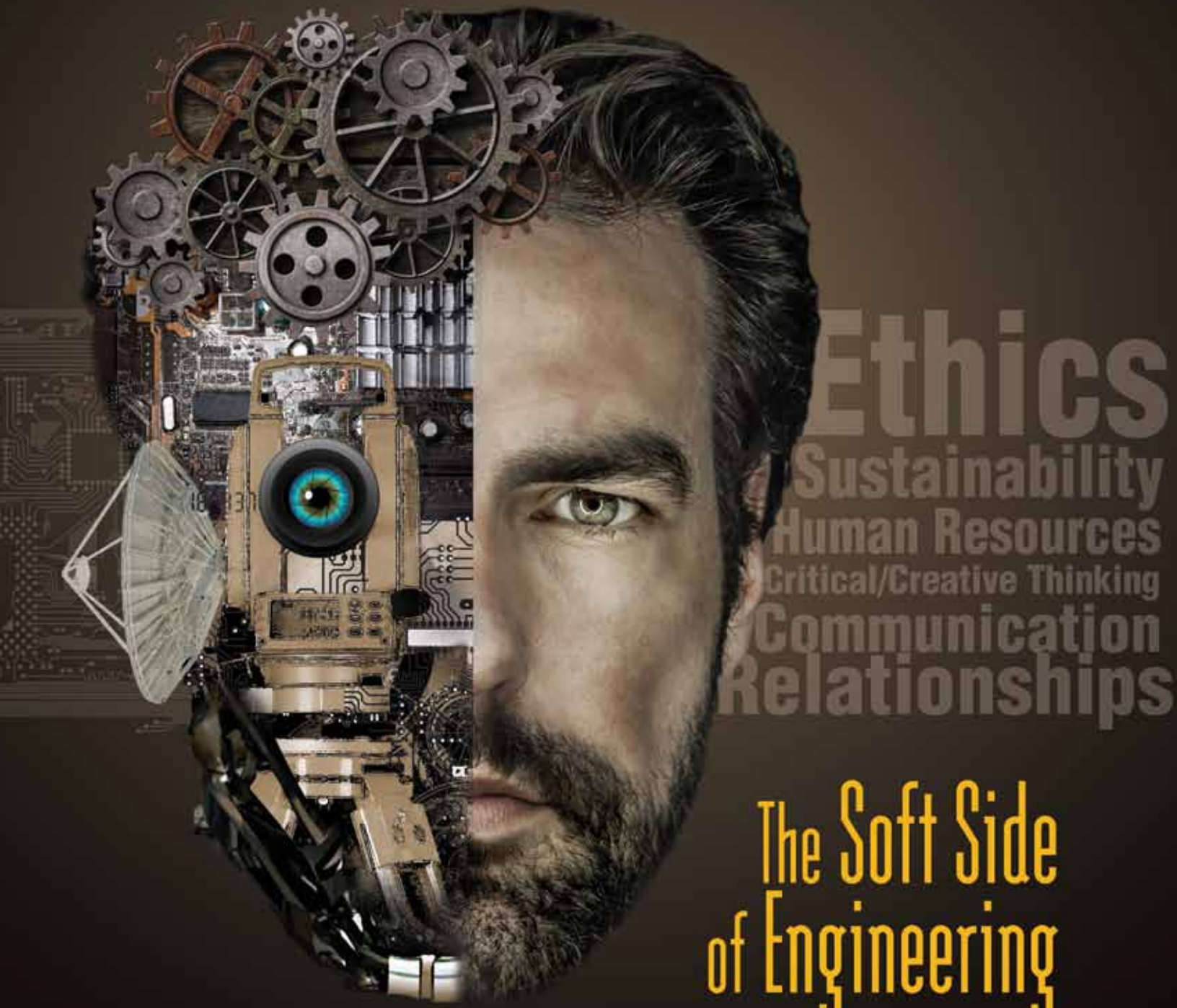

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Pittsburgh
ENGINEER
Quarterly Publication of the Engineers' Society of Western Pennsylvania

In this issue...

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Guest Editor Column

Pete Geissler, Guest Editor.

Welcome to the soft side and your *Comp*etitive+*E*nduring *L*eadership (CompEL[SM]).

Is the soft side the neglected essential for success in engineering?

Yes, according to many practitioners and educators who are concerned that engineering's tight, virtually exclusive focus on the technical skills that we call 'the hard side'—calculations, designs, construction methods and the like—has outlived its usefulness. Perhaps a broader, more comprehensive world view is needed, or at least desirable, if engineers are to understand and effectively serve the broad society in which they apply their skills and technology.

Enter the soft side, the overlapping and related behaviors that support, complement, and enhance the hard side, thereby creating CompEL for persons and firms.

The soft side is a compendium of complementary mindsets—attitudes that influence events or situations—that result inevitably in palpable behaviors that define the culture and personality of individuals and their groups, in this case firms. *The successful marriage of the soft and hard sides inevitably creates CompEL for those individuals and firms.*

Mindsets ⇨ Behaviors ⇨ Culture/Personality/ Reputation ⇨ CompEL

In this issue of Pittsburgh Engineer, six authors share their expertise with six essential behaviors that constitute a major part of the soft side and create CompEL William O'Rourke explains how ethical behavior enhances CompEL by enhancing reputations, which in the final analysis is the most important asset—some would say the only asset—for individuals and firms. Next, Don Nusser points out that applying the principles of sustainability to his firm's and clients' operations positions his firm as more responsible and responsive than competitors, an important marketing differentiation and goal.

Barry Wolfe tells why it's crucial when hiring new and retaining current employees to look beyond what a candidate has done—typically what's on a resume—to what he or she has accomplished to add value.

Dr. Stan Kabala notes that critical/creative thinking is the route to design solutions that optimally meet the needs of clients and society, and he explains how to encourage it.

I follow Stan's article with Results Writing and Communications, and point out that none of the behaviors of the soft side, and CompEL itself, is possible without understandable communications that start with clear, concise, and on-point writing.

And Jim Browne presents the imperatives for building long-term relationships, how they have been pivotal to the success of his firm, and how they can be applied by consultants of any discipline.

A word about the origins of CompEL. 'Competitive advantage' has become a tired cliché that has lost much of its clout and meaning. A new mantra is needed that is far stronger—thus Leadership rather than Advantage—and Enduring is needed to emphasize strategic, aka long term. Too many of us think of competitive advantage in terms of price or technology to be exploited tactically during current negotiations. In contrast, CompEL focuses on the long-term value and reputations of individuals and firms; it is initiated by the behaviors embedded in the soft side; it simultaneously embraces technical superiority and other necessary ingredients of the hard side.

* * *

We've made it easy to expand your view of the soft side and your involvement with ESWP.

- Continue the dialog about CompEL with your peers and our authors. It's easy: each of the articles ends with Conversation Starters, provocative, applicable quotes from others in the field; suggestions for further reading for other viewpoints; and ways to contact the authors with questions and comments.
- Enter the quiz and win a free lunch for two at ESWP. Have you tried the fine cuisine lately?
- Laugh at the cartoons and, I hope, see yourself in them.

Pete Geissler is a writer, teacher and coach. He may be reached at 412-322-0480, or by email at: geissler@earthlink.net or visit his website: www.peteswords.com

Conversation Starters:

"In business school classrooms they construct wonderful models of a nonworld." Peter Drucker. (Is it the same in engineering school?)

"Although popularity and affluence, for example, are nice outcomes, people prefer to define success as the ability to 'make a difference', 'create lasting impact', and' being engaged in a life of personal fulfillment'". From Success Built to Last.

"Management by objective is fine if you know the objectives. Ninety percent of the time you don't." Peter Drucker.

Further reading:

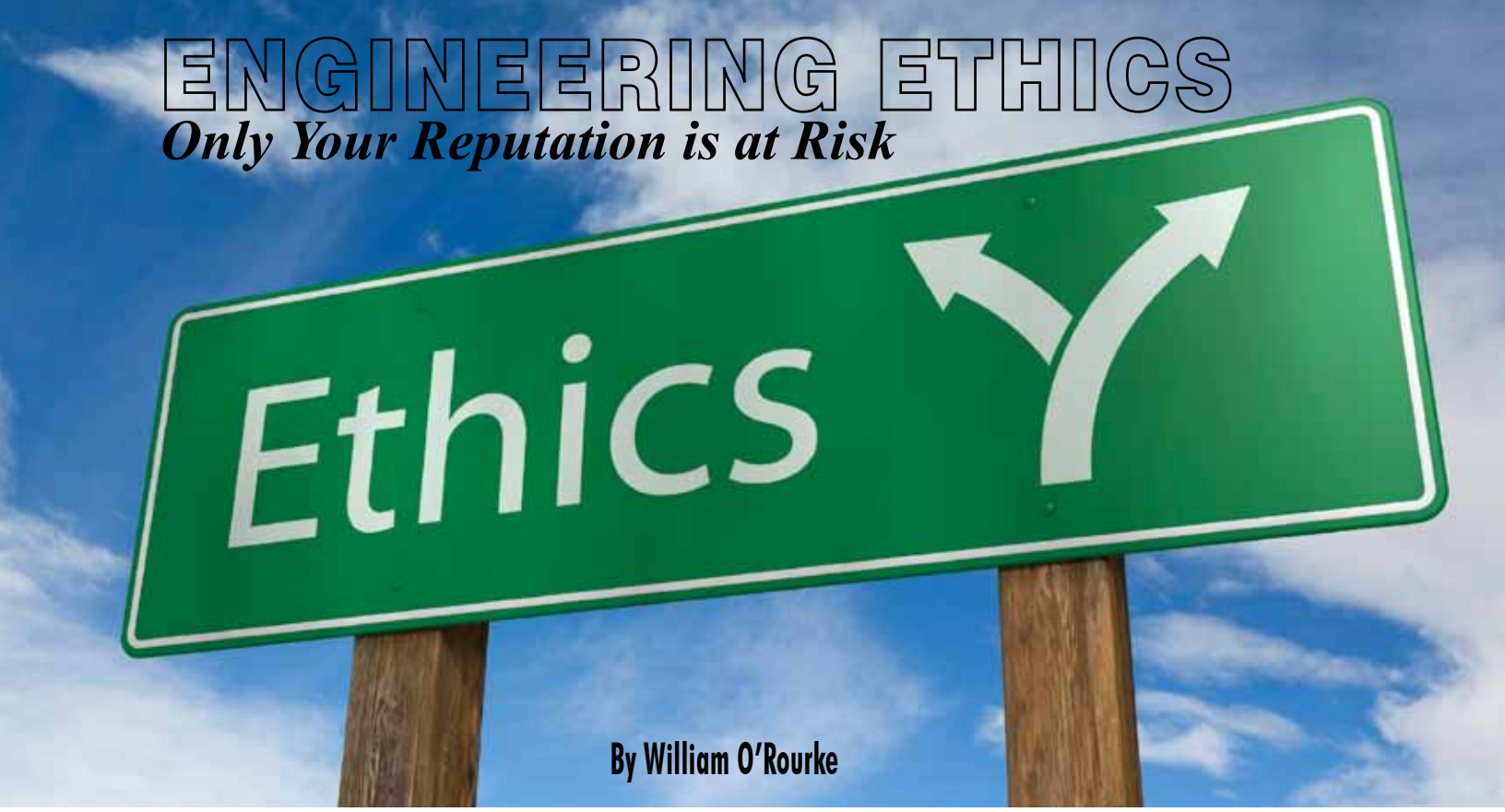
Positioning—The Battle for Your Mind, by Al Reis and Jack Trout.

Leapfrogging the Competition, by Oren Harari.

Competitive Advantage: Creating and Sustaining Superior Performance, by Michael Porter

ENGINEERING ETHICS

Only Your Reputation is at Risk



By William O'Rourke

All professions – business, medicine, teaching, law and engineering – have adopted codes of ethics to guide professional behavior. All of these codes generally state that the professional should "do what's right." The problem is that different people perceive different behavior to be "right" at different times. So, more explanation is necessary, from moral awareness, to judgment, to integrity, honesty and fairness.

All people face moral and ethical situations in the workplace. These include conflicts of interest, suspicion of wrongdoing, dishonesty, theft, and misrepresentation. Engineering ethics is beyond personal morality. It refers to standards of conduct that every engineer wants to follow. It is a fiduciary responsibility to the public. It includes the notion that the professional requires a certain degree of competence before acting in a manner where others will be relying on that competence. Engineering ethics is fact-based. It provides assurance that the public can rely on the technical actions or assertions of the engineer and that the result will meet the intended or represented specifications.

Engineering is what engineers do; and by professional standards they must do their engineering "right." This involves assurances of health, safety, reliability, avoiding environmental harm, quality, durability and economy. Yet, many of these concepts involve trade-offs such as planned obsolescence, cost/benefit analysis, and risk management. Engineers cannot guarantee 100% quality, nor can they eliminate all risk, but they can specify the chemical composition, the properties of the product, the expected life, and follow generally accepted design standards so that the public understands in an open, honest and transparent way exactly what is being technically represented, warranted, and assured.

Personal Integrity

Beyond the broad topic of ethics in the engineering profession is the more specific topic of personal ethics (integrity). In reviewing ethical situations, it becomes clear that individuals, not organizations, make the ethical choices, right or wrong. We are all challenged daily to do what is right personally and professionally. Given the mandate for profitability, the stress in the workplace, the drive to get it done better, faster, and cheaper, doing what is "right" is not always the easy choice. Still it is the best choice, and the only choice.

When asked by those entering the workforce for my recommendation on the best employer, my response is, typically, to work for a person and a company that you respect and admire. Those enlightened leaders seek to do what's best. They strive for the theoretical limits of what is possible. They teach us how to use our imagination. They talk and act in superlatives; not just settling to be "good" or even "better," but always seeking to be the "best." And, they believe that ethical, honest behavior is the only way to live.

"Professional ethics refers to those special morally permissible standards of conduct that, ideally, every member of a profession will follow."

The History of Engineering Ethics Demonstrates the Concerns of the Profession

The engineering field established itself as a distinct profession in the 19th century. In The United States, this growing professionalism gave rise to the formation of four founding engineering societies:

- The American Society of Civil Engineers (ASCE 1851),
- The American Institute of Mining Engineers (AIME 1871),
- The American Society of Mechanical Engineers (ASME 1880), and
- The American Institute of Electrical Engineers (AIEE 1884).

Similar societies and institutes appeared throughout the World.

As the profession became established, its standards of conduct also began to develop and evolve. Professional ethics refers to those special morally permissible standards of conduct that, ideally, every member of a profession will follow. Engineers become exposed to these professional standards of conduct in engineering school and from others in the profession.

An example from the ASCE states that Engineers shall

- Hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.
- Perform services only in areas of their competence.
- Issue public statements only in an objective and truthful manner.
- Act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
- Build their professional reputation on the merit of their services and shall not compete unfairly with others.
- Act in such a manner as to uphold and enhance the honor, integrity and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
- Continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

Many of the larger corporations have adopted "Values" (almost all including "Integrity") and their own codes of conduct. Many have appointed Chief Compliance Officers for ethics, just as they have appointed compliance officers for safety, health, environmental affairs and sustainability. The engineers, like all employees, are expected to behave in accordance with those corporate values.

The professional standards of conduct for engineers set a very high bar for the professional engineer. Sure, there have been engineering mistakes. Sure, there has been liability ascribed to faulty engineering design. Sure, there are some "bad apples" in the profession. However, considering the scope of the work that engineers have addressed over the last century, their collective performance has been superior.

There have been dramatic episodes of engineering failures that can be attributed to ethical lapses, including:

- The Hyatt Regency walkway collapse in Kansas City in 1981, designed with an emphasis on cost reduction, not safe support and movement of people.
- Space Shuttle Challenger (1986) where there was some evidence that an O-ring was faulty, but the excitement of the launch outweighed the need to assure, with absolute certainty, the integrity of that component.
- The BP Oil Spill in the Gulf of Mexico (April, 2010) where technical inspections were outsourced and sometimes shortcut, and where full disclosure of the gravity of the situation was obfuscated for days.

When technical design and technical operation are involved in catastrophic failures, the finger will often point to the engineer. But in these complex situations, there are often numerous organizational behaviors and pressures acting simultaneously. Many factors usually cause these failures, not just the technology.

The Ford Pinto: an Ethical Lapse?

In 1968 Lee Iacocca, who had much success with the introduction of the Mustang, recommended to Ford CEO Henry Ford II that Ford design a small car to compete with the foreign small car market. Henry Ford agreed with Lee Iacocca and promoted him to President. Iacocca wanted the

new Pinto in the showrooms by the 1971 model introduction. That meant that the Pinto had to be designed and tooled in record time.

Prior to introduction, Ford conducted crash tests. Eight Pintos were subjected to rear-end collisions. All eight cars that had the standard fuel tank failed the tests. Three Pintos were modified to prevent failure and the modified design did prevent failure in the crash tests of these three cars. Despite those results, Ford proceeded with the standard fuel tank design. There was pressure at Ford to meet the fast introduction, plus meet a price tag of $2,000 plus a targeted weight not to exceed 2,000 pounds. Ford experimented with alternative gas tank locations but all reduced trunk space. A quote attributed to a Ford engineer was "safety isn't the issue, trunk space is." Iacocca was quoted as saying often that "safety doesn't sell."

The final review at Ford was a cost/benefit analysis that ascribed a value of $200,725 on a human life. They compared the cost of an $11 gas tank retrofit to the cost of losing an estimated 180 lives and decided that it was three times less expensive to proceed with the standard gas tank design.

As early as 1973 the Ford field engineers concluded that the Pinto was susceptible to exploding in low speed (less than 25 mph) rear-end collisions. It was not until 1978, faced with litigation, public outrage, and government attention, that Ford launched a recall of 1.5 million Pintos.

Was this an issue of engineering ethics? The engineers designed the car, identified a potential problem, and identified alternative solutions (relocation of the tank or retrofit to minimize the risk). The fuel tank location behind the rear axle was commonplace in American cars at the time. The engineering seemed sound. Still, a decision was made to proceed knowingly with a design that failed crash tests. When field reports indicated that the fires were happening at an increasing rate, the field engineers did not launch a recall for five more years. There were clearly many individuals in a position to do something or say something long before 1978, including the engineers, but they apparently didn't. This shows how important a corporate culture can be in facing ethical situations objectively.

Author and Lecturer Dr. Mary Gentile, from Babson College, stresses the importance of a corporate culture that allows and even fosters employees speaking-up on ethical issues, and the culture to assure that the employees are heard when they have the courage to speak. "Giving Voice to Values: How to Speak Your Mind When You Know What's Right (2010)."

A Few Lapses, Many More Successes

Rather than dwell further on specific situations and try to dissect the very complex reasons why they happened, consider another observation. Think about all the buildings in the world, all of the bridges around the world, all the dams, all the trains, cars, boats and airplanes moving around the globe. Imagine the number of factories, refineries, drilling rigs, and other manufacturing operations; think about all the energy being generated whether nuclear, coal fired, hydroelectric, wind or solar; think about the water delivery, collection and treatment systems. Imagine the billions of televisions, radios, phones, tablets and computers that keep the world constantly connected.

These vast facilities, machines and equipment all around our globe, and even beyond, are designed, constructed and operated reliably. The amount of confidence that the world's population has regarding this reliability is incredible and amazing and well placed. The reason for that confidence is that the engineers do their job. The universities that train the engineers are teaching the requirements of the profession. The profession that is embracing, training and developing these engineers is doing so with professional ethics.

Engineers Are Rightfully Proud of Their Ethics

Engineers are a proud bunch; they pride themselves on providing technical information that is accurate, complete and reliable. That sense of pride is sometimes demonstrated in the Professional Engineering stamp that is applied to the work product. The "Iron Ring" is a ring worn by Canadian-trained engineers, as a symbol and constant reminder of the obligations and ethics associated with the engineering profession.

Whether engineers wear the Iron Ring, carry their Professional Engineering stamp, or not – they are doing the job in a most responsible, accountable, incredible way. That's why engineering routinely ranks in the top five professions in surveys, such as the Honesty & Ethics Poll conducted by Gallup (in a recent Honesty & Ethics Poll by Gallup the Nursing profession was rated highest, while members of congress were rated lowest, even below used car salesmen).

The Past is Prologue for Deeper Ethical Practices in the Future

Superior performance must serve as the foundation for the future, to maintain and even enhance the professional reputation of our engineers. Considering the state of our many bridges, buildings, water treatment facilities, and factories, the public is counting on the engineering profession to tell them where and when we need to be concerned. The public is counting on the profession to take the difficult step, when warranted, of shutting down facilities and bridges when that action is necessary. The professional engineer must continue to embrace that fiduciary responsibility.

These ethical issues happen every day throughout our organizations. Most are handled diligently and appropriately. A most important factor in maintaining an ethical culture of a profession or an organization is the tone that is set by the leaders of the organization and the leaders of the profession. That "tone at the top" must be audible. The leaders must articulate their clear expectations in this ethical area. They have to set the example and be the example. They need to train the next generation of leaders to assure that the culture continues long into the future.

A Few Guidelines and Real-life Anecdotes to Support the Concepts

Challenge
The situation: Beryllium in an aluminum alloy added desirable properties but could deteriorate the health of workers.

The solution: Examine alternatives at considerable cost but that offer similar benefits, then convince customers to accept them.

Don't Bend the Rules – Ever.
The situation: Products were being shipped without being properly inspected–equipment had malfunctioned–in order to enhance quarterly financial statements, and it was justified since no defects were found during four years of production.

The solution: Call the customer and offer the option of accepting the products or waiting for the normal inspection results.

Tell the Truth.
The situation: Assume, for calculating life cycle costs, that 100 percent of the aluminum in a product could be recycled but 0 percent for a competing plastic product, an unrealistic assumption.

The solution: Assume current recycle rates for both materials of 40-50 percent, adding intregrity to the calculations and the person making them.

Tell the Whole Truth.
The situation: A deposition concerning an airplane seat belt that was intended to reduce damage to abdomens should the plane crash. The design included score lines intended to 'give' slightly. The design was inherently faulty but the questioning lawyer didn't ask the "right" questions.

The solution: I rejected the advice of the company lawyer to not offer any information that wasn't asked for. I still felt an obligation to contact the manufacturer and assure myself that the design in question would not be commercialized.

Do What's Right.
The situation: Trichlorethylene was found in core samples taken adjacent to a manufacturing plant, possibly affecting the drinking water and health of 125 families.

The solution: Ignore the advice of the company lawyer to do nothing since, in the lawyer's opinion, any action could be construed as assuming liability. Then visit all 125 homes, notify the families of the risk, deliver large bottles of water and promise to continue to do so until adequate filters could be installed. Sort the liability question later.

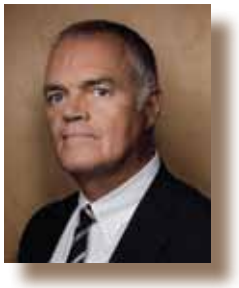
Reinforce Values.
The situation: Safety incidents were being hidden by the manager of a plant in Australia, violating one of the manufacturer's primary missions.

The solution: In a meeting, I was asked if the VP had fired the plant manager. "No', I replied, "the plant manager has fired himself with his cover-up, and it's up to others to fire him formally. All employees are watching." The plant manager is no longer with the company.

A Suggested Approach: For personal ethical situations, I suggest the following approach, adapted from "Managing Business Ethics: Straight Talk About How to Do It Right" (5th Edition) by Linda Trevino and Kate Nelson:

- Recognize you have an ethical issue
- Gather the facts
- Define the ethical issues
- Identify the affected parties
- Identify all of the likely consequences
- Identify the obligations
- Consider character & integrity
- Think creatively about potential actions
- Act – inaction can be seen as condoning the behavior.

About the author... **PE**



After serving as an officer in the US Army, Bill O'Rourke joined U.S. Steel as an Industrial Engineer. Upon graduation from Duquesne University School of Law, he joined Alcoa as a Patent Attorney. In over 30 years with Alcoa he held positions including Patent Counsel, Corporate Auditor, CIO, VP Procurement and VP Environment, Health & Safety. From 2005 to 2008 Bill was the President of Alcoa-Russia. Bill is now Executive Director of the Beard Institute at Duquesne University with a focus on business ethics, an Ethics Fellow at Brigham Young University and Chairman of the Board of Sustainable Pittsburgh. Bill serves on the Board of the Alcoa Foundation. Contact Information: orourkew@duq.edu

Conversation Starters

"A good reputation is your greatest asset and makes sleeping easier at night." William H. Child

"The world has achieved brilliance without conscience. Ours is a world of nuclear giants and ethical infants." General Omar Bradley

"Trust is the glue of life." Stephen R. Covey

"I don't have much, but I give you my good name. I give it to you untarnished and sincerely ask that you keep it that way." William J. O'Rourke, Sr (My Dad)

SUSTAINABILITY

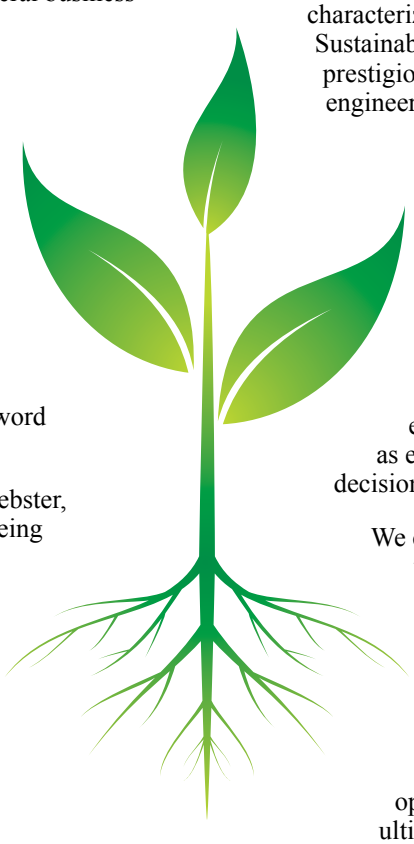
Creating the Value Proposition & Walking the Talk

By: Don Nusser

An Indefinite Definition

The words "sustainability" and "sustainable" are used everywhere: brochures, ads, logos, business cards, magazines, even in local MBA programs. If we ask for a definition of the terms, we are likely to uncover a multiplicity of meanings, which would most certainly include some mention of energy, environment, quality of life, net zero, and the future. More examples from several business people interviewed on the topic:

- "It means energy conservation"
- "It means energy conservation and environmental acceptability"
- "Not sure, but it must be a good thing because everyone is talking about it"
- "It is impossible to attain, since everything we do affects the future"
- "It means whatever the user of the word wants it to mean"



My favorite desk reference, Merriam-Webster, defines "sustainability" as "capable of being sustained", which is even less helpful. It also defines the word as "using a resource so that the resource is not depleted or permanently damaged." When do we ever develop anything which does not use a resource, and at what point do we feel uncomfortable depleting it?

The bottom line is simply that the word "sustainability" appears to have no precise or common meaning. Quite simply, I like to think of sustainability as "the capacity to endure."

Toward Greater Understanding

Hatch Mott MacDonald ascribes to an overall definition of "sustainable development" first offered by the World Commission on Environment and Development (aka the Brundtland Commission) in its 1987 report titled "Our Common Future": Meeting the needs of the present without compromising the ability of future generations to meet their own needs. By all means, a very broad definition, and one that can be applied to the many forms of development that we design and oversee. In the report, the Commission addressed development and the environment as a single issue, recognized that many crises facing our planet are interlocking ones, and asserted the importance of all sectors of society to be involved in the decisions which are associated with any kind of development.

HMM is not alone in adopting the Brundtland characterization of sustainability. The Center for Sustainable Engineering, a consortium of three prestigious universities, describes sustainable engineering: Sustainable engineering meets the needs of the present without compromising the ability of future generations to meet their own needs. The Center further states that we can meet that goal using methods that minimize environmental damage to provide sufficient food, water, shelter and mobility to a growing world population … designing products and processes so that wastes from one are inputs to another … and incorporating environmental and social constraints as well as economic considerations into engineering decisions.

We can debate the definition of sustainability until we are, well, green in the face. The broad definitions of sustainability ultimately manifest themselves in a firm's internal operations and external service offerings. The important aspect of sustainability is how it is applied, and HMM views sustainability as being applied on several "fronts": to our office operations and especially to projects, which will ultimately be reflected by the very sustainability of our business.

Office Operations Maintain Awareness

In 2009, HMM developed the concept of a Local Environment Practice Plan (LEPP) to be implemented in every office in North America. These LEPPs act as a conduit, channelling corporate sustainability culture into individual offices. A local LEPP addresses eight categories of operations: procurement, paper, energy, transportation, water, waste reduction and recycling, environmental awareness, and emergency action. These office-specific plans ensure that these environmental measures are carried out and that additional objectives are created annually.

Data from the LEPPs are fed to our annual carbon surveys, which also incorporate business travel information culled from staff expense reports. Together, the data are used to calculate the firm's carbon footprint over the course of the year.

A Sustainable Approach to Projects

Most engineers might say that they have been doing all this for all the decades of their careers. What's new here except the word "sustainability"? HMM believes that sustainability is good stewardship, and that as consulting engineers it is our responsibility to provide value-added solutions to minimize a project's impact to the built environment and to make a project sustainable in all aspects. Implementing "green" concepts can result in a better quality project with lower capital and operating costs.

I often compare the incorporation of sustainability into our projects as I do safety and ethics. Both are interwoven into the culture of HMM, as opposed to being just an "add-on". Like fibers in a fine tapestry, they lend their color and strength to our operations and projects, and each is identifiable only by looking closely. We continuously emphasize our commitment to sustainable operations and project designs both internally and externally by

- cultivating a broad understanding of sustainable development among our staff
- developing our skills to facilitate a sustainable approach to operations and project designs
- understanding our clients' needs
- auditing our sustainability performance and reporting on our progress

I would propose that the ultimate aim of a sustainability program as it is associated with projects should be "zero impacts."

The goal of any safety program is, of course, "zero accidents." I would propose that the ultimate aim of a sustainability program as it is associated with projects should be "zero impacts." Although the safety goal is not negotiable, the level of sustainability attained in a project will depend upon the applicable business and project objectives. For example, the goal of sustainability in office operations could be as follows: "to reduce carbon footprint by 10% per year." In projects, the approach to sustainability is established by working with our clients and understanding the project purpose, objectives, and goals. In our business, the sustainability goal may be as follows: "to recognize a continuous competitive advantage through clients' appreciation of our sustainability performance both internally and externally." Our experience to date suggests that the latter goal will be dependent upon the results we attain in implementing the first two.

How are project sustainability goals established? First and foremost, by listening to clients' needs and understanding the overall project objectives and goals. Often, we are involved in defining the goals with clients, which can include cost, environmental and social impact, lifespan, flexibility, and other factors. HMM recognizes the importance of being involved in the very early stages of a project when the number of stakeholders inputting to any particular set of solutions can be maximized, and when "integrated planning" concepts can be applied to maximum advantage. We also recognize that there are alternative approaches to project sustainability based upon clients' sustainability goals, the applicability of federal/state/city sustainability regulations, and planning budget.

The application of sustainability to projects today must be flexible in order to accommodate clients' goals

Often, clients will have a sustainability policy with goals and objectives clearly outlined. Sustainability objectives can range from meeting minimum regulatory requirements (e.g., the California Green Building Standards Code) and incorporating internally-controlled sustainability measures, to the attainment of certifications by a third party rating system such as LEED®, ISI Envision™, Greenroads™, and GreenLITES. There are also a plethora of sustainability guidelines which clients are incorporating into projects without third party certification. These guidelines reach far beyond the classic building (vertical construction) approaches and address rail/transit, aviation, waste, and water/wastewater systems.

What's in Your Toolbox?

HMM employs a number of planning and decision-making tools that optimize life-cycle costs and social/environmental impacts simultaneously. These tools establish metrics on sustainability when considering alternative solutions and measuring against a base line. For example, CapIT was developed by our parent company, Mott MacDonald, and is the first system in the world that simultaneously calculates the capital cost and embedded carbon of a construction project. CapIT has been used on projects internationally. This tool

- estimates initial capital costs of civil engineering projects
- optimizes specifications based on cost and embodied CO2
- enhances value engineering by allowing creation of alternate versions of a project to easily compare using the snapshot function
- calculates the impacts (both cost and CO2) of transporting materials and labor to and from the project site

- generates cost reports, carbon reports, and combined cost/carbon reports
- downloads data into spreadsheets for use elsewhere

In the future, CapIT will have the ability to quantify other sustainable metrics such as embodied water, NO_2 and SO_2.

To further assist our clients with measuring a project's whole life carbon output, HMM will launch LifeCYCLE software, which calculates both the cost and carbon footprint over the whole life of a project, with the ability to calculate an unlimited number of alternatives. The programming for LifeCYCLE was created by Mott MacDonald for the Masdar project (described below), and has been used successfully on Masdar as well as numerous other projects around the world.

Incorporating sustainability into a project design often begins far before the CADD hardware is switched on. For example, a planning phase tool developed by HMM parent company Hatch called 4-Quadrant Analysis (QA4) is a simple but powerful tool, illustrated in Figure 1. The core principle of this tool is that innovation drives initiatives that lower costs and social/ecological impacts simultaneously. It can be used as a value improvement process during early project stages, thus identifying the optimum project concepts.

The QA4 tool was recently used to evaluate two cokemaking technologies (byproduct and heat-recovery) in two locations which consisted of two different steel plant configurations and availabilities of raw materials and fuel. The objectives for each evaluation were to calculate the

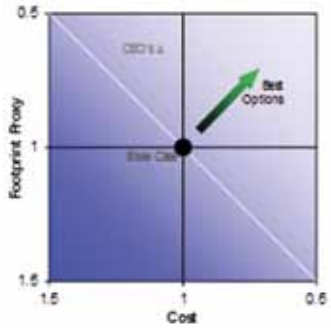


Figure 1. The 4-Quadrant Analysis Options Evaluation Matrix

- overall energy balances and costs, both capital and operating;
- greatest return on investment during the life of the plant using cash flow analysis; and
- environmental impact, considering energy consumption and emissions of SO2 and other constituents.

The QA4 output was a graph with environmental footprint and net present cost being plotted as an inverse ratio of the base case. For the first location, the byproduct plant was considered to be the base case, and the heat-recovery plant was shown to be superior with a smaller environmental footprint and lower cost. The results for the second location also showed that the heat-recovery plant was superior, with a more environmentally acceptable footprint but with a lower return on investment.

Three Real Life Examples:

1. Reshaping One of the World's Busiest Airports

Los Angeles World Airports (LAWA) is reshaping Los Angeles International Airport (LAX) to meet the needs of the future. Their $5 billion LAX Modernization Program includes the design of the new Midfield Satellite Concourse and the expansion of the Tom Bradley International Terminal. To become the global leader in airport sustainability, LAWA has developed the Sustainable Airport Planning, Design and Construction Guidelines for implementation on all LAWA projects. These guidelines shift the traditional definition of project success from financial-only performance to integrated, sustainable solutions that balance environmental stewardship, economic growth, and social responsibility. As the prime consultant of LAWA's Engineering Services team, HMM assisted LAWA with implementation of the guidelines. Project highlights included

- LEED® Gold certification for the new Aircraft Rescue and Fire Fighting Facility
- two additional buildings designed to achieve LEED® Silver certification (pending)
- reduction of aircraft delay and taxiing times to reduce fuel use
- reuse of more than 90% of the on-site excavation and demolition material to reduce construction waste requiring disposal
- specification of regional materials to reduce transportation costs, increase service life and decrease maintenance cycles
- design of construction access routes to reduce roadway congestion and exhaust

2. Successful Closure in the Pine Barrens

As I discussed above, project sustainability measures extend past vertical construction and building systems. For example, HMM designed the closure of the Southern Ocean Landfill in Ocean County, NJ, a site situated in the ecologically sensitive New Jersey Pinelands (see Figure 2). The closure design of this 283-acre tract included numerous sustainability measures, including

- reuse of soil generated from county road construction projects
- use of 10 percent recycled content in the synthetic geo-membrane cap
- use of crushed glass from the county recycling facility for construction of the gas venting and bedding layer
- use of leaf compost in construction of the vegetated layer
- a storm water management design which achieves a zero discharge under a compounded 100-year and subsequent 10-year storm

3. A Future City Now

Masdar City is an emerging global clean technology cluster located in what aims to be one of the world's most sustainable urban developments powered by renewable


Figure 2. Southern Ocean Landfill

energy (artist's rendering depicted in Figure 3). Masdar will be home to some 50,000 people, mixing residential, hotel, retail, commercial, and light industrial development built in 7 phases over approximately the next 8 -10 years.

Phase 1 comprised Masdar Institute of Science and Technology, which opened in 2010. The Masdar project used the Mott MacDonald CapIT and LifeCYCLE sustainability tools described above; Mott MacDonald led infrastructure design across the entire project.

This special economic zone, located about 17km from downtown Abu Dhabi, will eventually be home to companies, researchers, and academics from across the globe, creating an international hub for companies and organizations focused on renewable energy and clean technologies. It served as a test bed for new approaches to the planning, design, engineering and operational challenges involved in creating environmentally sustainable cities. Some highlights:

- Masdar City is meeting its energy requirements through renewable sources. Examined options include photovoltaics, concentrated solar energy and geothermal. These will provide electricity, thermal energy and domestic hot water to the city.
- Masdar City will have a metro to carry people into Abu Dhabi central, consisting of a light rapid transit system to provide the main transport spine. Transport options assessed include a Personal Rapid Transit system and electric vehicles. Modeling of energy and carbon emissions was also carried out.
- Masdar City's district cooling system – which involves pumping chilled water from central plants to buildings across a wide area – is up to 60% more efficient than conventional air conditioning, achieved by combining state- of-the-art technologies including geothermal and solar thermal energy, and chilled beams/floor slabs.
- Masdar City's aim is to divert most solid waste from landfill, emphasizing reuse and recycling instead.

Moving Forward Sustainably

Sustainability is not an added cost to projects and organizations, instead, it is an approach to unleash innovation, growth, and efficiencies. HMM plans to continue on the path of incorporating sustainability into its culture, projects, and day-to-day operations, contributing to its competitive and enduring leadership position in the marketplace. Staying competitive and earning repeat business from existing clients will result from more than strict adherence to scope, schedule and budget on every project. The integration of sustainability and other "soft" engineering factors such as ethics and diversity contributes to the "value-added" our clients seek. It is important for HMM to invest the resources to educate its staff and to have all the tools necessary to provide to its clients a customized level of project sustainability. We do this because of the contributions we can make to the engineering profession, and the benefits to both the built environment and to the sustainability of our business in and of itself.


Figure 3. Rendering of Madsar City

PE

About the author...

Don Nusser, P.E., PP, ENV SP is Vice President of Hatch Mott MacDonald (HMM) and currently servies clients in the gas, coal, and general manufacturing industries. He has BS and MS Degrees in Civil Engineering and is a licensed Professional Engineer and Professional Planner. He is also an Envision™ Sustainability Professional certified by the Institute for Sustainable Infrastructure (ISI). Mr. Nusser is Chairman of HMM's Sustainability Steering Committee and is responsible for implementing the corporate sustainability policy on a day-to-day basis. He is also an Environmental Practice Leader for HMM. Contact him at donald.nusser@hatchmott.com or (724) 514-5331.

Conversation Starters:

"Sustainability is here to stay or we may not be." Niall Fitzgerald, UK CEO, Unilever

"The world we have created today as a result of our thinking thus far has problems which cannot be solved by thinking the way we thought when we created them." Albert Einstein

"I think we are too hamstrung by the language of sustainable development. We tend to be thoughtful people who like nothing better than a philosophical debate beginning with the words 'it depends on how you define sustainable development'. This is a total turn-off for people who just like to get on and do things." Rebecca Willis, independent researcher and adviser on environment and sustainability (2011)

"If one does not know to which port one is sailing, no wind is favorable." Seneca, Roman dramatist, philosopher, and politician (5 BC to 65 AD)

ESWP Member News

More than 80 firms are represented in the Corporate Member program of the Engineers' Society of Western Pennsylvania (ESWP). Memberships are available at 3 levels: Gold, Silver and Bronze. Gold members are entitled to 14 memberships that can be exchanged by employees; Silver, 9; and Bronze, 5 — annual dues are $2400, $1700, and $1000 respectively. In addition, ESWP Corporate Member Firms may add 2 additional individuals in our Under-35 age category at no additional cost. More information can be found at eswp.com. Please contact the ESWP Office (412-261-0710) for additional details.

NEW! For Government Agencies, Corporate and Individual Memberships are available at a 50% discount!

Membership in ESWP comes with a long list of benefits! From our continuing education opportunities earning you Professional Development Hours (PDHs), to the business networking events in our fine dining city club, there is something for everyone in your organization. Also, ESWP is helping the next generation of engineers with student outreach programs, giving you the opportunity to participate in many rewarding programs.

ESWP Gold Corporate Member Firms

AECOM

gai consultants
transforming ideas into reality

i+icon USA
Infrastructure & Industrial Constructors USA

Baker

GATEWAY
On Call. On Time. On Target.

Orbital Engineering, Inc.

CDM Smith

HATCH

DEI
DeSalvo Enterprises, Inc.

KVAERNER
KVAERNER NORTH AMERICAN CONSTRUCTION INC.

USS

ESWP Silver Corporate Member Firms

ASTORINO
Architecture Engineering Interior Design Design Build

KU Resources, Inc.

POINT PARK UNIVERSITY

CEC
Civil & Environmental Consultants, Inc.

Lennon, Smith, Souleret Engineering, Inc.

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AIST Association for Iron & Steel Technology

Aquatech

AVALOTIS

Bayer MaterialScience

BRG Berkeley Research Group Construction Services

Burns White Attorneys at Law

Carnegie Mellon Engineering Carnegie Institute of Technology

CDR Maguire

Chester Engineers

CONVERTEAM The Power Conversion Company

Collective Efforts, LLC Civil and Environmental Engineers

CSD Carnegie Strategic Design Engineers LLC

dck Worldwide

Danieli Corporation

DiGioia Gray & Associates

DLA Architecture Interior Design

DQE Communications LLC

FIGG

Gannett Fleming

H.F. Lenz Company

Hatch Mott MacDonald

Hazen and Sawyer Environmental Engineers & Scientists

Highmark

Hill International

IKM

JNE Consulting

L.R. Kimball Architecture · Engineering · Communications Technology

Marcellus Shale Coalition

mascaro construction

McTish, Kunkel & Associates

menard Ground Improvement Specialists

MOC, Inc.

ms consultants, inc. engineers, architects, planners

Nicholson

PB Parsons Brinckerhoff

Paul C. Rizzo Associates, Inc. Consultants

RIG Consulting, Inc.

River Consulting

RJ Lee Group

RDA

R. T. Patterson Co., Inc. Engineers & Consultants

SAI Consulting Engineers

Schnader Attorneys at Law

SciTek Consultants, Inc.

SMS Siemag SMS group

SNC-Lavalin America

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TeleTracking Workflow Automation for Healthcare.™

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WYATT Incorporated Interior Construction

Zell Engineers

Results HR

The Most Important Question in Hiring

By Barry Wolfe

Chances are you're pretty confident about most of what you do in your job – except when it comes to hiring. Imagine if you finished a client project with that same sense of hopeful fingers crossed you have when you hire most people. Well, if you're wondering whether your hiring procedures are really as effective as they should be, the answer is probably no. But take heart: It's not just because you're an engineer.

In 2011, a leadership and training company called Leadership IQ published the findings of a three-year study on the effectiveness of interviewing techniques. The consulting firm had followed 20,000 hiring decisions made by 5,247 hiring managers in 312 public and private organizations.

The results? Only 19% of all new hires could be considered unequivocal successes. Forty-six percent of all new hires fail within the first 18 months on the job. That's right; for most companies, the reliability of their hiring practices is not much better than flipping a coin.

But here's the really interesting thing: Of the group of failures, only 11% were terminated because they lacked the required technical competence. The vast majority were not successful because, in one way or another, they were personally unsuited for the job. Maybe they didn't have the right interpersonal capabilities, or they weren't motivated to do the job the way the business needs it done, or they couldn't change course when someone told them things weren't working out.

So often, these people's exits are followed by small groups of former co-workers or managers who offer their post-mortems around the water cooler. "Bob just couldn't make Acme happy, and they're our toughest client," they'll offer with pitying head shakes. Or maybe, "Steve was too focused on the details, and that job really needs someone who can step into a leadership role."

Those are often perfectly valid statements. And in my twenty-plus years in HR, I've been continually amazed at how many times those critical requirements emerged only after the job descriptions were written, the advertising published, and Bob or Steve had been on the job for eight months. The Bobs and Steves of this world are not bad people. They're right for some job somewhere; but if we incorrectly put them in our openings, that's not their fault, it's ours. The problem is not bad people, it's bad hiring decisions.

Now, don't flip the page just yet; I'm not here to hector you about your need for better job descriptions. In fact, relying

solely on job descriptions is much of your problem. The real key to making better hiring decisions is to ask one question. It's not for the candidate to answer in the interview, though; it's for you to answer, and before you even start to fill out the job requisition.

Ask Yourself…

Before you even talk to your HR person about filling an opening, write down the answer to this question: "What are the three to five value-added accomplishments this person must deliver in the first 12 months on the job?"

Every job has three components – what you need to have (qualifications), what you need to do (duties), and what you need to produce (deliverables). Whenever most hiring managers contact HR to fill a job, they usually start and stop by defining their need as qualifications, like, "a BS in Civil Engineering and five years' experience in the natural gas industry." Defining requirements solely in terms of broad qualifications will generate a hefty stack of unsuitable resumes, while providing little guidance as to how to evaluate them.

Think Beyond Job Descriptions to Deliverables

The how-to-do-HR books will tell you that good hiring starts with an accurate job description. It doesn't. Besides qualifications and CYA language for legal compliance, job descriptions mostly describe duties. Sure, you need to be clear on what a person is supposed to do in a job, but that's not enough. Duties rarely change much year over year; but priorities do, especially as you go higher in the organization. This year a procedure manual needs to be rewritten; next year, it could be a new product or service that needs to be developed. And very often, such varied priorities exist in two jobs with identical job descriptions.

Those priorities aren't duties, they're deliverables. You can hold them in your hand, see them on the ground or on a computer screen, or find them on the bottom line. Hiring teams tend to sit down with candidates having no shared understanding of what the deliverables for a job are—at least until the new hire fails to deliver them.

But don't start pounding out your list just yet; there are deliverables, and there are deliverables. You need to be sure that your interview process assesses a candidate's capability to deliver those results that are truly value-added, as opposed to those that are non-value-added. A value-added deliverable is one that the end user—a customer, a client, or the boss—is willing to pay for; it's that thing he or she is really buying. It could be the same as a non-value-added deliverable, but it may not be. For example, a senior engineering position may list "prepares client reports" as a duty on its job description. The deliverable, of course, would be a completed client report.

But is that really the value-added deliverable? Chances are the client doesn't really want to pay for a report; he really wants to buy a recommendation about what he should be doing to fix a problem and what he should stop doing that's making the problem worse. There's your value-added deliverable, and a candidate's ability to provide that is what your interview process really needs to assess.

If you walk into an interview having defined the need mostly in terms of what the candidate has—qualifications—then you're prepared to ask about little more than what you can read on the resume. "Do you have five years' experience in natural gas?" Then once the candidate has given the yes or no answer, what are you going to ask about next? Maybe you'll ask a question you read on one of those innumerable web articles called "The 10 Really, Really Good Interview Questions All Interviewers Must Ask," or whatever; but whether you explore the real needs of the position is probably just luck.

You're doing better if you know the duties of the position, but assessing what a person has done isn't the same as digging into what a person has delivered. There is preparing client reports, and there is delivering a well-researched, thoroughly analyzed, professionally presented recommendation that offers the client a substantial perceived value. And there is that one-off need like researching foreign government regulations to support a client's overseas operations that you really must have in the next 10 months, but won't write about on the job description.

Clarifying the value-added deliverables provides the interviewer with a deeper insight into the real needs, and thus makes clear what the interview questions should be. So you can skip those over-broad questions like, "how would you describe your management style?" for which all candidates have the same canned answer ("Tough but fair:" Aren't we all?) and get to the ones that tell you what you really need, like "tell me about your best success with developing a young, inexperienced team into a successful one."

That, by the way, is why those internet articles are mostly pretty worthless. Even a great question is useless if you're

not clear on how to evaluate the answer it yields.

List those three to five desired accomplishments in a SMART format, meaning each one should be specific (deals with one thing), measurable (provides a way of ensuring it's done), achievable (doable given the resources at hand), relevant (to the job or larger organization's goals), and time-bound (has a deadline). Here are some examples:

- Acquire at least one new client in the natural gas industry within 12 months.
- Achieve company compliance with state regulation 12345 by year end.
- Ensure group's ability to use XYZ equipment within seven months.

If we weren't careful about distinguishing value-added from non-value-added deliverables, that last one might have been written as "deliver training to group on XYZ equipment within seven months." Completed training could certainly be a deliverable, but if the training was ineffective, should we consider the need as having been met? When we ask what value we're seeking, we see that we aren't hiring this person to deliver training - we're really hiring him to add an organization capability. And in the interview, there is all the difference in the world between exploring a candidate's training experience and his experience at upgrading skills for a team.

Think Beyond Experience to Accomplishments

Defining hiring needs in terms of years of experience is common, and it is helpful, especially for applicants; but to stop the needs analysis there is a mistake. Employment lawyers love experience requirements because they can defend them in court to a jury, and many interviewers think they're an efficient shorthand for gauging a person's capability; but in the real world, people of similar years' experience in similar backgrounds can have such different accomplishments and talents that using time as your yardstick is really pretty lazy. Besides, the talent pool is overflowing with long-tenured mediocrities. Mentally scan any company you've ever worked for, and then tell me you disagree. The fact that someone has done something a lot does not mean he's done it well.

A list of qualifications has its place in the hiring process. So does a job description. But the first and most valuable step is to define the necessary value-added accomplishments needed in the next year. You don't make a great hiring decision based on what a person has. Neither will you make it based on listing what a person has to do. The best hiring decisions start with knowing what a person has to deliver. **PE**

About the author...

Barry Wolfe is Corporate Director of Human Resources for Civil & Environmental Consultants, Inc., a nationally-recognized civil/site and environmental engineering firm with 17 regional offices and headquartered in Pittsburgh, Pennsylvania. He can be reached at bwolfe@cecinc.com.

Conversation Starters:

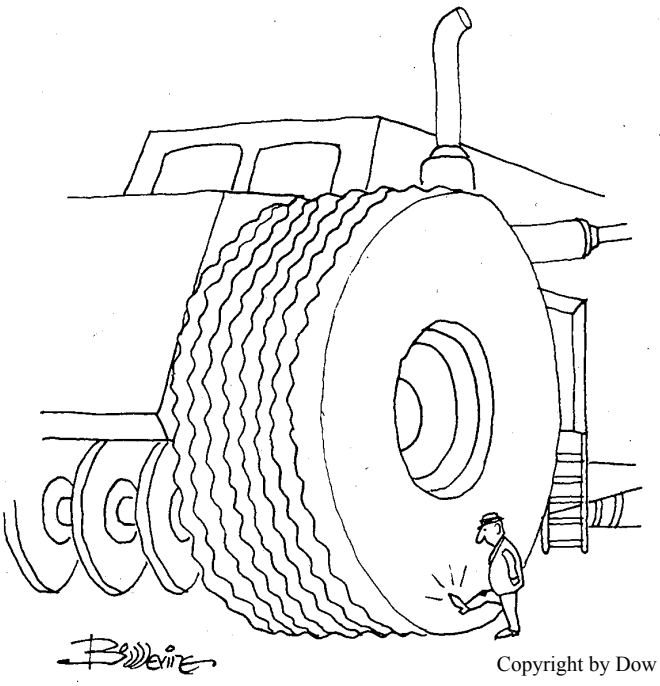
"We live in a world that emphasizes realistic expectations and clear successes. Don Quixote had neither." James March

"Listen up--here's some really bad news: It's dangerous not to do what you love." From Success Built to Last

For Further Reading:

Hire With Your Head, by Lou Adler

Topgrading: How to Hire, Coach, and Keep A Players, by Brad & Geoff Smart



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CRITICAL THINKING & CREATIVITY

The Initial Step For Building Your CompEL℠

By Dr. Stan Kabala

Critical thinking, as it applies to engineering, is the process of assessing or judging thoughts expressed by drawings or documents with the aim of improving them. Engineers tend to adhere intuitively to that process: they typically are critical thinkers; they are confident in their abilities to assess and figure out the logic of most technical and related issues, and they continually look for order, system, and relationships among concepts and thoughts.

Creative thinking—aka innovative, inventive, original, ingenious, resourceful, imaginative thinking—is the process of making or producing that which has not been made or produced before. Engineers typically are creative: Even the simplest engineering tasks demand ingenuity, insight, and judgment to evaluate the available options for overcoming a variety of technical and societal challenges.

Critical and creative thinking are intimately related: critical thinking is essential to define a need or problem, creative thinking to meet the need or solve a problem.

Engineers face a special paradox concerning critical and creative thinking: On one hand, engineering education tends to focus on data collection and analysis, not on how to use the data in new ways to solve all sorts of problems and create all sorts of comforts for man. On the other hand, engineering practice extends technology to the vital responsibility to improving man's condition in many facets of life, from aesthetics to a clean environment, fiduciary responsibility, and beyond.

The combination of critical and creative thinking can be defined further by what it is and isn't:

IT IS finding alternative solutions—solutions that are outside normal experience—to a situation/problem/human condition…bringing into being what was not there, whether it be a new way to open a beer can—who remembers the church key that was once indispensible?—or a Beethoven symphony … or penicillin … or the Walkman … or Pittsburgh's Convention Center and Clemente and Smithfield Street Bridges.

IT ISN'T the same old answers to the same old or similar new problems, which is what managers call stagnation, writers call block, and artists call a blank. I've used, and heard others use "I've hit a brick wall," "I can't get started," "It is what it is," and the latest, "It's the best I can do"—today's omens of defeat that are guaranteed to sustain the status quo.

The combination of critical and creative thinking isn't limited to so-called artistic types … advertisers, marketers, writers, painters, musicians and so on … they just get the publicity. Certainly we can agree that Mozart, Wagner, Stravinsky, Picasso, Shakespeare, and others in a long list are creative because they found new ways to express the human condition. We can also agree that Tom Watson, Bill Gates, Steve Jobs, Henry Ford, George Westinghouse, Thomas Edison, and Nicholas Tesla were and are just as creative.

THE SINGLE REASON TO BE CRITICAL AND CREATIVE is to build COMPEL℠ for individuals, their employers/firms, and clients. Engineers must come up with new ideas every day; the more creative--aka innovative, inventive-- their ideas are, the better are their chances of being noticed by top managers and the better their chances for promotion, the better the odds that the firm will thrive well into the future, and the better the odds that their clients will thrive as well; everybody wins.

BECOMING MORE CRITICAL AND CREATIVE: The five imperatives (Paraphrased from The Foundation for Critical Thinking to be most germane to engineering)

1. Intellectual humility: willingness to distinguish what is known and unknown; openness to new concepts that overcomes intellectual arrogance.
2. Intellectual courage: willingness to challenge popular beliefs, practices, and standards while adhering to standards of rationality.
3. Intellectual curiosity: willingness to ask probing questions; to listen carefully to the ideas of others; to understand and either accept or reject outside ideas.
4. Careful listening to others, yourself, and especially your subconscious smarts, which releases you from all sorts of inhibitions that can prevent criticality and creativity. The brain is a wonderful device that allows incoming information to organize itself into patterns that are not necessarily logical or symmetrical or normal—but they are useful, and we use the patterns to give rise to creative solutions.
5. Clear and substantive writing, which exploits the disciplines of writing to discover what is known and unknown, important or unimportant.

ESCHEW THE MYTH OF SUDDEN INSPIRATION - IT'S RARE

The upward trajectory of your career and the sustainability of your firm depend to a great extent on coming up with great ides, and you can't rely on chance to make that happen.

Dr. Edward Land, the inventor of the Polaroid camera, misled his audience when he defined creativity as, "The

sudden cessation of stupidity." Perhaps Dr. Land was influenced by Archimedes, the Greek mathematician and inventor who, around 250 BCE, supposedly leaped from his bathtub and announced that he had discovered how to determine the volume and composition of an irregular shape by shouting Eureka—Greek for "I Found it". He implied that his discovery was an epiphany that appeared suddenly and without prior knowledge or planning. Actually, it was the result of years of study. By the way, Archimedes also 'discovered' the Archimedean Screw to move liquids and slurries; engineers now call it a screw feeder.

The myth of inspiration lives on, but the reality of the matter is that critical and creative thinking are accessible to all human beings who can think and are fully engaged in their work and life, and who take systematic and deliberate steps that are far more likely to deliver creative solutions than is inspiration:

1. Define your purpose clearly and precisely;
2. Brainstorm with others or yourself (brainstorming does not require group interaction) to identify many ways, feasible or not, to meet your purpose, then selecting the few that best do so;
3. Examine the data and assumptions that can support the purpose and the best ways to meet it;
4. Understand the positive and negative implications and consequences that emanate from steps one through three;
5. Decide on a course of action, and then examine it to be certain that it meets, or will meet, your purpose as stated in Step 1.

REINFORCING THE EFFECTIVENESS OF DISCIPLINED THINKING

Engineers throughout history have demonstrated critical and creative thinking, and strict adherence to disciplined guidelines. The Wright brothers , for example, proved themselves master thinkers and dogged pursuers of a single purpose over a campaign stretching from 1899 to 1903, during which they practiced what we now call 'systems engineering'. Thomas Edison exhibited dogged purpose as well with his trials of thousands of materials for the filament in light bulbs before he found one that worked to his satisfaction. Edison's story does contain a note of caution. His doggedness extended to insisting that direct current was the preferred form of electricity to be used for transmission. Was he intellectually wedded to his idea? Did he have patents to see to profitability?

In the end, Edison was bested by the technical brilliance of Nikola Tesla and management skills of George Westinghouse. Together, they made alternating current the state of the art for the new electricity sector. Their battle is called America's first standards war by some pundits.

More recently, one can only imagine the number of alternatives that were evaluated before the design and construction of the Channel Tunnel began. The tunnel has been dubbed the civil engineering project of the twentieth century, an accolade that may be disputed by the engineers who designed and built the Panama Canal.

Within the past few years, engineers demonstrated their critical and creative thinking by redesigning and rebuilding the flood control system in New Orleans, the largest single civil engineering project ever undertaken by the Corps of Engineers. Then there are the many engineers and scientists who brought about the recent revolutions in data processing and communications. The list goes on.

SHORT EXAMPLES: CRITICAL AND CREATIVE THINKING (AND ITS LACK)

Electric cars are intended to reduce air pollution in congested areas by transferring gas emissions from tailpipes to power plant stacks. Perhaps the impact of producing many lead-acid batteries and the emissions from lead smelters should be considered. Can different batteries remove that conundrum? Or should engineers and planners examine and develop other means of transporting people?

The Olkiluoto nuclear power plant being built in Finland is now years behind schedule and billions of dollars over budget—two indicators of gross incompetence. The stated reasons by a member of the nuclear fraternity: " … delays had nothing to do with actual construction time … they are the result of public concerns and regulatory decisions." If that is the case, why weren't these concerns addressed before design and construction began? And why didn't the designers and engineers learn from similar experiences in The United States and other parts of the world?

The tunnel under the Allegheny River from downtown Pittsburgh to the North Shore has been dubbed "a tragic mistake" by the very politicians who advocated its design and construction. Perhaps planners and designers could have been more creative and found a better, less expensive way to move people from downtown to the North Shore.

The tailpipe emissions test imposed by our State government was instigated to improve the quality of our air throughout Pennsylvania, and all indications are that it hasn't. It has, however, imposed stiff fees on drivers in cities, but not in rural areas. Are there better, more equitable ways to improve air quality?

The opera house in Sydney, Australia is an aesthetic marvel but a financial and functional failure. Perhaps critical examinations of long-term consequences could have combined the desired architectural fanfare with other engineering considerations.

PE

About the author...

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Conversation Starters:

"Creativity without criticality is mere novelty." The Foundation for Critical Thinking

"We fear our highest possibilities." Abraham Maslow

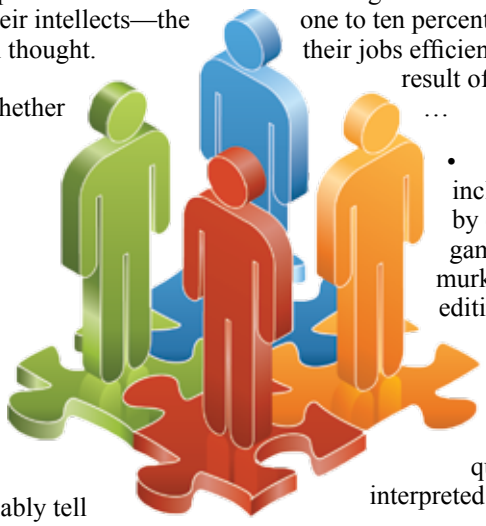
RESULTS *Writing* AND COMMUNICATIONS

The Essential Expression of COMPEL℠

By Pete Geissler

"Words are, of course, the most powerful drugs used by mankind." *Rudyard Kipling*

All consultants, regardless of their expertise or discipline, thrive or fail solely on their intellects—the capacity for knowledge and rational thought. Every intellect requires a voice; without it, nobody knows that the intellect exists, or whether it is superior or inferior to others.



Every engineering consultant's voice is primarily its drawings (the hard side of engineering), related and supporting documents, whether electronic or paper, and presentations (the soft side). When the voices on both sides express clear, concise, creative, on-point, logical thinking, the voices create COMPEL℠ for individuals and firms; when it doesn't, it creates competitive weakness.

The engineering consultants I've met invariably tell me that they hate to communicate, especially to write. They say that they communicate badly, spend—some say 'waste'—thirty to ninety percent of their time doing it, and would rather be working on the hard side, where they're more comfortable. Managers wish wistfully that employees could write and speak 'better', but they struggle to articulate what 'better' is, why it is important, or even to recognize it.

BETTER COMMUNICATIONS ARE REWARDED

Better communications,both internal and external, are recognized and known by their traits and results. Their traits are clarity (the message is understood after one careful reading or listening); concision (the message contains only those thoughts and words needed to meet the purpose(s) of readers or listeners, aka receivers); and logic (thoughts are arranged in a sequence that is clear to receivers without excursions to other thoughts).

I was sent to a conference on acid rain to write about the proceedings. Engineers from a pump manufacturer neglected the needs and wants of their audience by speaking about the details of design and metallurgy to power plant operators who wanted to hear about operating cost and maintenance. The audience fidgeted and the presenters lost them and thousands of dollars.

The result of better communications is COMPEL and higher profitability, a claim that is supported by my informal survey of managers that indicated that profits would jump by one to ten percent of sales if all communications did their jobs efficiently. Higher profitability is the direct result of noticeably and measurably higher …

- productivity of all employees, including and especially managers, by eliminating or minimizing the tag games that are inevitably caused by murky communications that require editing/rewriting or clarifying by higher authorities;
- hit rates and lower sales/marketing costs that result from proposals and reports that are quickly, easily, and accurately interpreted and evaluated by customers; and
- rates of repeat business from customers that understand and respect your intellect; you cannot keep customers that don't, and losing and replacing one costs at least ten to fifty times more than keeping one.

The disciplines of writing—the foundation of all your communications—create the intellect that is your COMPEL℠.

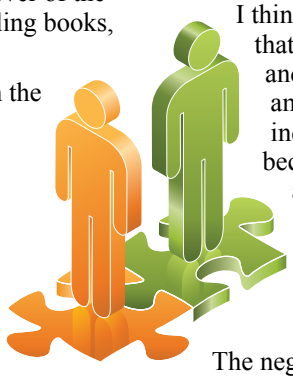
The methodical, evolving process of writing actually forces new thoughts to emerge from your mind, allowing you to make sense of your surroundings, your life, and, on a smaller scale, the document that you are composing at the moment.

In essence, better writing gives your mind a disciplined means of expression and conjuring up that great idea that separates the ordinary from the extraordinary, another basis for your COMPEL. It is a way to discover what you are thinking. Perhaps William Faulkner said it best:"How do I know what I think until I see what I write?"

COMMUNICATIONS AND LEADERSHIP ARE LINKED

Communications and leadership are linked so tightly as to be one: Managers cannot lead if they cannot clearly articulate their vision and values. Historians, consultants, business managers and many others have tried to define in a few words the values of leaders, whether in government or business; the ability to communicate is prominent in every definition.

For example, historian Paul Johnson, a keen observer of the human condition who has written several best-selling books, condensed leadership to five traits:



- ideas and beliefs, the central principles which the leader espouses passionately;
- willpower, an unshakable confidence of correctness;
- pertinacity, the patience and primitive doggedness to stick to a strategy;
- magnanimity, the greatness of soul that is so difficult to define but is so apparent to those who own it; and
- ability to communicate, to explain strategy and objectives in understandable and believable ways, and which overlays all the other traits.

Others have described successful leaders as magnanimous, humble, prudent, courageous, principled, fair, and visionary. They exhibit these traits by aligning their actions with words that are expressed clearly, purposefully, and truthfully.

THREE QUICK TIPS FOR COMMUNICATING BETTER

To reflect your true intellect, become a careful, critical reader. Nothing destroys your credibility more than nonsensical sentences. Avoid this, from a technical paper: "Typical annual volumes reached 8,250,000 gallons per month at a cost of $27,000." What are the annual volumes and cost? And this from a newsletter on healthy living: "Exercising and eating well can lower your risk of dying." How's that for wishful thinking?

To be on point, understand your receivers' needs and wants as specifically as possible and avoid veering away from them. In general, your receivers are always busy, harassed, and unwilling to waste time with irrelevant and murky prose that needs to be decoded, so get to your point quickly, clearly, and concisely. You can profile your receivers more tightly by asking yourself what is important to them and hit those points ASAP.

To create logical progressions of thoughts, think cohesion/unity. Sentences, paragraphs, and entire documents are cohesive when they flow smoothly and clearly toward a defined conclusion or direction that is set by the purpose(s) of senders and receivers, establishing the parameters of your prose. The result is thoughts that are connected logically and clearly.

Is communicating well out of favor? Is it needed? I can build a case that our society, including business, has rejected the habit of and need for communicating well. Perhaps the main reason is our addiction to so many other media that have replaced good writing, led by the ease of voice communications via telephone, Skype™, and voice-recognition software that translates our ramblings to text that is laden with grammatical and syntactical meanderings that our fifth-grade teachers would never condone. Then the computer and smart phones have blessed shorthand, now called texting, and emails that are 'good enough'. All have created the feeling, the conviction, that careful crafting of words is no longer necessary.

I think it is necessary, and point as evidence clients that have lost contracts because of murky proposals and reports or been sued because of a muddy, ambiguous sentence in a proposal or contract … individuals who lost opportunities for employment because of an indecipherable résumé, contested a murky last will and testament, lost a friend or client because of an insensitive email … and, for good measure, a very foggy Second Amendment to the U.S. Constitution that has spurred endless political debates and struggles.

The negative consequences of communicating badly dig their destructive tentacles into our business, financial, and personal lives. The positive consequences of communicating well are as endemic.

Yes, people are still hired because they can craft language that reflects intelligence, simply because many of us in this age of information sell nothing but our intelligence. Contracts are won because the proposal can be evaluated precisely, friendships are created because people find common ground via their language, lawsuits are avoided when contractual obligations are stated clearly, and jobs are landed by clear and persuasive résumés (have you thought of résumés as proposals? Or proposals as résumés?)

The benefits and impacts of good writing continue and extend well beyond transmitting information. **PE**

About the author...

Pete Geissler is a professional writer of engineering, scientific, and financial knowledge; teacher/professor of writing and critical thinking; and coach to proactive executives who understand the essential role of good communications in their careers and the sustainability of their firms. He has taught advanced courses at Carnegie Mellon and Duquesne Universities, ESWP, and several AEC firms. Pete may be reached at 412-322-0480, or geissler@earthlink.net

Conversation starters:

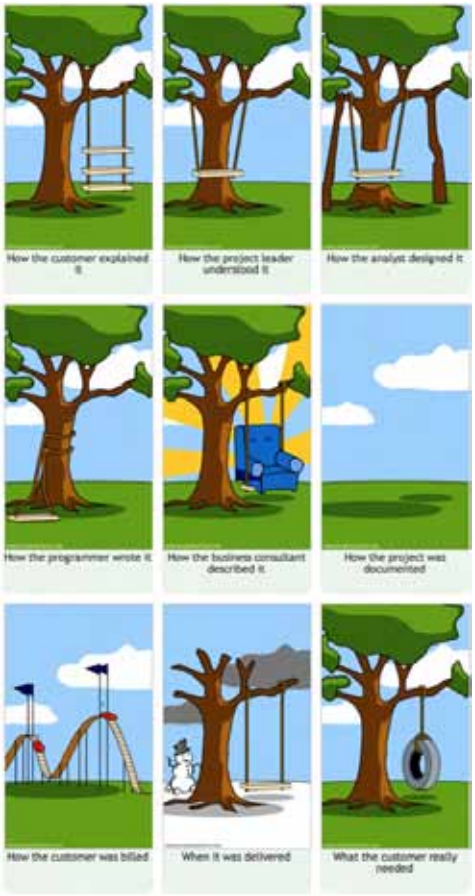
"The computer is a moron." Peter Drucker.

"Words are one of our chief means of adjusting to all the situations of life. The better control we have over words, the more successful our adjustment is likely to be." Bergen Evans.

"The root of all bad writing is to compose what you have not worked out for yourself." Alfred Kazin.

THE SEVEN MYTHS OF WRITING

1. WRITE THE WAY YOU TALK. Instead, write the way your receivers talk, and they will be more likely to grasp your message
2. START WITH AN OUTLINE OR SUMMARY. Instead, start writing with details—appendices in longer documents, the body in shorter documents. Do so and learn more about your subject.
3. GOOD WRITING IS INBORN, INTUITIVE. Teachers of writing worldwide agree that writing is a craft that can be learned by anyone of reasonable intelligence and motivation.
4. WRITING IS EASY. In fact, writing badly is easy, while writing well is difficult, demanding, and time-consuming. Writers struggle to find the right words and structures to meet their purposes.
5. WRITE SOLELY TO COMMUNICATE. Communicating is the proximate purpose of good writing; its ultimate purpose is to express intelligence.
6. STUDYING GRAMMAR WILL IMPROVE WRITING. Many studies have demonstrated that studying grammar actually worsens writing by deflecting writers from their real purpose of displaying their intelligence.
7. MULTI-TASKING RAISES PRODUCTIVITY. In fact, your brain cannot multi-task two or more cerebral activities, and writing is perhaps the most cerebral of all, as pointed out in #4.



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BUILD RELATIONSHIPS, BUILD BUSINESSES

But Only if You Think Strategically

By Jim Browne

When the Guest Editor asked us to write an article on relationship-building, he was quick to note that the principles are shared by all consultants, that we at Allegheny are long-time practitioners the art, and our experience is transferable directly to engineering. His admonition started us thinking about our firm's beginnings and controlled growth, which led us to a brief history.

We began in 1976 with a simple goal that we sustain today: Provide a service that meets the needs and fulfills the aspirations of clients. If that sounds familiar and a bit simplistic, we agree. We understand that our goal is identical to the goal of every consultant, so we drilled down to be more specific and came up with this: We provide a service that is based on listening carefully and responding appropriately to clients' needs and aspirations and to help them live comfortably, unobstructed with the many and varied hassles of their finances.

Building relationships that last and that proliferate via referrals—we call that the domino effect—has been key to meeting that goal. Along the way, we developed the following imperatives:

Avoid the One-Timers, Nurture the Long-Termers

Money Magazine asked us and a few others to create a financial plan for a 'typical couple' that the editors profiled. We jumped at the national exposure, sure that we would be bombarded with a plethora of opportunities for new clients. Instead, we were bombarded with phone calls from confused folks asking if they should renew a CD or buy IBM or some other minutia that we cannot possibly answer without knowing the goals and aspirations of the callers. When we told them that, they invariably went away: too much effort, not the quick fix they wanted and we are loath to give.

Then, a reader of *Money* called from Johnstown PA; he wanted an adviser who would examine his total financial picture and his long-term goals. We started by guiding and supporting him through a complex and harrowing bankruptcy via many personal visits, all at our normal fees. We somehow recognized the potential for a win-win relationship, and we think he did too.

The results: the domino effect in action. After 20 years he is still a client, has referred us to many others in the Johnstown area and in North Carolina, Massachusetts, and Illinois—some 25 in all, at last count—and they have referred us to still others. On a broader scale: almost all our new clients—we estimate 98 percent-- are referrals despite consistent advertising on radio and in print, mainly in arts programs.

Listen Carefully, Respond in Ways That Touch

Back in the mid-nineties a successful entrepreneur came to us with several file boxes full of financial statements and a tale of woe: seems he was collecting at least 45 pieces of random paper a month from this mutual fund, that individual stock, those bond funds, and a bunch of IRS notices that he couldn't decipher even if he had the time, which he didn't. He was spending—wasting, he admits-- hours shuffling papers aimlessly and fruitlessly; he still could not compute his net worth or his income from dividends and interest.

He was harried to the point of distraction, and he wanted desperately to focus on his consulting business, not his money. He put it this way: "I'll make it, you make it work." No question he wanted an adviser.

We went through our usual introductory interview, which literally forced him to list his assets and liabilities. He has never let us forget that our first bit of advice was to buy a new car: "Your car is dangerous, and it won't protect your most valuable asset, the one that's not on your balance sheet: you."

The results have been fulfilling for both of us. Almost 20 years later he admits he spends maybe 20 minutes at most per month reviewing his portfolio, freeing considerable time for his business and pleasure. He has referred two of his children - which we think of as the ultimate sustainability of our business - and dozens of his clients to us, and, in another example of the domino effect, his clients and his significant other have followed suit.

The Soft Sell Builds, the Hard Sell Diminishes

We have never subscribed to what we call the entertainment or hard side of marketing, the dinners, clubs, golf outings and the like that we feel are so blatantly commercial to the point of arm twisting. We prefer to take our clients to modest lunches at which we tend to discuss topics other than the client's portfolio. We'd rather delve lightly into topics that allow us to know the client better: family, planned major purchases or changes in lifestyle such as retirement or travel, hobbies, and feelings about national or international finances (which help us understand the client's tolerance for risk, for example).

Our client, in turn, learns more about us and our investment philosophies and plans—a classic win-win.

We're Not For Everyone, and Suspect That You Aren't Either

"Patience" is my favorite word of advice, and it applies to investing as well as relationship-building. "Aggressive" is my least favorite word of advice, and I use it only to understand a client's tolerance for risk.

Obviously, not every investor wants to be patient. We lost a client recently because he thought we are too conservative, too willing to wait for an upturn in the financial markets. He wasn't for us, and we wish him well.

Our feeling is that no consultant meets the needs of every client, even those that operate within a narrow niche market. Trying to do so surely dilutes the well-defined focus and mission of the firm.

Apply All of the Above Imperatives to Your Employees

Our vision is to make a difference in the lives of our clients. Our philosophy with regards to our employees - truly our firm's most important assets - has always been quite simple: surround yourself with bright, energetic, innovative people who understand our vision and the importance of delivering excellent client service. Work as a team.

The 98 percent referral rate mentioned earlier is not achieved unless all of the players on the team are working together, and hopefully, enjoying what they do.

Of course, you inevitably begin the employee relationship with an assessment of a fundamental skill set, which is always the easy part, and then all of the above imperatives come into play: nurturing, listening, taking a personal interest, and creating a team that celebrates successes (both emotionally, and of course, we cannot forget monetarily) and analyze the failures to determine what could have been done differently. The long-term relationship building with your team will almost certainly enhance your client relationship-building.

The Bottom Line

The ability to build and maintain long-term relationships with clients and employees who fit and agree with your mission can be pivotal to the growth of most consultants, regardless of type or size. **PE**

About the author...

Jim Browne, Founder, with input from Brandon Haynes, President, and Carolyn Madigan, Partner and Practice Manager, Allegheny Financial Group. Mr. Browne may be contacted at 412-367-3880, or by email at: jbrowne@alleghenyfinancial.com

Conversation starters:

"Of course, you can't win them all (relationships). You won't be able to—or even want to—keep everyone on your team." From Success Built to Last.

"Differentiating a business, e.g. by maintaining long-term relationships for more personal service, can lead to exceptional growth." Anonymous

Further reading:

The Service Organization: Climate is Crucial, Organizational Dynamics, vol. 9, #2.

Relationship Marketing, By Leonard Berry, American Marketing Association.

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1. The entropy change of the universe, for any given process, must be greater than or equal to zero, is known as:
   A. Hess's law of constant heat summation
   B. Newton's third law of thermodynamics
   C. Clausius' second law of thermodynamics
2. He discovered that the volume of a sphere is exactly two-thirds of a cylinder that tightly encloses it:
   A. Archimedes
   B. Einstein
   C. Hawking
3. He discovered the laws of induction and electrolysis:
   A. Humphrey Davy
   B. Michael Faraday
   C. Georg Ohm
4. Equal volumes of gases contain the same number of molecules is called:
   A. Dalton's atomic theory
   B. Avogadro's law
   C. Gay-Lussac's law of combining gas volumes
5. He formulated the mathematical relationship between entropy and molecular motion:
   A. Ludwig Boltzman
   B. Sadi Carnot
   C. Friedrich Kohlrausch

Please submit your answers by 6/1/13 to David Teorsky, via email to: d.teorsky@eswp.com, with the subject line "Engineers Quiz." Quiz developed by Pete Geissler

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