

The CSEM Newsletter



Canadian Society for Engineering Management
Société canadienne de gestion en ingénierie

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Une société adhérente à l'Institut canadien des ingénieurs

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CSEM's mission is to represent the interests and enhance the capabilities of engineers in management in order to advance and promote efficient management of commerce, industry and public affairs.

FROM THE PRESIDENT



CSEM President,
Ken Putt, P.Eng., FEIC.

As we enter this final year of the 20th Century, it's appropriate to look back and see how far we've come and then look forward to the future with optimism and enthusiasm.

The engineering profession has been an integral part of nation-building in Canada in the past century. Many examples of past infrastructure engineering projects are now on a long list of Historic Engineering Sites prepared under the chairmanship of the EIC's Drew Wilson, FEIC. A noteworthy start was the Canadian Pacific Railway, which was a condition of British Columbia entering Confederation and becoming a Province of Canada. Engineering achievements continued with international-scale graving docks (drydocks) that formed the basis for the Royal Canadian Navy at Esquimalt and Halifax.

Engineered infrastructure we now take for granted includes grain elevators and bulk materials port terminals on both coasts, numerous critical and innovative bridges, the Alaska highway, Canol pipeline and Polymer artificial rubber plant of the Second World War, the Peterborough hydraulic lift locks on the Trent-Severn Waterway, the St. Lawrence Seaway, river fishways and hatcheries, municipal waterworks and effluent treatment plants, irrigation projects on the Prairies, viaducts and modern highways, the Toronto subway and Montreal Metro, hydroelectric projects and high voltage transmission across the country, aluminum smelters and extrusion, froth floatation mineral recovery and hydrometallurgy, advances in oxygen steelmaking and continuous casting, telephony and the Canadian microwave transmission system, industrial use of turbine engines and cogeneration, pulp and paper advances, short takeoff and landing airplanes, snowplanes and snowmobiles, and firefighting water bombers, NRC wind tunnels and wave basins, Dominion astrophysical observatories, Canadarm, civilian communication satellites, and more. Unfortunately, our award-winning engineers and even our Canadian Nobel-laureate Scientists are largely unknown.

Common among these achievements were the engineering management capabilities to conceive of the need, assemble the skills,

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FROM THE EDITOR

In this issue I have collected a number of articles from various sources. As well, I have gone to 16 pages to accommodate them. The application form on the back page will be a permanent feature of our newsletter. As always, I ask that CSEM members consider writing articles for publication in the CSEM Newsletter.

*Gord Thomson, P.Eng., LL.B.
Editor*

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scope the opportunities, confirm the technical and business feasibility, obtain the financing, obtain the approvals to proceed, design and manage the project implementation and successful startup, on schedule, under budget, and fit for use in the mind of the key stakeholders. Fortunately, our engineering management skills and abilities have grown, evolved and continuously improved.

However, in the next millenium, increasing complexity, geopolitical, business and ecological risks, management of interdisciplinary teams that extend outside of engineering into the social, bio-medical, environmental and ethical realms, and broadened stakeholder involvement will challenge engineering managers in new ways.

The future holds many technical marvels with innovation and new knowledge being created at an ever-increasing pace. The technical skill-sets in engineering are becoming increasingly specialized and will be more-so in the new millenium. New fields of engineering have sprung up at the boundaries with the sciences, such as bio-medical engineering, software engineering, geomatics, micro-electronics and risk management, to name a few. New engineering fields will continue to be created that will further expand the boundaries of the traditional engineering disciplines. Engineering management will, increasingly, be the one common denominator between the traditional and the new engineering disciplines.

The Canadian Society For Engineering Management intends to provide its members and all those interested in engineering management continued professional development opportunities and access to leading engineering management thinking into the new millenium and beyond. We welcome the opportunity to serve you and your project and general management colleagues.

The CSEM Newsletter

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**Next issue will be published
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**The deadline for articles or
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KEEPING YOUR INNOVATIVE GUNPOWDER DRY

by Gord Thomson, P.Eng., LL.B., FEIC

If the Canadian economy can be considered to be a bullet, then much of energy contained in the gunpowder propelling it can be attributed to the innovation generated by individuals and small businesses. There is a body of law, called intellectual property law, which exists to encourage further innovation in the industrial arts and sciences by providing a degree of legal protection and economic incentives. This article identifies the more common intellectual property rights.

COMMON FEATURES

Patents, trade-marks, copyright and industrial designs have certain common features. Each is governed by a federal statute and all are administered by the Canadian Intellectual Property Office (CIPO) located in Hull, Quebec. With some exceptions, the acquisition of intellectual property rights requires a formal application to CIPO, an examination process and registration. Once the legal prerequisites set out in the relevant statute are met, the intellectual property right is granted for a limited period of time. The intellectual property “right” is actually a bundle of rights that allows the owner to exclude others from using, making or copying the intellectual property. Registered intellectual property rights have national application and are enforceable anywhere in Canada. Most Canadian intellectual property rights are valid only in Canada. For example, a Canadian patent is not valid in the United States. To protect a Canadian

invention in the United States, it must be registered as a patent in the United States Patent and Trademark Office. Copyright is the notable exception. An international treaty called the Berne Convention provides for reciprocal protection of Canadian copyright in foreign countries that are party to the treaty. Therefore, a Canadian copyright is valid in the United States (and many other countries) without registration in either country. Intellectual property rights can be sold or licensed for a royalty.

Intellectual property is often identified to the public by marking the relevant article or its packaging with a special symbol. For example, trade-marks use the ® for U.S. registered marks or the superscript ™ for both registered and unregistered marks. Copyright is identified by the © symbol followed by the name of the author and year of publication. Patented articles may be marked as “Canadian Patent” followed by the registration number or “Patent Pending”. While such marking is not a requirement in Canada it does have advantages. For example, it gives notice to potential infringers who, once warned by the symbol, cannot subsequently state in a court of law that they copied without knowledge of any pre-existing rights.

Unauthorized use of a registered intellectual property right is called infringement. Infringers can be sued in the Federal Court of Canada or provincial courts. Legal remedies for infringement include financial

awards for damages, an accounting of the infringer’s profits, disposal of the infringing articles and court orders prohibiting further infringement. In the case of the unauthorized use of an unregistered trade-mark, the owner can rely upon a common-law remedy called “passing-off”.

PATENTS

Under the *Patent Act*, the Canadian government grants a patent which is a limited monopoly to manufacture, sell and use an invention in Canada. In return, the inventor discloses the invention and the manner in which it operates to the public. Patents do not protect ideas. They protect inventions defined as “any new and useful art, process, machine, manufacture or composition of matter, or any new or useful improvement” to such items. Such things as methods of medical treatment, scientific or abstract principles (for example, $E=MC^2$), natural forces such as gravity and multi-cellular animal life forms (for example, mice) are not patentable in Canada.

To be patented, an invention must possess novelty, ingenuity and utility. The invention must not have been previously disclosed to the public although Canadian and U.S. patent law provides for a one-year grace period in which a patent application may be filed after public disclosure. However, such disclosure will render an invention unpatentable in most other countries. The invention must possess a certain level of ingenuity

(Continued on page 4)

or inventiveness. It cannot be an obvious advancement to someone skilled in the field of the invention. The invention described in the patent application must also work and do what the inventor claims it will do. A search for and review of previous patents issued and pending in the same field as the invention by a patent agent or lawyer is very useful in determining whether the invention is novel or inventive.

Canada is a “first to file” jurisdiction, entitling the person who first files the patent application to obtain the patent regardless of whether that person was the first inventor. Therefore, patents should be applied for promptly. The preparation of a patent application is complex, time consuming and therefore can be costly. The prosecution of a patent application within CIPO is a rigorous process that can take years to complete. Additionally, the patent application is published 18 months after it is filed so that the public can inspect the invention. This promotes the sharing and advancement of knowledge. If the inventor wishes to maintain the invention as a secret, then patenting is not an option. An international treaty, called the Patent Cooperation Treaty simplifies patent applications for foreign jurisdictions.

A patent gives the owner an exclusive right to make, construct, use and sell the invention for a period of 20 years after the date of filing of the application subject to adjudication in a court of law. Any person who does, without authorization, what only the patent owner can do is infringing the patent and can be sued.

INDUSTRIAL DESIGN

Industrial designs are granted under the *Industrial Design Act*. They are features of shape,

configuration, pattern, ornament or combinations thereof applied to useful articles. They are aesthetic in nature rather than functional. To register an industrial design, an application is made to CIPO that includes a drawing or photograph of the design and a description. The application is examined to ensure that it meets the requirements of the Act. The examiner will search existing designs registered in CIPO and may search hardware and tool catalogues to ensure that the proposed design is original and not previously disclosed to the public. A design, which has been published in Canada or elsewhere, more than one year prior to the filing of an application for registration cannot be registered. Registration gives the owner an exclusive right throughout Canada to apply the design to articles for importation, rent or sale. The term of registration is 10 years from the date of registration. To discourage infringement, the articles to which the registered design pertains, their labels or packaging can be marked with a “D” in a circle and the name of the owner of the design.

COPYRIGHT

The *Copyright Act* provides for copyright protection upon the creation of a literary, dramatic, musical or artistic work or a compilation thereof and prohibits their unauthorized copying in any material form. Registration of copyright is not necessary but does provide proof of authorship and ownership in a court of law. Copyright protects the expression of an idea but not the idea itself. To be protected the work must be original and involve some intellectual effort. The author must be a Canadian national, a resident of Canada or a citizen of or resident of a state participating in the Berne Convention, Universal Copyright Convention or World Trade

Organization. Copyright provides for the protection of software as a literary work and it is an important source of protection for intellectual property on the Internet. The duration of copyright protection depends on the nature of the work. For example, literary works are protected for 50 years beyond the death of the author, or if jointly authored, 50 years after the death of the last author. For photography, copyright lasts for 50 years after the date the negative was made. Associated with copyright are legally enforceable moral rights. These rights cannot be assigned or sold like copyright but can be waived by the author. Moral rights include the right to be associated with the work as its author, the right to prevent distortion or mutilation of the work and the right to control how the work is used. Obtaining a waiver of moral rights from any author assigning copyright is recommended.

TRADE-MARKS

Trade-mark rights are derived from use. The trade-mark must be able to distinguish the goods and services of one business from those of another. They are protected under the *Trade Marks Act* and at common law. They most commonly appear in the form of words, phrases, letters, numbers, designs or combinations thereof. The shape of a container, such as the Perrier bottle, can be a trade-mark if it is used to distinguish. Words that describe the characteristics or quality of the goods or services in English or in French cannot be registered as trade-marks. A trade-mark agent or lawyer should be consulted prior to filing an application for registration to search for trade-marks or business names (trade names) that are identical to or potentially confusing with the proposed trade-mark. They can provide advice on the registrability

of the trade-mark. If an existing trade-mark or trade name is found that is identical to or potentially confusing with the proposed mark, then a different trade-mark can be selected.

Trade-mark applications are made to CIPO and undergo an examination process to ensure the requirements of the *Trade Marks Act* are met. A trade-mark application may be filed on a proposed use basis but the trade-mark will not be registered until it is in use. Trade-marks deemed acceptable to CIPO are published in the *Trade Marks Journal*. This gives other businesses the opportunity to oppose the trade-mark if they believe it is identical to or potentially confusing with their own trade-marks or trade name. Opposition

proceedings delay the registration of a trade-mark, add greatly to the cost of obtaining registration and may compel the applicant to withdraw the trade-mark. A trade-mark search prior to filing an application helps lessen the chances that the proposed trade-mark will be challenged by CIPO or opposed by another business.

While not absolutely necessary, trade-mark registration has a number of benefits including the exclusive right to use the trade-mark throughout Canada and access to the legal remedies set out in the *Trade Marks Act*. Without registration, trade-mark rights are generally restricted to the geographical area in which the trade-mark is known. The period of trade-mark registration is

15 years from the date of registration. Registration is renewable for subsequent 15-year periods upon payment of a renewal fee.

CONCLUSION

Whether you run a SOHO, SME or MNE, intellectual property law is an important business ally. Intellectual property rights are very valuable business assets. Identifying, protecting and exploiting these rights can preserve existing and generate new revenue streams.

Gord Thomson is an intellectual property lawyer and Registered Trade-mark Agent. He can be contacted at 1-888-248-5751 or at gord.thomson@sympatico.ca. The CIPO web site is located at WWW.CIPO.GC.CA.

ONTARIO WORKPLACE SAFETY AND INSURANCE BOARD AGREES WITH CATAAlliance ON SOFTWARE DEVELOPER CLASSIFICATION —Non Compulsory Ruling Frees Up Hundreds of Thousands of Dollars for Expansion

Ottawa - January 08, 1999 . . . CATAAlliance announced today the successful completion of its advocacy campaign to have the software industry specifically classified as non-compulsory under the WSIB (Workplace Safety and Insurance Board). Software products companies may still register for coverage if they find WSIB's rates attractive.

CATAAlliance President John Reid said, "The decision will save hundreds of thousands of dollars for Ontario's software companies thus allowing them to direct more resources to research, development and global marketing."

Effective January 1, 1999, the Ontario WSIB has included software product developers in classification 7721-001, Computer Services which will be renamed Software Developers and Computer Services. they will now enjoy the WSIB Status: By application (non-covered).

CATAAlliance worked extensively with WSIB in 1998 to clarify the status of software product developers. Companies were surveyed and research documented on behalf of CATAAlliance by KPMG, which is a member. The findings: software products are clearly not in a manufacturing industry, but in a knowledge-based service industry. Accordingly, the risk of on the job injury is extremely small. Compulsory registration under the Act is therefore not required.

Reid added, "We would like to thank the Minister of Labour, Jim Flaherty, for his assistance in helping to resolve this issue. His leadership in bringing the parties together led to a better understanding of the classification situation and the decision of the WSIB to agree with the CATAAlliance position."

"The software industry is extremely competitive on a global basis. When you decrease the costs of doing business in Ontario, more high tech business is encouraged to expand in the province," he concluded.

The CATAAlliance (www.cata.ca) and its network of 2700 enterprises is widely recognized as Canada's high tech voice with a principal mandate to help its members become world class competitors.

Managing with Purpose: A Goal Primer

By Dave Korotkov, MSc

Have you ever wondered why so many people fail to achieve their goals? While many obstacles stem from the failure to understand basic goal setting dynamics, many difficulties arise from the mental barriers we create. Some of the more common roadblocks include feelings of unworthiness, not knowing what we want, and fears of success and failure. Goal setting is also hard work!

So, what exactly is a goal? Simply put, a goal is a standard or level of performance that we strive to achieve. A goal is not a wish or fantasy. Goals come in many shapes and sizes. There are mental goals, as well as social, career, physical, and humanitarian/spiritual goals. Goals not only enhance performance, they also help to establish priorities, increase confidence, anticipate satisfaction, and prolong effort.

It is easy to spot a person who has a clear set of goals. That person exudes a sense of purpose and determination. He or she has abundant energy and is willing to put more time and effort into any given task.

— Jeff Davidson (1998)

How can we become better goal setters and achievers? To help develop the requisite skills, use the following as a guideline:

1 First, determine what you want to achieve and assess where you are in reference to it. Develop daily, short and medium-term goals that lead to the long-term goal (e.g., increase personal or organizational productivity, deal with the year 2000 bug). In developing the subgoals that will get you to the long-term goal(s), brainstorm or visualize the steps. To help maintain levels of motivation, it is often useful to build in small successes;

2 To clarify your goals, write them out. The number of goals you decide to set will depend on many factors including ability, time, and goal complexity. In developing your goals and assessing for achievement, use the criteria in the box below;

3 Ask yourself; "What's in it for me?" Remember, the benefits go beyond achieving the actual goal. The rewards can be social (e.g., networking opportunities), tangible (e.g., contract), nontangible (e.g., satisfaction), or activity based (e.g., holidays). Motivation can be maintained through expected reward as well as the actual benefit;

Goal Setting Characteristics

GOALS SHOULD BE:

- Measurable: Quantify your goals (e.g., attend three management seminars).
- Positive: Focus on increasing a behaviour. It's often more rewarding to see yourself improve than it is to see an unwanted behaviour disappear.
- Specific, Challenging and Realistic: Specific and challenging goals are better than do your best goals. Don't choose a goal that's out of reach or too easy. For starters, set your goal slightly higher than your present level of performance.
- Performance/Process based: By focusing too much on the final outcome, you're more likely to become frustrated and give up easily. By focusing on goals that you have some control over (i.e., performance or process: e.g., improving production), you are more likely to achieve the desired outcome. Outcome goals are useful to the extent they serve as initial motivators. Carried to the extreme, an outcome goal can be a distraction.
- Accompanied by Feedback: Monitor your progress by graphing your data. Goal setting with feedback is useful when feedback is immediate, positive, specific, and GRAPHIC (e.g., number of work-related accidents plotted by week or month).
- Flexible: If your goal is too easy or difficult, change it. If you find yourself slipping back to a previous level of performance, take it back a notch, stabilize it, then move ahead when possible or reasonable.

As with any change strategy, assess the benefits as well as the risks involved before proceeding. In the end, goal setting involves personal and/or organizational responsibility.

- 4 Examine what barriers (e.g., mental, physical) stand in your way and remove them (e.g., lack of capital). It's often better to remove the obstacles first than to exert more effort;
- 5 If you have more than one goal or your goals conflict, then prioritize. You might consider developing a two-by-two matrix based on urgency and importance. Highly urgent and important issues merit close attention;
- 6 Develop an action plan with deadlines for achieving the goal(s);
- 7 Implement your action plan;
- 8 Reward yourself when you or your organization achieve a goal or an objective (i.e., subgoal); rewards help to increase motivation (they also feel good). Be aware that failure to achieve a goal is often the result of poorly defined goals, goals that are not sufficiently challenging or measured; and
- 9 Continue to set goals. Enough said!

There you have it, goal setting in 9 easy steps. Whether you're still deciding on what your new year's resolutions will be, or intent on setting a standard that will put you or your organization over the top, remember that goal achievement comes from doing and not from wishing.

Dave Korotkov is in the process of completing his PhD. He is interested in health psychology, behaviour management and performance, and program evaluation. He can be reached by e-mail at davekor@hotmail.com.

THE ENGINEERING INSTITUTE OF CANADA AND ITS MEMBER SOCIETIES

L'INSTITUT CANADIEN DES INGÉNIEURS ET SES SOCIÉTÉS MEMBRES

EXECUTIVE DIRECTOR THE ENGINEERING INSTITUTE OF CANADA

The Engineering Institute of Canada (EIC), a bilingual national organization, is seeking an engineer familiar with EIC activities and who possesses strong communication and leadership skills to fill the position of Executive Director beginning on or before June 1999. This is a part-time position, minimum 2-3 days per week. The incumbent must be located in central Canada to facilitate interfaces with other engineering organizations. The initial term of office will be for one year and renewable annually with EIC Council approval. Salary range: \$40,000 to \$50,000 per year, commensurate with qualifications.

The role of the Executive Director will be to promote and develop the vision and image of the EIC and interact with Participating Partners (universities/course providers) and engineering associations at both the national and provincial levels. Reporting to the President, he/she will interface with EIC national council and its subcommittees and will represent the EIC on the Executive Committee of National Engineering Week. The incumbent will promote the awareness and facilitate access to EIC's continuing engineering education programs throughout the engineering community.

Interested candidates should submit their CV along with 3 supporting references from members of EIC's constituent societies to the EIC Coordinating Office, 1980 Ogilvie Road, PO Box 27078 RPO Gloucester Centre, Gloucester, ON K1J 9L9 post-marked no later than 28 February 1999 or via email to info@eic-ici.ca. For additional information, contact the Chair of the Selection Committee, André Rollin (514) 453-6998.

DIRECTEUR GÉNÉRAL L'INSTITUT CANADIEN DES INGÉNIEURS

L'Institut canadien des ingénieurs (ICI), un organisme national bilingue, est à la recherche d'un ingénieur familier avec les activités de l'ICI et possédant une facilité de communication et de gestion pour combler le poste de directeur général de l'Institut dès juin 1999.

Ce poste à temps partiel, équivalent à 2-3 jours (minimum) par semaine, devra être situé dans la région centrale du Canada pour faciliter les relations avec les autres organismes d'ingénierie. Le traitement annuel sera de 40 000 \$ à 50 000 \$ selon l'expertise du/de la candidat(e) et sera renouvelable annuellement.

Le mandat consiste à promouvoir et développer l'image et la vision de l'ICI. Cette personne sera responsable de maintenir et renforcer les liens avec les associations provinciales et nationales en ingénierie. Relevant du Président, le/la titulaire devra apporter son support aux activités du conseil d'administration, ses sous-comités et différents partenaires de formation continue (universités, collèges, associations) ainsi que le comité exécutif de la Semaine nationale du génie et autres. Par intermédiaire du Conseil administratif de l'ICI, le/la titulaire favorisera la sensibilisation de l'accès aux programmes de formation continue de l'ICI.

Les demandes seront acceptées jusqu'au 28 février 1999 (le sceau de la poste fera foi de cette date) ou par courrier électronique au info@eic-ici.ca. Les curriculum vitae et 3 lettres de support de membres des sociétés constituantes de l'ICI doivent être acheminées au Bureau Principal, 1989, chemin Ogilvie, CP 27078 RPO centre Gloucester, Gloucester ON K1J 9L9. Pour toute information additionnelle, communiquez avec le Président du comité de sélection, M. André Rollin au (514) 453-6998.

A Leadership Profile of American Project Managers

Thomas W. Zimmerer and Mahmoud M. Yasin

Although the needs and demands of Clients have always been the highest priority for any project manager, increasing global competition, ever heightening client expectations, and the magnitude of the projects impact on a firm's bottom line has begun to place greater emphasis on the skills necessary to successfully lead today's project teams. Historically, strong technical skills and knowledge of the industry would have been the key selection criteria. It was, in many cases, simply assumed that men and women who possessed these qualities would lead the project to a successful completion. Today's complex project environments require even greater skills at leadership than ever before. "Cookie-cutter" formula-based management was probably never correct, but in today's environment it will inevitably lead to disaster. Performance expectations for quality, cost effectiveness, timely delivery, and a host of other client measures are ratcheted-up a notch each year. In the highly competitive arena in which most projects operate, be they external or internal, the requirement to produce results that exceed client expectations has become the norm. As one respondent shared, "I have not worked on a project in the past five years that was not viewed by the client as being 'fast track'" The stakes are high, and getting higher. The days when cost overruns and delayed completion were common are history. So are the projects where technical personnel were once allowed to "experiment" until they got it right. With the managerial practices of outsourcing, downsizing, total quality management and continuous improvement becoming even more prevalent in our organizational environment, it can be expected that project managers are experiencing increased performance pressures. Internal project managers are possibly just as vulnerable to not having their contracts renewed as external consultants and contractors.

RECENT LITERATURE

Jeffrey Pinto and Om Kharbanda shed light on this problem in two journal articles published in *Business Horizons*, "Lessons for an accidental profession" (1995) and "How to fail in project management" (1996). These authors emphasize the increased need for project managers. "Increasingly technically complex products and processes, vastly shortened time-to-market windows, and the need for cross-functional expertise make project management an important and powerful tool in the hands of organizations that understand its use" (Pinto & Kharbanda, 1995). In their follow up article, "How to fail in project management," the authors write a stinging criticism of the practices that combine to produce project failures (Pinto & Kharbanda, 1996). Karen Ayas (1996) takes a broader brush to the whole issue through what she describes as a "project network structure." The design of the system should "stress the synergies between organizational strategy, structure, culture and systems to allow organizations to build and expand learning capacity." The application of "process management view" to project management was reported recently in *Harvard Business Review*. The study of leading companies such as AT&T, Hewlett-Packard and Raychem over an eight-year time span led the author to report that, "managers can benefit by applying a process management approach to their product development process. Companies can create an aggregate plan that allows them to assign practices to their projects with an estimate of needed resources ... managers can eliminate congestion and long hours by evening out work-loads"

(Alder, Mandelbaum, Nguyen, & Schwerer, 1996). (See also Jungen & Wowlczyk, 1995.)

Bob Lewis (InfoWorld, 1996) sets forth the five keys that he believes differentiate successful projects from the others: scope control; regular, concrete, reasonable results; weekly status meetings; team buy-in to the plan; and walking around.

Project management is considered a vital tool for the implementation of business process reengineering. "Project management allows organizations to break things down into simple processes and assign these activities and modules to individuals. This approach helps organizations identify existing built-in dependencies among processes...A multidimensional forum for enterprisewide visibility is essential and will lead to significant productivity and cost savings....Project management is the organizational 'glue' that binds together dispersed, high accountable teams throughout the organization. Teams will seek and demand a framework to ensure their success under the new rules of rapidly changing, intensely competitive markets. Project management provides the framework, encourages dispersed leadership and provides visibility of effort to stakeholders throughout the organization" (King, 1996). Clearly, project managers are being viewed as pivotal leaders in the introduction and implementation of both operational and behavioral managerial changes. Are project managers viewing their roles and responsibilities in the same light as the authors of leading journal articles? What do practicing project managers believe are the critical characteristics necessary to be effective? On the other hand, what factors contribute to

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RESEARCH RESULTS AND DISCUSSION

What are the characteristics of effective project managers? The following results (presented in Table 1) were obtained from an open-ended question that asked respondents to list, in rank order, the characteristic that they believed was essential for effectiveness.

Possibly the most interesting aspect of the project manager's responses to this question was the fact that technical competence was the third highest rated characteristic. Eight of the nine characteristics were managerial in nature, reflecting a basic understanding that effectiveness is directly related to the ability of the project manager to lead and manage more than simply possess exceptional technical skills. This finding is consistent with the academic literature, but is more powerful when drawn from open-end responses of experienced practicing project managers.

What factors contribute to ineffectiveness among project managers? In order to examine the question of effectiveness in a different light, the project managers were then asked, via open ended questions, the specific nature of personal flaws of project managers that directly contribute to ineffectiveness, as well as the organizational factors that produced the same results. The intent of these questions was to identify how both personal flaws and organizational factors contributed to producing an ineffective project manager. To a large degree the personal flaws are a reverse

(Continued on page 10)

Table 1. The Most Significant Characteristics of an Effective Project Manager

Rank Characteristics of an Effective Project Manager

1	Leadership by example
2	Visionary
3	Technically competent
4	Decisive
5	A good communicator
6	A good motivator
7	Stands up to upper management when necessary
8	Supportive team members
9	Encourages new ideas

Note: These characteristics are ranked from the most important (1) to the least important(9)

producing ineffective project managers? On the operational side, what do they see as the primary causes of projects that fail to meet budgetary and time constraints? What do they see as the most effective project management "tools," and the extent to which these "tools" contribute to the success of a project? Finally, how powerful is "the leadership factor" in the success of a project and what are the specific characteristics and behaviors of leaders that will have a positive influence on organizational effectiveness in the next decade? The authors found no research that specifically addressed these questions nor reported results obtained directly from project managers.

RESEARCH INSTRUMENT DESIGN

The research instrument was compressed of both open-ended and forced-answer questions. In addition, the respondents were asked their agreement or evaluation of several

statements through the application of a traditional five-point Likert scale ranging from a high of 5 to low of 1. The completed instrument was then pretested by 12 project managers and executives in a number of firms. All suggestions were incorporated into the final research instrument. The research instrument was then mailed to a selected sample of 100 senior-level project managers who, it was assumed, would possess a wealth of experience regarding the issues being studied.

The authors received 76 usable responses to the research instrument from the mailing of 100. The extremely high response rate was due in part to an aggressive premailing and postmailing telephone campaign. The respondents were all relatively senior project managers with a minimum of 10 years experience in project management. All of the project managers surveyed were employed in large architectural and engineering consulting companies.

Project management is the organizational 'glue' that binds together dispersed, highly accountable teams throughout the organization.

Table 2. Factors Contributing to Making the Project Manager Ineffective

Personal Flaws	Percentage	Organizational Factor	Percentage
Sets bad example	26.3	Lack of upper management commitment and support	31.5
Not self-assured	23.7	Resistance to change	18.4
Lacks technical expertise	19.7	Inconsistent reward system	13.2
Poor communicator	11.8	The organization reacts to events rather than plans for them	9.2
Poor motivator	6.6	Lack of resources	7.9

Note: The factors are ranked based on their importance, the top being the most important.

Table 3. Reasons Causing Projects to Experience Budgetary and Timely Completion Problems

Rank	Reasons	Responses%
1	Failure to utilize tools to manage the project systematically	39.5
2	Poor leadership on the part of the project manager	32.9
3	Slow responses from the client organization	9.2
4	Lack of timely decisions and corrective actions	5.2
5	Lack of effective interorganizational communication	3.9

Note: These reasons are ranked from most important (1) to least important (5).

(Continued from page 9)

image of the characteristics of effective project managers from Table 1. There seems to be a good deal of internal consistency among the respondents (see Table 2). The organizational factors that contribute to becoming an ineffective project manager are equally relevant, but not surprising. Lack of upper-management commitment and support is a well-documented source of project problems. The project management literature has addressed each of the organizational barriers to effectiveness and it is again reinforcing to discover that the responses document that practicing project managers' perceptions fully support the literature. The past few decades have not seen the elimination of these classic sources of organizational ineffectiveness, although their negative impact on project performance has been known for some time. Resistance to change and a reactive approach to environmental turbulence are signs of a firm struggling with adjusting to new competitive conditions. Traditional reward systems are generally not well suited to project management. Traditional reward systems tend to have very little direct linkage between the performance criteria of a project and compensation. With competition being very intense in some sectors, some projects are priced and sold at dangerously thin multipliers with little opportunity to show a significantly positive return. When the realistic expectations for the project are not considered in the compensation plan, it can be expected that dissatisfaction with the compensation or reward systems are bound to be voiced. Project

managers know that under difficult competitive conditions, jobs are taken to keep the staff utilized and the expected profit margin is possibly at breakeven. It is often just as difficult to manage a project with no expected profit than one with above average profit expectations. In addition, reward systems seldom reflect the nature and varying degrees of difficulty of the task and often focus solely on the final profit numbers. Failure to develop a reward system that reflects the specific nature of the project can create potential long-term conflicts. Consider how new market entry is normally achieved: the firm "buys" a project. The firm intentionally bids a project below what established competitors minimum bid to get the work and, hopefully, enter a new market successfully. Logic would suggest that a firm would want one of its best project managers to lead such a project to ensure success. But if the project affords no opportunity to earn a performance bonus based on project profitability who would volunteer to "take on" a known loser?

In too many cases, organizational insensitivity to the negative realities created by poor organizational practices and policies are not understood or simply ignored. The result of these negative practices and policies is the eventual erosion of a potentially high-quality professional staff. The lack of upper management support and commitment results in a complete breakdown of trust and respect. One of the sure killers of motivation is when project managers become conditioned to being abandoned by their management at the first sign of client conflict. As one project manager described the situation: "its like

discovering that your management is sitting on the client side of the table at every meeting, and that you are left alone to defend every decision." It doesn't take too many such experiences before project managers modify their style of management to protect themselves. Under these conditions one is not likely to find that the project team is performing to the maximum potential.

What are the primary reasons that projects experience budgetary and timely completion problems? Table 3 reports the respondents' reasons for why projects run into budgetary and timing problems. The most frequent responses reflect both organizational and managerial problems. As an example, "failure to utilize the tools available to manage a project to completion in a timely fashion and within budget" was the most frequent response. "Poor leadership on the part of the project manager" was the second most frequently reported cause of problems. "Lack of effective interorganizational communication" and a "lack of timely decisions and corrective action" were also reported. The only external factor mentioned by the respondents was "the client's failure to respond in a timely fashion." Almost every project manager has dealt with clients who seemed unable or unwilling to make timely decisions yet retained their expectations that the project would be completed on time and within budget. It seems that managing the client is an art that only experience can teach. This need to learn the diplomacy of client management becomes increasingly important as a client-oriented strategy is recognized as essential to survival.

What are the project management "tools" most often used and how effective are they? Managing the project requires the skillful application of project management tools that are designed to assist the project team complete the project on time, within budget, and to the satisfaction of the client. Table 4

Table 4. The Use and Contribution to Success of Key Project Management Tools

Project Management Tools	Extent of Use by the Project Manager Mean (SD)	Extent of Contribution to the Success of the Project Mean (SD)
Project execution plan	3.8714 (1.166)	4.1739 (1.028)
Project schedule	4.6429 (.723)	4.6286 (.820)
Project organizational chart	3.7246 (1.211)	3.2794 (1.131)
Project earned value report	2.9118 (1.116)	3.1343 (1.153)
Project cost system	4.3088 (.956)	4.3433 (.863)
Client communication log	3.7536 (1.168)	3.9136 (1.081)
Project budget	4.6429 (.703)	4.6143 (.822)
Work breakdown structure	3.2727 (1.089)	3.2941 (1.066)

Scales

Extent of Use—5 (Always Used) to 1 (Never Used).

Contribution to Success—5 (Critical to Success) to 1 (No Value).

reports the responses from experienced project managers regarding the extent to which they use eight recognized project management tools and the extent to which the tools contribute to the success of a project. As you would expect, the two highest rated tools (actually tying for first) were the project schedule and the project budget. Irrespective of project size or complexity, these project tools were rated highest in use and first and second in terms of contribution to the success of the project. Of the eight project management tools that the respondents were asked to evaluate, none were reported to be of no value. Some of the more detailed tools were used less often and consequently may have been perceived as less valuable to project success. Despite the discussion in the project management literature regarding the need to increase the degree of accuracy in the determination of the percentage of project completion, the “earned value reporting tool” was rated the least used and correspondingly reported to have made the least contribution to the success of a project. The top five project management tools most often reported as used (project schedule, project budget, project cost system, project execution plan, and client communication log) were also rated as making the greatest contribution to the success of the project. Clearly, more effective project managers exercise

managerial discipline in the consistent application of what they have found to be the most valuable project management tools for achieving success.

What are the “other” factors that contribute to the success of a project? In addition to the direct managerial actions that project managers can take through the implementation of project management tools, project managers focus on their managerial and leadership skills as controlling sources of influence that contribute to the successful completion of projects. Table 5 reports the source of influence on successful completion of a project as

reported by the project managers surveyed. As expected, “the decision made by the client” was the strongest influence, with “responding to the changing client request” second. The third source of influence on the successful completion of a project is the “desire to excel,” reflecting the strong positive personal motivation of project managers to make every project they lead a success. “The decision made by the project team” and “the pressures from inside the project” were the next highest rated sources of influence reflecting the need for the project manager to focus on the leadership of the project team. Equally interesting are the lowest rated sources of influence on the success of a project. Respondents give little or no credence to “luck” or “external politics” as barriers to success.

How critical is the “leadership factor” to project success? Given the many factors that can directly or indirectly influence the success of a project, do project managers believe that there is one overriding factor that contributes to whether a project will be a success or a failure? In fact, the answer is yes. When asked to weigh the percent age of success or failure of a project that can be contributed directly to the pressure of either positive or negative leadership the responses were powerfully revealing (see Table 6). Positive leadership

(Continued on page 12)

Table 5. Factors Contribution to Successful Project

Sources of Influence on Successful Completion of the Project	Mean (SD)
Decisions by the client	2.9079 (1.661)
Responding to changing client request	3.8816 (.736)
Desire to excel on the project	4.5132 (.757)
Decisions by the project team	4.2933 (.767)
Pressures from inside the project	4.4679 (.734)
Decisions made by upper management	4.3026 (.980)
Unforeseen technical problems on the project	3.1200 (1.637)
Internal “politics”	2.7895 (1.024)
Pressures from outside the project	3.3553 (.1667)
External “politics”	3.2500 (1.008)
Just plain “bad luck”	1.5393 (.936)

Table 6. The Impact of Project Manager Leadership on Success of Projects

Leadership	Project Success (Failure) %
Positive leadership	75.662
Negative leadership	(67.385)

Note: n = 76

(Continued from page 11)

contributes almost 76% to the success of a project. Consider what this response means. Variation in project success can be contributed to the leadership displayed on the project by 76%. Equally meaningful is the second statistic: negative or poor leadership contributes 67% to the failure of projects. Clearly, firms that fail to train and reinforce the need for project managers to practice positive leadership seem to run an unacceptable risk. In a recent interview with five vice presidents of major engineering consulting firms, a question was posed regarding the number of projects in the past five years that failed due to a lack of technical competence on the part of the project manager or the project team. In what was estimated by them to be more than 1,000 projects, both large and small, the executives could recount only 10 failures due to lack of technical competence. Yet, when you ask most company executives what the most critical criteria for promotion to project manager is, technical competence generally leads the list of responses. Possibly what is absent is the recognition that technical competence must be supported by persons who are capable of managing a project and providing positive leadership to the team.

All the evidence of recent research supports the idea that successful projects are led by individuals who possess a blend of technical and management knowledge, but beyond both, leadership skills. Sensitivity to the client's needs, the composition of the project team, the strategic importance of the project to the firm, and the technical requirements of the project reflect themselves in a continuous stream of communication and personal interactions that serve to reveal the true nature of the project manager. Project managers were asked to rate 50 characteristics or behaviors that they believed, based on their experience, would have a positive influence on organizational effectiveness in the next decade.

Tables 7 and 8 highlight the highest and lowest rated characteristics and behaviors and reveal some very interesting findings. The highest rated characteristics and behaviors build a profile of an individual that most of us would wish to work for. The profile reveals a leader who recognizes that it is absolutely essential to build a

project team, reinforce positive behavior, communicate, demonstrate trust and respect, develop team members and empower them to perform and set goals while remaining flexible to respond to the inevitable changes. Important by their absence from the "golden dozen" are characteristics and behaviors such as technical expertise, individualistic, effective organizational politician, or detail oriented. The profession has moved beyond the mind-set that the best-qualified individual to promote to the project manager's position is the best technical person or some flashy politically savvy character with the "right contacts." Table 8 reports the characteristics and behaviors that practicing and experienced project managers rated as the 12 least important characteristics for the achievement of organizational effectiveness. Some of these responses were a surprise to the researchers while others were not. Project managers rated "strategic thinker" very low. This may be explained by the fact that many project managers are totally operations-oriented and become involved only when the job is sold. In terms of preparation for promotion into the firm's executive ranks this shortcoming could be costly. Yet, this lack of recognition of the need for the practice of strategic thinking may explain the managerial practices of some firms who employ project managers.

CONCLUSIONS

The results of this research should never be assumed to suggest that technical competence is no longer a relevant factor in project management selection. What can be concluded is that

Table 7. The 12 Highest Rated Characteristics and Behaviors

Rank	Characteristic or Behavior	Mean (SD)
1	Team builder	4.6351 (.632)
2	Communicator	4.6338 (.615)
3	High self-esteem	4.5890 (.779)
4	Focuses on results	4.5227 (.624)
5	Demonstrations of trust	4.5135 (.726)
6	Goal setter	4.5070 (.734)
7	Demonstrations of respect	4.4730 (.780)
8	Flexibility in response to change	4.4648 (.771)
9	Team player	4.4570 (.771)
10	Employee developer	4.3803 (.763)
11	High level of interpersonal skills	4.3784 (.696)
12	Empowers subordinates	4.3521 (.678)

Scale

5	Absolutely essential for effectiveness
4	Important to effectiveness
3	Sometimes important to effectiveness
2	Not necessarily important to effectiveness
1	No importance to effectiveness

Table 8. The 12 Lowest Rated Characteristics and Behaviors

Rank	Characteristic or Behavior	Mean (SD)
1	Desires power	2.6850 (1.309)
2	Detail oriented	3.1014 (1.073)
3	Strategic thinker	3.2535 (1.192)
4	Highly structured behavior	3.2663 (1.118)
5	Charismatic personality	3.4306 (.917)
6	Accepts flaws of others	3.4930 (.960)
7	Effective organizational politician	3.5211 (1.0401)
8	Role model in the organization	3.6216 (.887)
9	Utilizes a network of contacts	3.7838 (.940)
10	Accepts responsibility	3.7887 (1.611)
11	Technical expert	3.8429 (1.16)
12	High level of administrative skills	3.9041 (.900)
Scale		
5	Absolutely essential for effectiveness	
4	Important to effectiveness	
3	Sometimes important to effectiveness	
2	Not necessarily important to effectiveness	
1	No importance to effectiveness	

organizational effectiveness requires project managers to combine their technical competency with the application of proven project management tools that support project planning and control, and the need to practice leadership skills that are compatible with the internal motivation of the project team and externally compatible with client focus strategies. Figure 1 serves to combine these two approaches. As the pressures of global competition become more pronounced and the client's need to develop strategic partnership grows, performance expectations will increase correspondingly. It should be expected that our turbulent global competitive environment will remain a continuing source of change. Only firms that master the skills of early identification, selection, training, and development of project managers can expect to remain successful. Once the key project managers are in place, the firm's upper management must develop and implement a mutually beneficial reward and reinforcement process that recognizes the organizational reality that all revenues and profits are earned at the project level. In the long-term, upper management cannot be considered competent if the projects that generate shareholder value fail. The linkages between long-term organizational effectiveness and the management of the firm's total resources flow directly through every project leader. What has always amazed the authors is that high-powered successful project managers that consistently produce results cost no more than those with only average capabilities. When the reader reviews the highest rated characteristics and behaviors of effective project managers

they only need to ask themselves one question: "What, if anything, stops me from earning a reputation as this type of project manager?" The answer is, nothing but ourselves.

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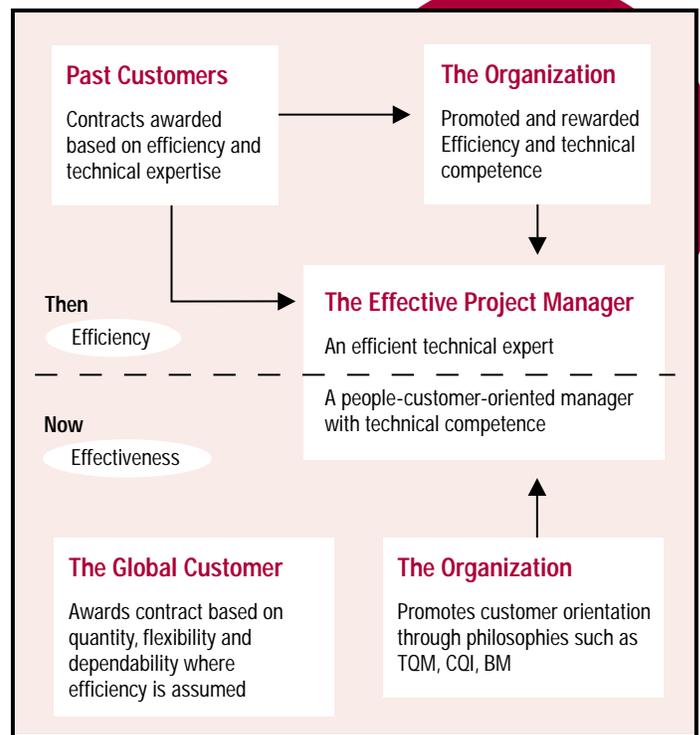


Figure 1. The Changing Role of the Effective Project Manager

Strategic Marketing Techniques for Modern Engineering Practice

By Brian Burton

INTRODUCTION

The past twenty years have seen increasingly intense competition in the engineering disciplines. This period has also brought profound changes in the industry and created a client base that insists on personalized service and value for their expenditures. These same conditions have reinforced the need for careful assessment of marketing strategies for engineering firms because relying on “word of mouth” referrals and “flying by the seat of your pants” is risky business in the true sense of the word.

Traditionally highly skilled professional disciplines have viewed marketing and sales with a general disdain and at best, a necessary evil. In a similar manner the requirement that the firm sustain their “public relations” was given a relatively low priority. However engineers who fail to recognize the importance of marketing (and public relations) and develop marketing techniques which effectively reach their target markets, in today’s world, risk a reduction in business volume and a decline in revenue.

There are, however, marketing techniques which are not as obvious, for example, as advertising that can be both effective and suitable to the character of the industry. These techniques for the most part have evolved from the science of strategic marketing.

Strategic market planning involves the systematic analysis of the strengths and weaknesses of your own firm, your competitors and a step-by-step analysis of the market itself to enable a firm to develop and implement a plan of action which has a much greater probability of success. Strategic marketing in many cases may enable a firm to concentrate its resources in market sectors which have strong long-term growth potential and greater profitability.

Strategic market planning is similar in this respect to a military campaign. Most

of history’s famous generals have learned that victory in battle requires a **thorough** analysis of the terrain, available resources and the enemy **before** the call to arms. Effective marketing for modern engineering practice requires a similar well-researched and planned approach. Success in these matters often hinges on the close examination of every minute detail. Casual or unplanned marketing on the other hand wastes resources and reduces efficiency.

Once a plan is developed and refined it must be set into motion and sustained. Ideally it should be reviewed for effectiveness and modified accordingly on a regular basis.

The following article describes some of the background involved with the current approaches to successful strategic market planning and techniques for modern engineering practice.

BRIEF HISTORY OF MARKETING

The fundamental concepts of economics where products or services are exchanged for mutual advantage or profit can be traced back to the beginning of recorded history.

The “market” which is comprised of producers of tangible assets on one side and prospective purchasers of goods and services on the other, has been described in the past as the “hidden hand” which maintains the equilibrium of supply and demand (by ensuring that they automatically match each other by means of the price mechanism). It is also viewed by some as mankind’s first “computer,” operating as a self-regulating motor mechanism driving the economy providing control and balance of economic activities. The practice itself cannot be controlled or manipulated by a single person, corporation, sector or nation for any extended period. (A great deal of money does change hands however in the activities surrounding short-term manipulation.)

The practice of marketing involves any activity that accelerates or expedites the movement of goods and services from the producer to the consumer. It has also been described as any activity which enhances or protects the flow of corporate revenue. Until quite recently marketing was considered more of an art or acquired skill than a science.

Looking back, many early attempts at advertising copy appears incredibly simplistic. In other cases corporate slogans created 60 years ago are still standing up to close scrutiny and are closely protected. Success in these matters has not been an accident.

Over the last sixty years marketing professionals developed, tested and refined the principals to form the basis of what we now recognize as a science and a professional specialty.

The scientific approach to marketing involves the study of behavioral, social and survey sciences, psychology, psychographics, economics, statistics, cognitive dissonance in the fields of communication and many other sophisticated concepts.

Marketing science, with its emphasis on the probabilities of social and behavioral science, is in many respects the total opposite of the physical sciences. As such it is a world apart from the practice of engineering with its long tradition of reliance on mathematical techniques and the immutability of the laws of physics.

A BETTER MOUSETRAP

For many centuries there was unwavering faith in the effectiveness of “word of mouth” advertising coupled with the belief that marketing would somehow take care of itself if the product was good enough. Thomas Edison, for example confidently predicted in 1922 that if one invented a better mousetrap the world would immediately “beat a path to your doorstep.” This statement demonstrates the long-standing and erroneous

assumption that the buying public will somehow find out quickly that a better mousetrap exists and the location of the nearest retail outlet. What actually occurs is that we generally hear a great deal about successes of this nature and very little about the failures.

There is a remarkable shortage of written documentation regarding the early attempts at systematic marketing, however, conventional theory suggests that it was linked for the most part to the growth of consumerism which followed the industrial revolution. At some point (although the exact date is impossible to pinpoint) the creation of the instruments of commerce, capitalism and international trade combined to create a vigorous and constantly expanding market economy and allowed individual citizens to innovate in areas of commerce and, when successful, to accumulate wealth. There is even less documentation on public relations which probably began as a form of damage control "when the ship went down".

In the early 50's the study and practice of marketing began to gain much more acceptance as a science which involved understanding, predicting and influencing human behavior with reasonable accuracy. As the body of knowledge relating to psychology, survey science and consumerism expanded and the technology involved in mass communications evolved, the techniques used to influence purchasing decisions became more and more efficient.

As the technology improved the various media such as radio, television and computers (which quickly created "electronic commerce") were quickly exploited as potential tools in reaching consumers.

MODERN MARKETING CONCEPTS

One universal premise which is applicable to all marketing (although the nature of products or services might differ widely) is termed the modern marketing concept which holds that the primary aim of a company is to a) accurately determine and evaluate the needs of a target market and then (and only then) b) adapt or modify its products or services to satisfy these needs.

(The key of course is to complete this task more effectively than the competition.) The

currently accepted marketing model generally recommends an eight-step procedure as follows:

- Examine client requirements in the market.
- Generate ideas that satisfy the client.
- Develop ideas into service or product concepts.
- Conduct business analysis on concepts.
- Screen concepts and set priorities.
- Run performance and client acceptance tests.
- Develop launch plans and commercialize.
- Monitor performance regularly against the original plan.

This list, which at first glance may not appear applicable to provision of engineering services, is appropriate if a firm is committed to future growth and enhancing the profit of the firm. Our economy is not static. Rather it is in a state of flux. Working through these eight steps often allows a new vision of the company to develop and ensures you'll be providing the service the client is willing to pay for.

ACCENT THE POSITIVE

The true challenge lies in effectively communicating your firm's competence and diligence to the target market and ensuring that your promotional materials and personnel stress favorable attributes and minimize those that may be perceived as negative. (For example a small firm may stress the importance of customized individual service while a large firm could highlight the extent of resources and geographical diversity.)

Another obstacle involves overcoming lack of appreciation of the importance of public relations. By definition this activity involves the sustained effort to build recognition, acceptance and trust in the firm by both the public and its clients. In effect actions speak louder than words, but these actions must also be noticed.

THE MARKETING AUDIT

Deficiencies in the execution of the marketing function can include failure to adequately define the corporate goals; inadequate communication; lack of guidelines; failure to adapt to unexpected needs or difficulties; improper identification of potential clients' true

needs and sources of resistance at the corporate and/or individual level.

In many cases the quickest method to identify and rectify marketing function deficiencies is to commission a marketing audit which involves an independent third-party examination of the entire marketing function covering objectives, implementation and organization for the purpose of elevating effectiveness and specifying corrective action if required.

Historically, marketing audits were undertaken primarily by companies that had reached a desperate position either because of deteriorating markets or ineffectual policies. In the author's opinion marketing audits should be undertaken on a regular basis.

CONCLUSION: STRATEGIES FOR SUCCESS

The techniques used in planning and implementing a successful marketing program are similar in many ways to the methods used to design and construct a bridge. The differences however, are critical because the materials and components which are employed in marketing are totally unlike concrete and steel. Not only are the elements involved in marketing imprecise and uncertain...the environment is constantly changing. As a result successful marketing for modern engineering practice represents a true challenge in planning and execution.

The success of strategic marketing and public relations programs for engineering practices is **highly** dependent on accurate assessment of internal corporate resources in combination with evaluation and measurement of market segments and expectations.

Past experience has clearly demonstrated that the most important factors affecting the eventual success of strategic marketing programs are sincere commitment on the part of senior staff and setting clearly defined reachable targets. It is all essential to ensure that the firm's resources match their marketing goals and to review progress on a regular basis.

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