

Reinventing engineers for the new marketplace

To compete in a changing marketplace, engineers need to reinvent themselves as independent, entrepreneurial consultants—and market their creativity.

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Chances are very good that nine out of 10 employed professional engineers who are reading this article will be downsized or made redundant by their present employers within the next 10 years. Traditionally, high levels of creativity and innovative idea generation have not been seen as central to the engineer's role.

In the very near future, that perception will have to change. Engineers will be forced to compete for clients by use of aggressive creative thinking techniques.

Image makeover

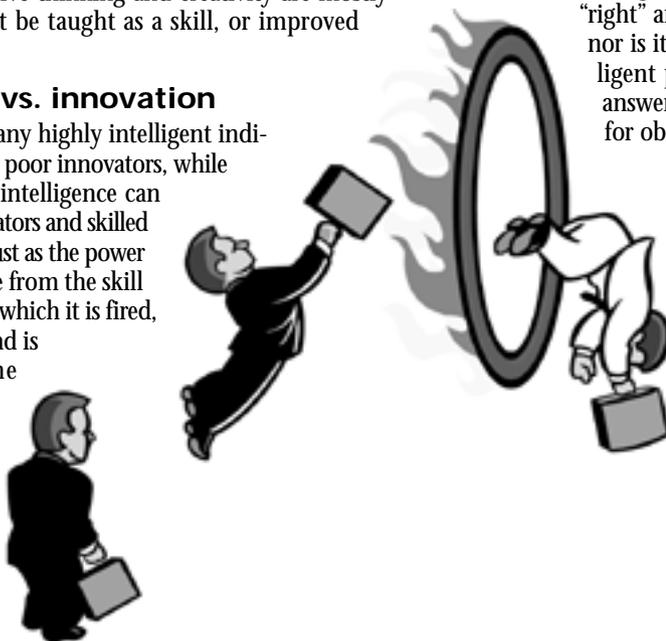
In many technical organizations, prolific "idea people" have usually been seen as being too unstable to head engineering development teams. Having being successfully negotiated the rigors of demanding engineering curriculums, most engineers feel that all they need for a productive career is to continue harnessing the intelligence that permitted them to enter the profession in the first place.

There is an unspoken assumption that, if you are "intelligent," you are automatically a creative thinker. One tragic result of this false presupposition is the widespread misconception among engineers that innovative thinking and creativity are mostly innate and cannot be taught as a skill, or improved upon.

Intelligence vs. innovation

The fact is that many highly intelligent individuals are actually poor innovators, while people of average intelligence can be capacious innovators and skilled creative thinkers. Just as the power of a gun is separate from the skill and accuracy with which it is fired, the power of a mind is separate from the thinking skills of the owner.

Surprisingly, intelligence can prove to be a significant handicap to creativity. The intelligent



Creative solutions

An example of a simple implicit problem is the following:

Two women are sitting on a park bench talking. The first says: "I have three children." The second asks: "What are their ages?" The first replies: "I will give you hints and stop me when you have enough information to calculate their ages:

1. The sum of their ages is 13.
2. The product of their ages is the same as your age.
3. My oldest daughter loves peanut butter."

"Stop!" cries the second woman, "I know their ages." Do you?

Even though the solution of this problem requires only Grade 3 math skills, the majority of professional engineers cannot solve this problem. Perhaps it is because the average 40-year-old engineer is only about 5 per cent as creative as the average eight-year-old.

person can take a firm position on any topic and proceed to construct a rational defence for his or her point of view. However, the better the defence, the less the thinker needs to explore the subject in any depth or seek alternative points of view. The result is that many intelligent professionals find themselves locked into rigid perceptions of what constitutes an "acceptable" solution to a particular problem.

Intelligent people are often able to quickly generate the "right" answer, but this is not the only possible solution, nor is it likely to be the most creative one. A less intelligent person, unable to immediately get the "right" answer, is far more likely to more fully explore a topic for obscure alternative solutions.

Traditional problem-solving

Engineers have traditionally been trained to solve explicit problems, such as finding the solution of n-equations in n-unknowns. In such problems, all the required information is provided, and the solution requires the application of a specific strategy that will work for all problems of a given type.

Unfortunately, the nature of the 21st century economy means that the types of problems that engineers have to solve tend to be implicit in form. All

the information required for the solution is available, but it is fragmented, dispersed and requires highly developed perception skills to extract and use successfully. The thinking skills engineers need to solve even the simplest implicit problems are not currently taught in Canadian institutions.

Although virtually every American Ivy League university has a fully endowed Chair of Creative Thinking, with at least one full-time professor who teaches thinking as a skill to undergraduates in many different departments, no such positions exist in Canadian universities. The only high-level creative thinking courses now available to engineering professionals are offered by the continuing education departments of a small number of postsecondary institutions.

Successful innovators

What then is the mindset of the successful

entrepreneur-engineer trained in creative thinking skills? Here's an example: An engineer who is constantly called upon to deliver lectures in locations around the world uses flying time as assimilation time.

She buys a dozen different magazines on subjects completely unrelated to her area of specialization. During the flight, she reads each publication actively, by sampling broadly but reading selectively. Since ideas are the currency of the innovator, the engineer takes the time to jot down some brief notes for future reference. The most desirable ideas are those that jump out as being new, different, contrary to tradition and challenging to long-held assumptions—generating or offering new solutions to old problems.

The mindset of the innovator is to always be on the lookout for the unexpected, to constantly be expanding one's world view,

while engaging in a never ending war of challenging assumptions. The innovator looks for as-yet undetected patterns—problems that have yet to become serious enough to be widely noticed, and possible opportunities that could arise from these.

Successful innovators are able to spot once-marginal trends that are moving toward the mainstream and offer opportunities for exploitation. They are particularly interested in linking sociological and technological trends, since these often offer the greatest chances for the generation of creative solutions. For example, the explosive growth in internet use has opened unlimited opportunities for engineers able to deliver fibre optical and solid-state laser innovations in order to satisfy the growing demand for new telecommunications bandwidth.

Toward innovative engineering

The innovator knows that the ability to correctly recognize a developing threat confers a significant advantage. When new trends are running counter to one's established position, this is the time when creative ideas can be most effectively proposed.

The innovator-engineer is never too proud to look at what the competition is doing to solve a problem and to find a creative way of doing it better. The innovator seeks to take advantage of these new ideas by treating them as a wave that can be "surfed" to new opportunities. The mastery of critical observation and creative thinking techniques, combined with the endless and energetic search for new opportunities, is the soundest way of preparing the mind for the generation of innovative solutions. This is what will allow the professional engineering entrepreneur to prosper in the demanding and chaotic environment of the 21st century. ♦

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The skills spectrum of creating thinking

Creative thinking encompasses a broad spectrum of separate, specialized thinking skills. In order to prosper in the next century, professionals in all fields will have to develop creative thinking with the following attributes:

Aware: Thinking that is self-aware and critical of the flaws that appear in its patterns and practices.

Clear: Thinking that is well-organized, coherent, accurate, clear and independent of personal prejudices, values, standards and beliefs.

Strategic: Thinking that is forward-looking, where actions are taken with proper foresight and planning for consequences and implications.

Scope: Thinking that is broad in scope, inclusive, context-sensitive, flexible and adaptive.

Profound: Thinking that seeks comprehensive, underlying principles in the form of demonstrable theories, laws and axioms that will link diverse ideas and concepts.

Curious: Thinking that is always questioning, inquisitive, wondering, probing, open-minded, exploratory and endlessly curious.

Accurate: Thinking that is sound, intellectually careful, complete, thorough, fair and supported by evidence.

Progressive: Thinking that does not attempt to solve an entire problem once and for all time, but recognizes an ongoing process of knowledge building, accepts further challenges and seeks new ways of dealing with them.

Perceptive: Thinking that perceives problems in novel ways and enables the solution of implicit problems.

Persistent: Thinking that does not stop with the generation of one satisfactory solution, but continues to generate long chains of creative possibilities.

Flexible: Thinking that is able to jump outside of traditional patterns and uses a variety of creative thinking tools.

Dialectical: Thinking that is able to examine both sides of an issue and to reverse itself, when necessary.

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