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Empires of the MIND

We have entered a new era in which brains count for more than brawn, and old ways of doing things are under constant scrutiny. We are more dependent on innovation than ever: not only in technology, but in the quest for equality, security and peace...

Twenty years ago, nobody – well, almost nobody – had ever heard of Bill Gates. He was a mere 23 years old, and had formed a company based on his work as a teenaged student developing a programming language for the first microcomputer, the MITS Altair. During the reign of mainframe computers the size of city buses, the gangly young man looked like an ineffectual dreamer. He

talked of a seemingly fantastic vision of a fully functional computer on every office desk – or, more outlandishly, in every home.

Today, Bill Gates is a household name even in households occupied by folks who quaintly think that language is solely concerned with words, and that hardware is something you buy in a hardware store. As chairman and chief executive officer of Microsoft Corp., the world's largest supplier of software for personal computers, Gates heads a vast global enterprise. He is a darling of the media, writes a popular newspaper column, and is a best-selling author and a leading philanthropist.

He is arguably the most famous business personality since Henry Ford, a mythic figure with whom he shares many distinctions. Both came to dominate an industry almost personally. Both, indeed, came to personify an age – Ford the age of machinery, Gates the age of cybernetics. Both believed in making the precious fruits of technology available to the masses by rendering them easier to acquire and use.

But the main similarity between these two entrepreneurial giants (aside, perhaps, from being unbeliev-

ably rich) is that they both proved to be innovators of the highest order. An innovator is someone who finds and introduces new ways of doing things. Innovation is often confused with invention, but invention comes first and innovation after. Innovation takes up where invention leaves off.

Henry Ford did not invent the automobile, and Bill Gates did not invent computer software. What they did was take an existing product and work to make it accessible to the ordinary citizen – Ford with the simple design and assembly line techniques that produced his Model T and Model A, Gates with operating systems that enable people to work or entertain themselves with incredibly powerful computers that can literally sit on their laps.

The motto for innovators might be, "there is nothing new under the sun," with the rider that there is nothing old that cannot be revived in a different form by applied imagination. When we in the western world look around us today, we see a multitude of things once thought to be passé that have had new life breathed into them by innovative minds.

Hamburger stands, coffee shops, mail order catalogues, messenger services – all these existed before, but it took variations on a theme by innovators to give us the likes of McDonald's, Starbuck's, L.L. Bean and United Parcel Service. Running shoes went out of date in the 1960s. With new designs and marketing targets, they have raced back into popularity over the past 25 years.

Not only do innovators take old ideas and give new twists to them, they are adept at combining two or more old ideas into something new and different. A few years ago, there were cars and there were delivery vans. Along came a team of innovators, and presto! We had the minivan. In-line skates are a marriage of old-fashioned ice skates and roller skates. Pioneered by Ted Turner of CNN, the all-news network is a *ménage à trois* of a conventional television network, a news agency, and communications satellites.

Taking nothing away from inventors, it is the innovators of this world who have given shape and sub-

stance to the kind of life we lead at the tag end of the 20th century. There is practically nothing we in the western world use or consume today that is in the same form as it was at its inception. Take that simplest and most common of implements, the pencil. Among other things, it has been innovated upon by the addition of an eraser at one end.

The formalization of innovation

From the day that human beings first learned how to make a fire, there has never been a time when innovators have not been active. The material progress of humankind can be roughly traced by the accretion of innovations over the centuries.

It must be noted, however, that innovation has not always been for the better. Much of it has been dedicated to the cause of killing people more effectively in time of war, and the cruelty of mind and spirit shown in the design of some engines of war is enough to make one despair for humanity. Even in peacetime, many innovations – consider, with a shudder, the Chernobyl-type nuclear reactor – have had unforeseen deleterious effects.

Innovation has thrived more than ever in the 20th century, but up until 1960 or thereabouts, it was mainly a haphazard affair, the domain of slightly dotty individuals tinkering away in their basements and garages. People associated it with handy but inconsequential gadgets. It was practised in the spirit of the saying that if you build a better mousetrap, the world will beat a path to your door.

Since then, to a large extent, innovation has been formalized. It has developed into systematic activity operating at the very heart of the modern consumer society. Countless men and women are employed finding saleable variations of existing products, from a prune injected with orange flavour to an investment package that saves on taxes. That is what marketing is all about.

In any number of fields, research and development workers toil tirelessly to come up with better ways of doing things. Some of their work has very far-reaching effects, as in pharmaceutical, medical and safety technology, making the difference between death and life. R&D workers form the vanguard of an economic and social system which, in the past half-century, has come to depend increasingly on intelligence and imagination instead of physical strength or the repetitive application of technical skills.

The pace at which innovations are made has inexorably sped up in the past few years with the advent of

the global economy. Information technology has plunged us all into a challenging new world ruled not by industrial or military might, but by creative ideas. It shows how prophetic that doughty old imperialist Winston Churchill was when he said in the 1940s: "The empires of the future are the empires of the mind."

Amidst the organized institutional efforts to maintain the flow of innovation, however, there is still ample room for the would-be builders of a better mousetrap. To take one example of many, Robert Dickie of King City, Ont., set out in the 1980s to build a better electrical plug. He devised the biscuit-thin "Flatplug" and licensed it to manufacturers and retail distributors in international markets. Dickie was helped along by the Canadian Industrial Innovation Centre at the University of Waterloo, one of several agencies in this country devoted to encouraging innovation with incentives and support.

Adding just a little to our quality of life

The speed and capacity of computers has been a boon to independent innovators, affording them the capability of experimenting and performing tasks once reserved for large organizations that had access to those old bus-sized mainframes. The downsizing of large corporations and institutions in recent years has given rise to more independent innovators than ever before. Their ranks consist not only of young people who begin their careers working on their own or in small loose-knit groups, but of middle-agers who have been cut from large organizational staffs and have gone into business for themselves.

Is it still possible for freelance innovators to score big, like Bill Gates? The answer is an emphatic yes in the case of two young former Ph.D. candidates in electrical engineering at Stanford University, David Filo and Jerry Yang. Less than five years ago they got together to work on a way to look up their favourite sites on the Internet. They created a simple, convenient directory, a kind of "phone book for the Net," which they called Yahoo! It is now the most-visited site on the World Wide Web, and Filo and Yang (who share the title of "Chief Yahoo!" in the company they founded) are rich men and cyber-age celebrities.

But the average freelance innovator is more likely to end up with a lot of satisfaction and relatively modest financial rewards than with any great fortune. The reason is that, for every earth-shaking idea, there are ten thousand less-spectacular

"If you build a better mousetrap, the world will beat a path to your door."



ones that add just a little to our quality of life. It is only when these are taken together that we can see how much innovation means to our way of living. Would anyone like to go back to the world before plastic garbage bags and paper towels?

Computers themselves have opened up whole new vistas of innovation. In Canada, youthful companies like Softimage and Discreet Logic have conquered the entertainment world with software that can turn visual images upside-down, inside-out and sideways, and create such lifelike representations of creatures and objects that they seem more real than the real thing.

It has been said that the technology these companies purvey has permanently changed the way movies are made. Meanwhile, IMAX Corp. of Toronto has been steadily innovating on its original innovation, a three-dimensional super-sized screen and sound system, to allow licensees to make and show the largest and, in a sense, the most striking movies ever. IMAX productions in specially-constructed cinemas are now thrilling audiences around the world.

Building Canada with the new and improved

It is altogether fitting that Canada should produce some of the stars of innovation in our times, since this has always been a singularly innovative country. Indeed, it can be safely said that no country has ever been more dependent on innovation for the well-being of its populace.

Long before the first European ever set foot on North America, our native people had to find ways of coping with the climate and terrain of the upper half of the continent, which offered them a stark choice of improvisation or death by exposure or starvation. They responded by developing needed aids to living like parkas, igloos, dog sleds, snowshoes and canoes, and doubtless improving on their design as time went on.

One of the key reasons Canada now occupies the second largest land mass in the world is that the early fur traders took the native birch-bark canoe and refined and enlarged it, eventually developing the superb *canot de maître*, which carried four tons of cargo. It was in "new, improved" versions of the basic native craft that French, British and Canadian-born explorers fanned out to map and stake claim to Canada's present territory from sea to sea to sea.

Another innovation allowed Canada to populate and economically develop much of its great western hinterland. This was Marquis wheat, developed in the early 1900s by Charles Saunders of the Dominion Experimental Farm in Ottawa. Before the introduction of Marquis, agriculture on the Prairies was severely handicapped by a short growing season. Before they could ripen, grain plants were frequently destroyed by frost.

Through painstaking cross-breeding, Saunders developed a strain of wheat that would mature before the annual onset of freezing temperatures. It also had excellent baking qualities. The development allowed wheat farms to be opened much farther north than previously, leading to the settlement of immense stretches of previously uninhabited territory. Within a few years of its introduction, Saunders' innovation had made Canada the largest wheat-exporting nation in the world.

Many years later, at a time when Prairie agriculture had become overly dependent on wheat, Canadian scientists experimented with variations on rapeseeds. Out of this came canola, now a huge export crop in Western Canada which goes into producing a low-cholesterol edible oil.

Capitalizing on the nature of the land

Prime Minister William Lyon Mackenzie King once remarked that Canada had too little history and too much geography. It is no accident that many of the innovations this country has given the world have dwelt on overcoming the effects of distance and isolation – things like the railway sleeping car, the oil pipeline, the audio and the plug-in radio, and the STOL (short take-off and landing) aircraft.

The peculiarly rugged nature of the Canadian economy has led to many innovations that have been adopted worldwide in the industries in which Canadians have expertise: mining and metallurgy (the lead-zinc flotation process and the geiger counter), hydro electric power (improved dam designs and long-distance high-voltage transmission), pulp and paper (high-tensile kraft paper), marine navigation (the steam foghorn), railways (the shatter-proof rail) and aviation (the variable pitch propeller and North America's first, though short-lived, commercial jet plane).

Not surprisingly, many Canadian innovations have sprung from the exigencies of the climate in this land of ice and snow. A short list would have to be headed by J.A. Bombardier's snowmobile and later his Ski-Doo, followed closely by the rotary snowplough, first used on

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Canadian railways, then adapted to streets and highways and eventually to residential driveways. Among the more recent winter-related developments from Canada are a tracked, amphibious self-righting craft to serve as a rescue vehicle in freezing conditions, an artificial island made of sprayed-on ice, and a "snow paver," which builds high-strength snow surfaces for roads and airstrips.

The recent success of innovative Canadian telecommunications systems on the global scene is well in line with a long and honourable tradition. The teleprinter, combining the qualities of a telephone and a typewriter, was developed in the early years of this century by a Nova Scotian, Fred Creed. In the 1920s, the wirephoto transmitter, precursor of the Fax, was developed by Winnipeg-born William Stevenson, who as "The Man Called Intrepid" went on to become the British government's leading spymaster in World War II.

Professional innovators will attest that the biggest obstacle facing a person with a hot idea is a lack of self-confidence. Canadians would seem to be especially vulnerable to the feeling that, because they live in a numerically small country next to the almighty United States, they lack resources to get their ideas off the ground. A good look at Canada's enviable record should dispel this impression. If innovations are still-born in this country, it may have more to do with the attitudes of the innovators than with where they happen to live.

According to experienced innovators, many good ideas never see the light of day because their initiators think too much, too soon, about feasibility. In this way they anticipate daunting difficulties before they arise. Akhil Madhani, who recently won the \$30,000 Lemelson-MIT Student Prize for Invention and Innovation in the United States, told columnist Carol Smith of the Seattle Post-Intelligencer that the creative impulse can easily be squelched by focusing too soon on applications and practicality. If you look at applications immediately, you will probably become too discouraged to proceed.

According to Madhani, innovators often give up because they are not prepared for the resistance to change their ideas may encounter. A case in point is the current effort to improve the viola to make it more comfortable to play; violists often develop muscular and back problems because of the awkwardness of their instrument, which is much harder to handle than a violin. The improved

version of the viola is a strange-looking device, but its acoustical qualities are up to standard. Still, several tradition-minded conductors have refused point-blank to permit it in their orchestras.

What makes an innovator? Something that was once called "divine discontent" in the context of artistry. True innovators are never satisfied, Madhani says: "They take the approach that nothing is satisfactory, and then go about doing whatever they can to do something about it." Innovators are "constantly looking at everything and asking why things work the way they do – why is the coffee mug shaped that way?...They never assume it couldn't be done differently."

It may yet give us the greatest gift of all

Not all innovation is technical, of course, and the principle of always questioning whether a thing could be done better applies to a great many fields, merchandising, economics, and social science high among them. Social innovations such as unemployment insurance, medicare and graduated income tax have probably had more influence over the way we live in Canada than most technical innovations. On the economic front, the development of low down payment residential mortgages has had a profound affect on the character of our society by making it possible for the average family to own a home.

Innovations in the socio-economic field have never been as successful as those in science and technology. The greatest example is Soviet Communism, which may be said to be an innovation on early religious community life, in which everyone shared the labour and the wealth. Like many other social innovations before and since, it failed because it failed to take human nature into account.

Nowhere is innovation more needed – and nowhere is it more difficult – than in the sensitive field of politics. We said earlier that Canada is something of a creature of innovation. The most important innovation of all as far as this country is concerned was a political one: the confederation that allowed the disparate colonies of British North America to join in a common state. We witnessed an example of how important political innovation can be in the recent agreement to reconcile the interests of the warring parties in Ireland. The day may yet come when the innovators among us can give us the greatest gift of all: peace among human beings.

