

A Strategy for Success: Innovation Will Renew American Leadership

by Rocco Leonard Martino

Rocco Martino (roccomartino@gmail.com) is inventor of the CyberFone[®] software system permitting real-time video. Dr. Martino, who was founder and chairman of the board of Cyber Technology Group, Inc. (Wayne, PA), is the author of numerous books on finance, computers, communications, healthcare, networks, and planning.

***Abstract:** While the foreign policy discussion in the United States today is focused upon the Iraq War and Islamist terrorism, America also faces other, more long-term challenges to its physical security and economic prosperity: the threats posed by our declining economic competitiveness and our dependence on Middle Eastern oil. As in the past, America's ability to prevail over these challenges will depend on its technological and industrial leadership, and especially our ability to continuously recreate it. The United States needs a national strategy focused upon developing new technologies and creating new industries.*

Much of the foreign policy discussion in the United States today is focused upon the dilemma posed by the Iraq War and the threat posed by Islamist terrorism. These problems are, of course, both immediate and important. However, America also faces other challenges to its physical security and economic prosperity, and these are more long-term and probably more profound. There is, first, the threat posed by our declining competitiveness in the global economy, a threat most obviously represented by such rising economic powers as China and India.¹ There is, second, the threat posed by our increasing dependence on oil imports from the Middle East. Moreover, these two threats are increasingly connected, as China and India themselves are greatly increasing their demand for Middle East oil.²

The United States of course faced great challenges to its security and economy in the past, most obviously from Germany and Japan in the first half

¹ Thomas L. Friedman, *The World is Flat: A Brief History of the Twenty-first Century*, updated and expanded (New York: Farrar, Straus and Giroux, 2006); David Lei, "Outsourcing and China's Rising Economic Power," *Orbis*, Winter 2007.

² Peter Cornelius and Jonathan Story, "China and Global Energy Markets," *Orbis*, Winter 2007.

of the twentieth century and from the Soviet Union in the second half. Crucial to America's ability to prevail over these past challenges was our technological and industrial leadership, and especially our ability to continuously recreate it. Indeed, the United States has been unique among great powers in its ability to keep on creating and recreating new technologies and new industries, generation after generation. Perpetual innovation and technological leadership might even be said to be the American way of maintaining primacy in world affairs. They are almost certainly what America will have to pursue in order to prevail over the contemporary challenges involving economic competitiveness and energy dependence.

There is therefore an urgent need for America to resume its historic emphasis on innovation. The United States needs a national strategy focused upon developing new technologies and creating new industries. Every successful strategy must define an objective or mission, determine a solution, and assemble the means of execution. In this case, the objective is economic superiority; the solution is new industries which build upon the contemporary revolution in information technology; and the means of execution will have to include a partnership of industry, government, and people.³

The Shift to Mind from Matter

Throughout history, there have been pivotal points at which the future took a new path. The actual event might be evidently epochal or go entirely unnoticed. The ultimate significance can be immediate or deferred before becoming a catalyst for change. Everyone recognizes the cascading effect into World War I and beyond of the assassination of Archduke Franz Ferdinand of Austria in 1914. Far fewer recognize February 14, 1946 as the birth of globalization. That was the day ENIAC, the first electronic general purpose digital computer, was demonstrated in Philadelphia at the University of Pennsylvania, after its co-invention by John Mauchly and Pres Eckert.⁴ It spawned a coterie of inventions that created the dominant information technology revolution of today. Computers led to the space program, and the space program to communication satellites. And, with the launch of the first communications satellite in 1962, Marshall McLuhan's vision of the Global Village became possible.⁵

The computer is the first machine in history that was invented as an adjunct of the mind. All prior machines were adjuncts of physical strength and

³The White House Fact Sheet: The American Competitiveness Initiative: A Commitment to Education, Research and Innovation, Office of the Press Secretary, May 19, 2006.

⁴Stan Augarten, *Bit by Bit: An Illustrated History of Computers* (New York: Ticknor & Fields, 1984).

⁵Herbert Marshall McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man*, 1962.

capabilities, such as movement.⁶ Hence it is no surprise that, since the invention of the computer, the generation of wealth has shifted from physical labor and associated industries to mental pursuits and related inventions and industries.⁷ Where in the 1960s the United States was concerned that the Soviet Union might overtake it in essential industries such as steel and chemicals, today it is Ireland, India, and China that are building economies based on mental pursuits reflected and augmented by electronic devices and applications, including instant information and instant communication.

The Soviet Union's passage into history left the United States the world's only superpower. Will the United States, too, be eclipsed in a new world order, where ideas and innovations are of paramount importance in economic growth and national economic security? U.S. prosperity and security depends on new inventions that will create the new industries and new jobs the new world order needs. The United States is eminently positioned for this role.

Two major strategic initiatives emerge as vital in this endeavor. The first is eliminating the need for outsourcing information technology jobs. The second is curbing dependency on foreign sources of energy. The byproduct of these programs will be the creation of wealth and jobs in the United States, and increased national economic security through the reduction of dependence on foreign technological developments and foreign energy.

Information Technology

The explosive growth of information technology worldwide led to significant increases in the cost of creating systems and products, as work requirements outpaced the labor supply. Indeed, the outsourcing of computer programming and technical development began as a search by business for lower costs.

Innovative government policies in taxation, educational support, and industrial subsidies created the capability of meeting the worldwide demand for high-tech products in such countries as Singapore, Korea, Taiwan, Malaysia, Japan, and, now, in China. Similar innovative government policies in Ireland, India, Mexico and, now, the Philippines have resulted in significant movement of computer programming and other intellectual tasks to those nations. The initial movements were based on cost, but now they are related to a combination of capability and cost. Experience leads to development, which leads to more experience and more development, and then to dominance.⁸

⁶ Rocco L. Martino, *Information Management* (McGraw Hill, 1968) and *MIS Methodology* (McGraw Hill, 1969).

⁷ Alvin and Heidi Toffler, *Revolutionary Wealth* (New York: Alfred A. Knopf, 2006).

⁸ "Losing the Competitive Advantage," American Electronics Assoc. (2005).

Innovative developments in the United States created not only the global computer hardware industry, but also the vast market for application packages and products. This in turn fueled the need for vast numbers of programmers creating the code to fuel hardware and software systems. Over time, high-cost American programmers, despite their know-how, were replaced with much lower cost coders, who were directed to produce code and systems according to specifications often developed in the United States. That industry trend is unnecessary. The vast numbers of coders around the globe can be replaced to a large extent, if not completely, by using the power of the computer itself to generate the code.

In fact, the concept of automatic programming is almost as old as the computer itself. The first efforts at it date back to the early 1950s. The objective was to reduce the time and effort associated with the coding of a process in language understandable to the computer. As computers became more sophisticated, so did the techniques for replacing human coding with machine-generated coding. These efforts at productivity enhancement sparked many of the computer standards used today. Unfortunately, thinking in this sphere has stayed within the box, and automatic programming techniques are used as productivity enhancers rather than as system creators. What was needed then, and even more so today, are developments to generate functioning computer form sketches and logical descriptions in the vernacular that can produce computer systems without human intervention. Having the computers generate their own labyrinths of computer code would put know-how to work much more rapidly. The cost/benefit improvement would be significant. Despite this, only rudimentary efforts have been initiated to date.

There was no government or corporate policy, funding, or support for the creation of automatic programming capability. That fact should be contrasted with the current initiative in France and Germany of a multibillion-dollar program to challenge the dominance of Google in search technology. The program is called Quaero or, unofficially, "Eurogoogle."⁹

The times call for a national "Amerigooogle," if you will, the ultimate automatic programming system that will generate code by machine from specifications written by analysts. The result will be home-grown systems without outsourcing of coding jobs. More importantly, it will utilize the know-how resident within many of our soon-to-be-retired baby boomers.

Globalization is creating a demand for products and services that provide immediate and ubiquitous communication. As envisioned during the Internet boom of the 1990s, these are leading to workplaces and schools without bricks and mortar. These will produce many useful applications in such fields as telemedicine, which brings diagnostic and monitoring capabilities to rural physicians, and multimedia data centers in homes and public places; teleworking, and virtual meetings.

⁹"Attack of the Eurogoogle," *The Economist*, Mar. 9, 2006.

New Communities from Telemeetings

Of particular significance are innovations that permit anyone to actively participate in group events from any spot in the world.¹⁰ For example, video conferences can currently be staged with many participants. A viewer can see, hear, and exchange views with persons located at many different places. An external editor selects the visual frames that are displayed. The same is true of a televised football game, where a producer selects the images shown. Soon, the viewer will become an active participant, letting his or her eyes select what is to be seen. Further, this technology could be provided on any frequency, with any bandwidth, and at any distance, on a wireless, mobile device such as a cell phone.

Holographic imaging now exists that projects three-dimensional images. The next step would be to connect these images to multi-frame, multi-person, multi-location systems to present a virtual meeting for all participants. Further, for the greater ease and freedom of participants, commands will be activated by voice rather than manipulation of a keyboard or a mouse. An additional benefit would derive from projecting such images onto any wall or screen of any size and under any lighting.

Applications would not only be in business, or government, but in schools, residences, and in public entertainment centers. Imagine an interview.com where an MBA grad from Tennessee can have a virtual lunch with a prospective boss in Buenos Aires. This technology will be a major wave of the future. It will expedite globalization dramatically.

To meet the demands for such virtual conferencing, many new applications will be required, such as holographic conferences through imaging techniques that create the aura of being in a room with group of people who are physically separated by distance; multiple images projected onto a screen or wall by hand-held devices; reductions in size and cost of widely distributed, screen-based devices in homes, workplaces, and public spaces for data monitoring, transmission, and display; and integration of signals from disparate sources and receivers into coherent and useable data; far greater access to public data and data warehouses; and electronic communication that is not limited by frequencies, distance, or line of sight.

New Offices from Teleworking

Another example of a globalization communications technology, one that may have the greatest impact on our way of working and our prosperity, is teleworking. In this application, which is related to teleconferencing, an

¹⁰William M. Bulkeley, "Better Virtual Meetings with Pricey Cameras, Plasma Screens," *Wall Street Journal*, Sept. 28, 2006.

employee participates in the full work of an office, class, or group without being physically present. A key to this will be participatory, real-time, realistic-looking video conferences. Teleworking should put to good use the talents and skills of tens of millions of retirees. And with masses of people working from home, there will be greatly reduced pollution, decreased commuting time, lower auto and health insurance costs, increased leisure time, and lower business overhead.

An important distinction must be made between teleworking and telecommuting. Certainly the idea of working at home as opposed to moving to a central place of work is implicit in both. The distinction, however, is that teleworking involves a whole new approach. It involves creative and productive efforts by persons separated by distance but connected by modern communication and computer techniques as if the employees were side-by-side. The Industrial Revolution created work stations in a factory environment where workers went to the location of work. In the IT world, work can be shared electronically. The workplace is wherever the worker is located. Hence teleworking is a reality even if the workers still follow a company-directed policy of moving to a fixed location. Much of that is unnecessary and can be replaced by working at home, linked to other workers by IT, especially the proposed teleconferencing capabilities. The IT potential can be achieved with the elimination of the factory-mode of work locations.

Teleworking Our Way to Energy Independence

The benefits include both the employment of brainpower independent of physical location and condition, as well as a potential sharp reduction of dependence on foreign sources of oil.¹¹ Short of a startling breakthrough in a new energy technology, it is unlikely that we will break our dependence on imported oil unless we radically change the way we work and live. This is a major incentive to consider teleworking to reduce energy addiction.

In the winter of 2005–06, the United States used almost 21 million barrels a day of crude oil, and imported about 59 percent of this, or about 12 million barrels a day. Our daily domestic production is currently about 9 million barrels, and is diminishing steadily.¹²

Of the 21 million barrels consumed, two thirds go for transportation of one form or another, or close to 14 million barrels a day.¹³

¹¹John Deutch and James R. Schlesinger, “National Security Consequences of U.S. Oil Dependence,” Council on Foreign Relations Task Force Report No. 58, 2006.

¹²“The Global Context,” CERA May 4, 2006.

¹³Michael Peterson, “Oil Consumption in North America,” 2000, at Univ. of Nebraska at Omaha website, www.unomaha.edu; International Energy Outlook 2006, World Oil Markets, at <http://eia.doe.gov>.

The cost to the national economy of imported oil, at a March 2006 price of \$65 per barrel of crude, amounts to \$780 million a day, or about \$285 billion a year—approximately a third of 2005's balance of payments deficit of \$726 billion.

Alternatives to oil-based energy and energy generation—such as wind-mills, geothermal wells, hydro-powered electricity, coal-fired generators, and nuclear power plants—do exist, and are rather effective at this time. None of these, however, are suitable or readily available alternatives for the gasoline- and diesel-powered engines that make up the bulk of the transportation sector's costs.

Let's assume things go very well with alternative sources of energy outside of transportation. Say we cut 50 percent of the non-transportation component (i.e., reduce 7 million barrels to 3.5 million barrels per day): this would reduce total oil demand to about 17.5 million barrels a day. Then, to become completely self-sufficient within our current domestic production, we would have to slash daily oil consumption by an extra 8.5 million barrels, or about 40 percent of current use. This would have to come from the transportation sector's consumption of 14 million barrels a day. This would demand a reduction of *60 percent*. To bring about such significant reductions, big changes are needed.

Extensive programs are under way around the world to develop alternative fuels. Some very successful initiatives, notably in Brazil, convert vegetable oil to fuel oil. Efforts like Brazil's are economically feasible with today's high fuel prices. The development of hybrid gas-, ethanol-, and hydrogen-fueled cars as well as the employment of fuel cell technology for vehicles are also promising. They offer feasible means that could potentially reduce oil dependence by a significant degree. The creation of oil from garbage also bears promise. Still, it appears unlikely that even all these measures would reduce oil consumption for transportation by much more than half of current use. That amounts to reducing the imported oil dependence by 4 million to 4.5 million barrels a day. This means we need to reduce transportation-related energy consumption by about the same amount.

Such reductions must come from reduced commuter travel. And that may be achieved by moving to telework: working at home or at remote locations closer to home. Telework shatters barriers of distance and information access. People can perform useful and profitable work without wasting time, energy, energy resources, and money by traveling to a fixed place of work where their productive capacity might even be less.

The advantages gained are significant. More workers will be available to carry the social security burden, and workers could retire at a later age. Some critics of previous experiments have focused on the reduction of relationships gained from contact in a work environment. Perhaps this may be a challenge for some, but it is hard to measure growth of relationships in a one- or

two-hour commute; and many workplaces require using an impersonal telephone-computer combination. There will always be those who will argue both sides of this coin. At least there can be an alternative to mass movement to places of work in the industrial revolution mode.

Further, teleworking will provide a large capacity of well-trained, lower-cost workers to whom significant work can be outsourced. If we can outsource service work to Bangalore, India, then why can't we outsource to American workers in Bangor, Maine or Bowling Green, Kentucky?

What is proposed with more teleworking is, in effect, *more*, not less, outsourcing—but of a different kind. We should be outsourcing back to the homes of our own workers, a sort of “home-sourcing.” This would include the great numbers of retired workers with long experience and still-excellent skills. It would also include the masses of persons with physical mobility limitations, who make up a natural talent pool for telecommuting.¹⁴

There are ways to encourage more teleworking. A number of far-sighted companies and government agencies have policies to do just that. Corporations should be encouraged to provide workers the option of working from home one or more days each week. In addition, it is essential that state and city corporate and individual income tax structures be altered to ensure that barriers to the opportunity of productive work undertaken by nonresident employees are removed.¹⁵

The American Competitive Initiative (ACI) President Bush announced in February 2006 is important. It aims to encourage more business investment in research and development, increase federal support for basic research in the physical sciences and improve U.S. students' math and science education.¹⁶ It is equally important, however, to ensure that these initiatives do not come at a cost that offsets the positives of other equally important initiatives.¹⁷

One policy change that would revolutionize our approach to energy consumption would be to replace the income tax with a consumption tax, with the new levy aimed especially at energy consumption. This would encourage hard work and entrepreneurship while discouraging energy waste. The consumption tax could be phased in over a period of years while the income tax is phased out, easing the shock to those workers now heavily dependent on oil use. The amount of the tax could be calculated to keep it “revenue-neutral,” providing no more and no less money to the government.

¹⁴ Policy Leadership Series, Sloan Work and Family Research Network, Boston College, Issue 3, 2005.

¹⁵ “The Telecommuter Tax: Tax Policy Examples of States' Ignorance of Information Age,” *The Monitor*, Nov. 8, 2005.

¹⁶ White House Fact Sheet on ACI.

¹⁷ House Committee on Science Press Release, “Science Committee Members Praise American Competitiveness Initiative,” Feb. 15, 2006.

An important step the government should *not* take is to interfere with the further development of the Internet, its commercial applications, and other electronic communications, particularly those related to telecommunicating. While little has been done to date concerning taxation, there is significant discussion if state and federal agencies and government bodies concerning revenue streams on one hand, and the need for leveling the playing field in use of the access to licensed communication capability. Of great interest is the concept of “net neutrality” in terms of usage by major corporations on one hand, and individuals on the other. With energy prices currently high, and expected to increase, one can expect an explosion of new products and relationships to make telecommuting easier. In particular, new organizational structures are bound to be created to provide individuals parity through pooled-charge arrangements to counter the advantage of large-scale users. Innovation and ingenuity will no doubt provide market-dominated “net neutrality.”

Telework will result in the rebirth of American cottage industry as a potent economic contributor. It will greatly spur the ability to conceive, make, sell, and ship goods via the Web in industries that require little investment capital. Examples include software design, the making of quality clothing, and equipment repair and maintenance. The number of the self-employed, with all the benefits to enterprise and invention that implies, should soar.

Any change introduces problems, especially changes of this magnitude. There will be the usual problems associated with resistance to change, many of them based on habit patterns. Of real concern, however, will be those associated with health insurance, modes of supervision, government taxation based on location of the employer and worker, and social interaction between people.

Health insurance issues must be addressed in this new work environment. For the baby boomers, most of whom are or soon will be on Medicare, there would be no problem. For the younger teleworkers, there would be no difference from the situation today with the self-employed. For example, at this time, many local chambers of commerce offer group health insurance rates to proprietorships that cannot afford non-group-based rates. Such programs encourage the newly self-employed to join the Chamber to take advantage of group rates. In fact, total health insurance costs might very well be lower with commuting virtually eliminated for so many.

Needless to say, changes would be needed, but they seem minor compared to the benefits accrued. The most difficult problem will be the psychological removal of the supervisor, who cannot “see” subordinates at all times. However, with the communication capabilities existing or in development, especially teleconferencing, will make such “invisibility” insignificant in actuality.

Buying patterns will change with the work patterns. The “stores” for such enterprises will be Web sales or Web auctions via the Amazon and eBay models. Indeed, today’s specialized websites facilitate the exchange by

acquisition and sale of emerging online businesses themselves.¹⁸ Current on-line buying patterns will intertwine in a synergistic fashion with any telework trend. It will be “more of the same.”

The concept of telework is not foreign in our modern society. It becomes more a case of magnitude of implementation rather than innovative practice. In fact, implementation of the process can be carefully managed. In situations where an office worker begins to work from home, the transition can be gradual, with the firm or organization setting up a “hotel” in the office for the employee to come and use re-assignable space and get face-time with superiors and occasionally with co-workers. Desktop video conferencing will also assist the maintenance of relationships, just as email and text messaging are doing today. The coming generation of employees will be significantly more accustomed to and comfortable with remote access of information than the current generation. On the other hand, the soon-to-be-retired baby boomers will probably perceive this approach as vital to their continued productive endeavors.

National Economic Security

The rapid growth of the economies of China and India raises the possibility that they could surpass us in many aspects of scientific and technical excellence. One sobering statistic involves the number of engineering students that foreign countries are graduating. Twenty years ago, the United States and China graduated roughly the same number of engineers. Today, the U.S. graduates 60,000 engineers, while China graduates 200,000. India graduates 100,000, as does Japan, while South Korea is close to the U.S. total.¹⁹ In a technology-driven world, these numbers are disconcerting.

Along with scientific talent, another arrow in the quiver of China's economic arsenal that enables its rising power is its far-sighted investment strategy. The Chinese government and Chinese industry are spending massively on modern infrastructures and innovations. They are directing their resources to biotech and medical research, Internet networks, space travel, seaports, mathematical and scientific institutions, higher education generally, and other building blocks of the globalized economy. They have eyed the future, and are carefully mapping the fastest route to it. We must do the same, and do it better. We certainly have the know-how and the skilled workers. What is needed is national policy and a passion to succeed once more. The alternative is to become an economic vassal of China and India as we sell assets to meet our financial needs.

¹⁸“Internet Home-based Business Franchises and businesses for Sale,” at www.franchiseadvantage.com.

¹⁹Science and Engineering Indicators—2002 Figures for Engineers, at National Science Foundation website, www.nsf.gov.

The World is *Not* Flat: It Is Still Round

In *The World is Flat*, Thomas Friedman advances the prevailing notion that many nations of the world are growing their economies to the detriment of the United States. He sketches compelling scenarios in various sectors where the United States must compete in a “flat” world, in which labor, capital, and technical resources are equally accessible from any land. While Friedman’s analysis is insightful, the conclusions that can be drawn from it—that America’s economic supremacy is doomed—are far from guaranteed.

In fact, the world is not and has never been flat. The world is still round, but definitively smaller. There is no even or flat plane when it comes to ultimate capability to innovate, perform, and deliver. While the cost of labor may vary in different parts of the world, total capability is much more than the lowest cost of labor. Innovation, the ability to create, and especially the development of new products and industries will always be a decisive factor in wealth creation, both personally and nationally. Information can certainly flow faster and more evenly than ever before, but the use of that information is never “flat.”

For some, the flat world concept signifies the United States falling to the level of the third world, as more jobs move to low-cost labor areas. The ability to manufacture locally and sell competitively on a global basis would seem to favor such places.

However, invention and innovation cannot be measured by labor cost, nor can they be outsourced to save money. And China for one appears to understand this reality. The ultimate goal is national wealth and innovation on a consistent and escalating basis, and not necessarily dominance as a lowest-cost manufacturer. Hence, while most electronic devices and cars are manufactured offshore, the American economy need not suffer if it can continue to exercise cost control through invention and innovation. The world may be flat with regard to low-cost manufacturing, but it definitely is not in terms of opportunity. We are almost at the same point that occurred about 1895. At that time, the commissioner of the U.S. Patent Office bemoaned the future since there was nothing more to invent. That, of course, was before x-rays, antibiotics, radio, aircraft, jets, computers, satellites, and the host of devices that permeate our society today. We must be sure that we do not repeat a lack of imagination today.

Conclusion

In the not-too-distant past, measures of industrial capacity such as tons of steel production and output of refrigerators were used as the main indicators of national income and GDP growth. The miracles of Ireland, India, Singapore, Taiwan, Korea, and China, however, have created a new paradigm for measuring the economic activity. Today, the number and use of computers,

visualization techniques, communication systems, and personal electronic devices are the chief indices of the economy.

The United States became a superpower of global reach because it had passion, imagination, and the skills to invent and commercialize cutting-edge innovations. The Henry Fords, Andrew Carnegies, David Packards, Bill Hewletts, Pres Eckerts, and John Mauchlys of the past created the dynamic economy that pushed the nation to the position of the world's superpower. These individuals, and others of the same bent, created the bedrock for the likes of Microsoft's Bill Gates, Apple's Steve Jobs, Intel's Andy Grove, and airport entrepreneur Frank Chambers to move the economy from manufacturing to the information age. Likewise, the movements that propelled Ireland, India, Singapore, Taiwan, Korea, and China into dominance in electronic manufacturing and now toward the top of information technology had their roots in the innovative skills and visions of American entrepreneurs. That culture of entrepreneurship remains America's major heritage and strength.

