



**STRATEGY
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**INFORMATION AGE TECHNOLOGY:
THE COMMON ENGINE OF MILITARY
AND ECONOMIC POWER**

BY

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INFORMATION AGE TECHNOLOGY: THE COMMON ENGINE OF MILITARY
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ABSTRACT

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Information Age technologies have dramatically changed the way the military fights and the way the nation achieves economic strength. This transition from an industrial age to an information age along with the end of the cold war has far-reaching implications for National Security Policy. This study explores the relationship between the military and the economic elements of power as they relate to information age technologies. This paper suggests a changing paradigm in the relationship between military and economic power and explores possible changes in the formulation of National Security Policy as it relates to both; particularly in the mutual benefits gained from information age technology.

Recently, our national leaders proclaimed that the United States and the world were entering into a new world order. This new world order, which began with the collapse of communism, may become overshadowed by the world's rapid entry into the Information Age. The decisive victory in the Gulf War and the startling near collapse of the American stock market due to computer generated trading are just two examples on opposite ends of the spectrum (military and economic) of the far reaching impact and potential of information age technologies.

Information age technology has such a high degree of impact on national power, specifically on the economic and military elements of national power, that it requires special emphasis in the United States National Security Policy. The purpose of this paper is to explore the interrelationship between military and economic uses of information age technologies, and then review current programs, policy and cooperation to maximize and develop information technologies. Recommendations are provided for possible changes in National Security Strategy in the area of information technology.

Winn Schwartau points out in his book Information Warfare: Chaos on the Electronic Superhighway that "there is a tendency to think in either military or economic terms, therefore not recognizing the synergy of the two."¹ Schwartau was dealing strictly with information warfare, a subject this paper will touch on lightly, but is one of the most important national security issues related to the information age. However, it is this very synergy that may enable the United States to ensure its economy and military are the beneficiaries of all that the Information Age has to offer.

Never before in history did a technological change so affect the military and economy as a whole. As civilizations passed through the various stages neatly described by the futurists Alvin and Heide Toffler as the agrarian age (first wave), industrial age (second wave) and now the information age (third wave), technological advancements have

generally had military uses and economic uses loosely related.² This relationship changed to the degree that it prompted the Tofflers to state unequivocally that "the way we make war reflects the way we make wealth...."³ As we entered the information age, technological development for military and economic use generally moved along separate tracks with the military usually in the lead. The Gulf War and the end of the cold war may have signaled a change in the military approach to developing new technologies.

The Gulf War was heralded as the first information war. The world watched in awe as pictures of ships launching tomahawk missiles and bird's-eye views from the nose of precision guided weapons destroying bridges, bunkers and radar sites were shown on CNN. The victory convinced most observers that the American military had taken advantage of the most modern information age technologies. Much of the credit was attributed to the massive funding by the Reagan administration. In fact, the forces were the most modern and advanced in the world, but not as modern as they potentially could have been.

Many of the weapons systems which performed so magnificently during the Gulf War were designed and built with twenty year old technologies.

"Many of the most critical information systems used to distribute target and battle information during the war did not exist on the day Iraq invaded Kuwait. Instead, they were improvised, on the spot, by technicians who, upon discovering that communications and computer equipment would be late in arriving and lacked range, capacity and connectivity to meet operational needs, contrived networks by unorthodox use of agglomerations from military and civilian (underline added) informationware."⁴

This fact may be viewed as "good old American ingenuity", but it is just one example of two important aspects of the so-called first information war. These aspects are that the

military did not have the most modern information age means to wage this war, and in many of the technical areas such as helicopter repair, design of war games and simulations, and software design there was great reliance on civilian technicians and technologies. Considering the national resources expended prior to the Gulf War when there was a clear threat and big defense budgets, the military should have had the latest in technology based weapons systems. Part of the problem was the procurement system, but the other problem was, and will continue to be, the rapid changes in technological capability. Ultimately, the military must change how it modernizes to maximize information based technology.

The military is at a point where operational requirements and combat readiness will absorb most of the allocated funds. This will leave precious little for Research and Development (R&D) or even procurement of new equipment already feasible from information based technologies. The military and the federal government are rapidly being outpaced by commercial industries in R&D expenditures but certainly "the technology flow has reversed from the old pattern of defense innovations finding civilian application, to a new relationship with military technologies adapting to civilian breakthrough."⁵ Information age technologies are obviously important to the economy. The question is, how can this change in relationship best buttress the military and economic need for information age technologies?

"The convergence of computers and telecommunications has created a new international monetary system.....whose single days trading on the world currency markets dwarfs the total reserves of the central banks."⁶ It is beyond the scope of this paper to describe all the information age technologies that affect how we make our wealth, make products, communicate, and heal people. It is critical to understand and agree that information technologies will drive economic growth and enhance military capability. Additionally, one of the single most important engines driving this new age is

the communications web (national and world wide). The military and private industry are equally dependent on this information web. The continued growth and **protection** of this and other key knowledge based technologies are a fundamental national security issue. The past ways of doing business in developing the full potential of the country will not get us to the desired end state. This end state should be maximum use of information for economic prosperity in a secure environment. The National Security Strategy is the starting point for this very complicated and important journey to the end state. It must move beyond the past format of broad guidance and provide a specific vision for developing our full economic and military capability through the development of information technologies.

The current National Security Strategy emphasizes "enlarging the community of market democracies while deterring and containing threats to our nation, our allies and our interests."⁷ It also states that "a central goal of our national security strategy is to promote America's prosperity through efforts both at home and abroad."⁸ The economic strategy emphasizes that the government and the private sector are partners. The strategy is broad in scope and does not adequately underscore the significance of information technologies. The written National Security Strategy does not place adequate emphasis on capitalizing on technology, but it is obvious the government is attempting to capitalize on the potential of information technologies. In Fact, a separate document addresses technology strategy.

The most crucial step to changing the National Security Strategy is to accept the premise that the importance of economic development in the information age has changed and thus may take a preeminent role in national security strategy and policy.

"The end of the Cold War and the associated dramatic changes in the geopolitical environment have led many observers to conclude that much of our past thinking about United States national security interests and policies is now outmoded and that fundamental rethinking of these interests and policies is required. In particular, the notion is becoming wide spread that economic factors and concerns will play a more dominant role in defining and pursuing U.S. national security objectives."⁹

History has proven the importance of the economic element of power and that it can be used to influence foreign policy. It is simply a matter of power and influence. The United States can lead or follow. It may be the potential inherent in technology that can influence economic power as well as military power. The United States can not rest on past achievements and strategies. It must strive to capitalize on all the potential technology can offer to enhance the power of the nation.

"By and large , the United States has been a benevolent and effective maker of international rules, and one might wonder who will fill this role if the United States no longer does."¹⁰ The United States should not give up this influential position but may have to share some of the influence. "The major economic institutions--the World Bank (or International Bank for Reconstruction and Development) and the International Monetary Fund (IMF)--established at Bretton Woods, New Hampshire, to foster currency stability and global growth, find themselves on their 50th birthdays also challenged by sweeping changes."¹¹ These institutions can have a dramatic effect on the future world events by shifting economic policy to support emerging nations and/or by withholding support from aggressive nations. The market for international capital has grown due to the emerging nations demand therefore, U.S. economic policy is critical to the development of our long time friends as well as our one time enemies. The key point is that America's economic development and prosperity has world wide implications and is intimately tied to the world market. Policies can make, break or influence not only the

United States' well being, but that of the whole world. Just as military power in the past could avert conflict, economic power may now do the same.

Key to economic power are the basic components of the information age. One clear example is the United States lead in the computer software and information services. The United States has 75% of the world market demand for computers.¹² "Government policies will be critical to the information industry and these industries are particularly sensitive to the policies in the area of market access, intellectual property rights, privacy protection, data security and telecommunications."¹³ Additionally, the importance of new materials to the overall success or failure of information technologies is a related issue that National Security Policy must address.

The presence of new materials has made the usefulness of older materials and policies that support these industries questionable. It is not a simple problem. In the broad context, economic policy, as it relates to technology, can be categorized into information applications and new materials. "In the context of the new industrial revolution, competitiveness will increasingly depend upon speed of response and character or product related services."¹⁴ The military will depend on much of the same general aspects of the economic benefits of the information age. Policy must capitalize on these similarities but recognize the different requirements and structure policy accordingly.

There is a delicate balance between the government's role and the role of private enterprise. Too much government intervention can be just as harmful as too little. An integrated approach to economic and military policy, particularly in the mutual benefit gained from technology, is essential to avoid "balkanization."¹⁵ It will require "...the coordinated and synergistic use of economic instrument, on the one hand, and military instruments, on the other, in effective planning and execution of economic security, joint

efforts by the Department of Defense and the agencies principally responsible for economic policy in the government"¹⁶ to succeed.

Defining the meaning of economic security and all its inherent dimensions within national security is the starting point.¹⁷ "Still a useful framework for this purpose is to distinguish between the national security effects of economic policies and the economic effects of national security policies. The former include, for example, the rate and stability of U.S. economic growth; the latter include the potential spin-offs from dual-use technologies, as we use economic power for national security ends."¹⁸ There should be no loser between military power and economic power in the policy arena. Each can excel, particularly if the advantages gained by technology are integrated into policy at all levels.

The United States government has always recognized the importance of science and technology. Formal recognition of the importance of science and technology, along with industry's and government's roles, can be found in the Vannevar Bush report of 1945.¹⁹ This report may not be viewed as policy but, in fact, it established the framework for technology policy until the 1980s. It served the nation well, principally because the threat to national security was clear (WARSAW PACT), and the United States was a clear leader in the industrial world.²⁰ Things began to change in the 1980s. This change accelerated with the end of the cold war and rapid technological advancement.

As United States technological and industrial dominance diminished, new policies such as the 1980 Stevenson-Wydler Technology Innovation Act, the Bayh-Dole Act, the Patent Term Restoration Act, National Cooperative Research Act, the Technology Transfer Act and Executive Order 12591 focused on increasing innovation, supporting research and technology transfer.²¹ Additionally, government's direct involvement in a variety of programs such as SEMATECH, the National Information Infrastructure and over 60 cooperative research ventures under the auspices of the National Cooperative Research

Act are having a positive effect on economic and military competitiveness.²² The sheer volume of government activity in and around the issue of technology policy and some of the successes may lead one to determine that the United States is headed in the right direction. There are indicators, however that things may be moving in the same misguided direction as have other well intended government policies have gone.

Government abounds with committees, groups and meetings working on information technology development and policy. There are seventeen authorizing committees in Congress for R&D expenditures, but there is no effective process for integrating policy between committees.²³ The executive branch, through the Federal Coordination Council for Science, Engineering and Technology attempts, to focus critical technologies to guide policy. There are in excess of 90 different policy documents related to information technologies.²⁴ The military, beginning with the Joint Operational Requirements Council (JROC) at the joint level, and a host of service specific science boards and research and development facilities, attempts to harness information technologies and ensure the military (given current budget constraints) is prepared for the next century. The same sense of focus is found in the Commerce Department's actions in the economic arena. One of the most positive indicators of good policy making is the establishment of the National Science and Technology Council as a cabinet level organization. This ensures presidential level authority over implementation of technology policy.

So what are the on-coming problems that have the potential for hampering or sabotaging the country from maximizing the economic and military benefits of technology? The first of two is "It's politics stupid". Efforts like the development of synthetic fuels, Clinch River Breeder Reactor Project, supersonic transport and wool and mohair subsidies continued for years after they should have been declared dead or, in fact, not started at all,

indicate the dangers and excesses of government involvement in technology policy. We can accept this as part of the democratic system and encourage our government representatives to "bring the bacon home" to our state, but in this new global world of information and technology age competitiveness the nation could lose. Technology policy must be de-politicized as much as possible. It is too important to the future of the nation.²⁵

A strategy for technology policy can serve as an enabler to overcome the problem of politics and chart the course of technology policy in the future. The development of a strategy goes far beyond simply identifying critical technologies, programs, policies and objectives. It requires a vision for the future. Similar to military strategy, it must identify and apply ends, ways and means to this future vision. This future vision is going to be as difficult to determine as the National Security Strategy has been since the end of the cold war. The lack of a clear threat has clouded the end state of our the National Security Strategy and made this paradigm difficult to translate into force structure for the military. Similarly, the strategy for technology is clouded. The nation may be at a juncture where the fundamental paradigm for national security and thus the role of economic and military strength gained through technology must be retooled.

The National Security Strategy and the ultimate role of technology is faced with the same problem as the basic technology transfer policy. Technology transfer policy operates within three paradigms: national defense technology transfer paradigm, national competitiveness technology transfer paradigm, and global economy technology transfer paradigm. These paradigms focus on different, but interrelated areas. National defense technology transfer paradigm stresses military threats to national security, national competitiveness technology transfer paradigm focuses on declining international competitiveness and global economy technology transfer paradigm addresses the

internationalization of firms and technologies and its effect on the economy.²⁶ National Security Strategy is struggling with the primacy of military power and economic power and the related impact on internal and external security.

Military power was the priority in the National Security Strategy during the cold war. That was clearly understood and underlying policies and programs supported this priority. Science and technology policy supported this strategy with much of the technology transfer occurring from the military realm to commercial uses. Success of this policy can easily be measured through the victory achieved over the cold war enemies. However, the end of the cold war has not brought the anticipated era of peace nor a peace dividend.

The United States and other nations have been engaged around the world in more places and in more hostile and non-hostile situations than ever before. Military power remains and continues to remain, a key component of National Security Strategy. Just as the paradigm of technology transfer of military applications to commercial uses is reversing itself, the primacy of military power over economic power as the key component of national security is changing. In fact, the nation is at a point where it may be the time to focus on economic power and derive the benefits from it to ensure strong military power, thus ensuring national security. Once this fundamental and important decision is made in the strategy, application throughout all levels of policy must follow. Simply speaking it is a matter of establishing a priority or, in military terms, a main effort. This will be the most difficult policy decision. It entails risk, but not unacceptable risk. The potential benefits for the economy and military thus the nation are tremendous.

There is no question that great momentum exists in government, and certainly in the private sector, to develop information based technologies. The effort requires more focus throughout the government and, in some cases, direct interaction with the private sector, because as Winn Schartau has emphasized, "it is time to decide in policy and action that

the economy is a strategic asset and that economic concerns are issues of national strategy."²⁷ There are many excellent policies and programs within various agencies, and indeed for the first time a separate National Security Strategy for Technology Policy. It is time for a detailed review of existing programs and to develop comprehensive guidance within the written National Security Strategy. Some would argue that the National Security Strategy can not and should not address specifics. Specificity can not hurt, and in this era of dwindling resources, it may make the difference between maximum success, acceptable success or no success in economic and military security.

The National Security Strategy and Technology Strategy must establish a specific prioritized focus and determine the level of government involvement. Three potential focus areas are: security of information, cooperative efforts between government and private sector and direct involvement in enabling technologies such as the information superhighway, and national and international telecommunications systems. A specific focus will establish the ways in which the government can maximize technology for military and economic success. The policy guidance should address partnership between commercial and government research and development focusing on critical technologies. All, and many more of these issues, are addressed in both the National Security Strategy and the National Security Strategy for Science and Technology. Both are excellent documents and may serve the nation well if the primacy of the economy is well-defined and priorities are established. However, because technology in this new world is so integral to the economy and military, the engine of both, the simple existence of two separate strategy documents may impede progress. This may not seem like a potential problem and it may not be one. But, the fact that the National Security Strategy for Science and Technology is not discussed in the core curriculum at the United States Army

War College, where strategy is the focus, may be an indicator of the danger of separating these interrelated strategies.

Policy is well on its way to achieving many of the ideas outlined above. President Clinton outlined in 1995 initiatives of permanent extension of the research and experimental tax credit programs, investment in a national information infrastructure, accelerated investment in advanced manufacturing technologies, re-establishing technological leadership and competitiveness of the U.S. automobile industry, improving technology for education and training and investments in energy-efficient government buildings plus the green car.²⁸ This technology strategy outlines a clear linkage between the economy and national security, along with the significant role played by technology.

Implementation of the policy witnessed increased government involvement in research. Some of the best models are the projects sponsored by the Advanced Research Projects Agency, Advanced Technology Program, the Manufacturing Extension Partnership, the Technology Reinvestment Project and others.²⁹ These and other programs appear to focus on what may be the government's key role in technology, which is support of basic science and infrastructure.

"Clearly the most important new plank in Clinton's science policy is the presumption that government-aided applied science and joint government-industry partnership can stimulate strategic R&D."³⁰ This involves making the right choices which will meet political challenges as described above and may cause industry to become lazy.

"To remedy the wrong choices problem, the Clinton people rely on industry to decide which technologies are important, and they insist on still, expertly judged competitions to decide who finally gets government money. To remedy the Permanent Pork Barrel Problem, they call for rigorous program evaluations and time-limited grants. To remedy the Subsidies Make You Lazy problem, the demand that industry match federal subsidies risking stakeholders own money rather than letting business ride sleepily atop taxpayers."³¹

The effort to keep the programs focused is good and holds great promise for the future. To ensure success, the strategy must fix responsibility for oversight. The administration charted a course in this area that holds the answer.

This oversight was divided between the various Security Agencies including the National Security Agency, the Office of Management and Budget, the Information Task Force under Vice President Gore, Congress and others. Naturally, Congress has oversight over multiple aspects of the policy. The President needed to establish a standing committee of economists, scientists, military, doctors and businessmen to make recommendations for a comprehensive and integrated approach to technology development. The effort should ultimately be no less than was put forward in the Manhattan Project, and it should be articulated with great clarity in the a National Security Strategy that integrates all aspects of technology development.

The National Science and Technology Council began to serve this oversight function. The committee specified ways which included interagency structure, joint efforts between agencies, reorganization of R&D efforts, critical technologies lists and numerous other technology oriented policies. They began to take direct involvement in certain budgetary decisions involving technology. This type of realignment of budgetary control is most likely to meet resistance in Congress.³² This committee achieved political power when elevated to a cabinet position. It must achieve real power through almost absolute, but cross-checked, decision making authority and budgetary control. This budgetary control must begin with a strategy that specifies monetary expenditure, or in the terms of the strategist, the means. One way would be to establish a percentage of available funds dedicated for technology development. But, a more reasonable approach of demonstrating requirements to justify funding for critical technologies may be more effective.

The monetary expenditure is an essential policy starting point, because even though the U.S. spends more in total dollars for R&D than other competitors when compared by Gross National Product, the amounts are similar.³³ The United States will not reach the desired end state without applying the means of capital investment. The strategy should set goals for capital investment. This capital investment has twice the payoff when applied toward dual-use technologies. Dual-use technologies, competitive cooperation, and selected involvement of government in certain market areas should be guiding principles of the policy. The government should support private efforts in developing critical technologies but should do so prudently as previously described.

The United States is at the leading edge of a new age. Whether or not this age will develop along the lines many futurist have predicted or simply apply information age technologies to improve current manufacturing techniques and military capabilities, certainly prosperity and security will rest on knowledge based technologies. United States Security Strategy and Policy can set the course of America's future by establishing a clear end state for information technology as it relates to the economy and the military. Acceptance of the premise that the economy is now the preeminent element of national power, and that technology is the engine of both the economy and the military is essential. This focus, supported by strong oversight unencumbered by politics and guided by a single comprehensive strategy, will move the country into this new information age.

This paper attempted to provide broad ideas and recommendations on this extremely complicated subject. The reader may disagree on the ends, ways and means to maximize the future of information. However, as long as we agree that policy is needed and that it must maximize military and economic benefits offered by information technologies, then the most important point of the paper is accomplished. The paper emphasized a fundamental change in the writing of National Security Strategy which included

incorporating the technology strategy and elevating economic power as a priority. By suggesting an emphasis or priority in economic development over the military does not imply a disregard for military power. This is simply a shift in the priority to strengthen both through the power of information age technologies. It seems that as we enter into a new age that these changes are necessary to succeed in this new world order through which information freely flows and where technology is the common engine of economic and military power.

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