EXECUTIVE OFFICE OF THE PRESIDENT
PRESIDENT'S PANEL ON FORWARD ENGAGEMENT
WASHINGTON, D.C. 20502

February 26, 2003

President George W. Bush
The White House
Washington, D.C. 20502

Dear Mr. President:

We are pleased to transmit to you the, "Report on Forward Engagement and the Office of Technological and Strategic Assessment" as prepared by your Panel on Forward Engagement.

Upon your appointment of the PFE membership in January 2003, PFE began a review of the findings from the preceeding Fall 2002 Panel. As a result of our review, we formed a series of Working Groups: 1) design the proposed Office of Technological and Strategic Assessment (OTSA), 2) begin identifying 'nodes,' 3) to analyze their rates of change and potential impact, and 4) to propose recommendations which would alter their rates of change, or ultimate impact.

In brief, the report explores the concept of 'forward engagement,' the ability to look at long term trends and future events, and evaluate their potential impact. By doing this, we hope to improve the U.S. government's ability to track and react to events and trends that seem far off today, but may become current issues tomorrow. As a means institutionalizing this ability, the Panel has taken preceeding Panel's recommendation to establish OTSA within the Executive Office of the President. This Panel also explored examples of 'nodes' which OTSA would identify and analyze, to better understand the process of 'Forward Engagement.'

This Panel also investigated the possibility that OTSA can serve a secondary purpose as a model of networked government. The objective of this function is to make government more flexible and agile, thus better able to respond to 'nodes' that OTSA will identify.

Please let us know if you have any questions concerning the enclosed report.

Sincerely,

Jeremy B. Kahn
Chair

Enclosure

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THE PRESIDENT'S PANEL ON FORWARD ENGAGEMENT

Report on Forward Engagement and The Office of Technological and Strategic Assessment

Findings and Recommendations

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The President's Panel on Forward Engagement

The President's Panel on Forward Engagement (PFE) was established at the request of the President, to advise the Executive Office on Forward Engagement and recommend ways in which government can be improved through networking. The PFE was also tasked to identify intersections between thematic areas, and recommend responses to these issues.

Forward Engagement Panel Members

Jeremy Kahn, Chair
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Leonel Miranda, Derek Hoffmann, Joana Garcia, and James Juraska, Information Technology Working Group
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Executive Summary

The concept of national security in the future will expand as people and events become more interconnected through globalization and networking. The boundaries between domestic and international issues will continue to lose definition. Crises that develop halfway around the globe will impact the United States Government (USG) immediately, as reactions become nearly simultaneous. The diminished response time caused by continued globalization and networking poses a serious threat to U.S. national security. Thus it is imperative that the U.S. government transforms itself to become more flexible and agile, and begins to look ahead for potential crises approaching at varied rates of speed from beyond the horizon.

At the request of the President, a Panel was commissioned in January 2003 to look into these issues; analyze the recommendations of four preceding Panels, and building off of their recommendations, to pose its own recommendations for how the United States government should undertake the practice of *forward engagement*. Collectively these Panels and their work have become known as the 'Forward Engagement Project' (FEP).

The Spring 2003 Panel refined the previous Panels' concept of an Office of Technological and Strategic Assessment (OTSA), the body through which the U.S. government would practice *forward engagement*. It further simulated and evaluated how OTSA would define and analyze issues that intersect multiple thematic areas (or 'nodes') such as Economics, Science and Technology, Humans and Society, Security and Defense, the Environment, and Governance. In doing so the Panel identified three such nodes as examples in the areas of Information Technology, Water Scarcity, and Biotechnology. This report presents the Spring 2003 Panel's analyses and recommendations with regards to these three node examples, and the design and practice of the proposed Office of Technological and Strategic Assessment.

The Nodes

Information Technology

Information technology is identified as a node at the intersection of State Stability, Security, and Governance. Advances in information technology will influence the collective and personal security of U.S. citizens, the future of warfare, and the threat of techno-terrorism. The USG should focus on developing countermeasures to netwar, utilizing advances in information technology.

Water Scarcity

Water scarcity is identified as a node as themes such as governance, science and technology, economics, and security intersect, contributing to, and is affected by, a shortage in the water supply. The threat of water scarcity presents a growing environmental problem for populations and ecosystems that is likely to lead to new regional and global conflicts. The USG should enact policies to mitigate the threat and encourage conservation.

Biotechnology

Biotechnology is identified as a node because the individual's relationship to society will be revolutionized as man begins to manipulate evolution in ways never before conceived. These innovations will challenge spiritual and philosophical assumptions about human nature, resulting in serious social, political, security, and economic ramifications. The USG should implement policies that will enable it to absorb technological shocks and manipulate or moderate the effects of new capabilities.

The Office of Technological and Strategic Assessment

Because of the erratic nature of nodes and their development, they hold the potential to thrust an unexpected reality upon the United States and the rest of the world. Nodes warrant assessment and preparation because these developments do not exist in isolation. Therefore, the USG and its citizens will best be served by the institutionalization of *forward engagement*. OTSA is the mechanism by which *forward engagement* will be incorporated into the USG. OTSA serves two functions: 1) to identify and analyze nodes and 2) to serve as a model of networked government.

Conclusion

It is the recommendation of this Panel that the United States Government follow the networked government model of OTSA as laid out in this report. Furthermore, we recommend that the next Panel simulate the structure and function of OTSA as they work to identify and analyze nodes. After doing so, they should reflect upon their experience and reevaluate OTSA as a model of networked government and *forward engagement*.

Introduction

For the past two and a half years, the President has expressed concern over the government's ability to respond and react to events that approach from beyond the horizon, sometimes at alarming rates. Beginning in the Spring of 2001 the President convened the first of five successive Panels in the 'Forward Engagement Project.' The third of these Panels convened in the Spring of 2002, recommended the creation of an Office of Technological and Strategic Assessment, as a means of institutionalizing the practice of *forward engagement* and long-term forecasting within the government. This is essential because consideration should be given to future issues as current national security policies are developed. OTSA will provide early analysis of issues and recommend actionable policies to insure the protection of U.S. interests and national security.

The fourth Panel, convened in Fall 2002, further developed OTSA as a means of *forward engagement*. The Panel arrived at an important conclusion. The overlaps of traditional themes and categories are characteristic of many of the potential threats to U.S. national security in the future and may be an important phenomenon to explore itself. To understand how society and the environment will be affected in the future, it is necessary to explore how the different categories intersect, are impacted by, and contribute to potential national security threats. This revelation led the fourth Panel to explore the possibility of utilizing "nodes" in the function of OTSA. Nodes would be where categories and implications overlap. Thus the structure of OTSA, utilizing experts from all fields, would reflect this phenomenon. Nodes themselves would be the structure by which individuals would be convened to perform the analysis and offer recommendations.

The fifth Panel was assembled in January 2003 to assess the findings and developments of the preceding Panels in addressing the need to institutionalize *forward engagement* in the executive branch, and to identify areas of critical interest to the long-term security of the United States. The Panel was composed of experts in the fields of administration, economics, science and technology, governance, and defense. It was determined that Node Working Groups (NWGs) formed around an administrative core, based on a four-part construct developed by an earlier Panel, would be the functional structure of OTSA. This allows for NWGs to be formed as nodes are identified, and dissolved as the assessments are completed. It also utilizes and incorporates the synergies that occur between the experts and directors, as well as between the

experts themselves. This structure will be conducive to identifying areas of critical interest that warrant analysis. The 'network' will consist of experts from government, academia, the non-profit sector, and private industry organized by a core of OTSA directors. Together they will identify new trends, threats and phenomena with the potential to threaten the stability or security of the United States. Not only can OTSA explore multi-thematic implications, but the array of experts may also recognize potential threats from events or developments that may not be part of the traditional framework within security analysis.

The process described above is the course by which this Panel selected issues to analyze as NWGs. Each expert brought their own findings or assessments (within their respective fields) to the Panel and discussed possible multi-thematic events and trends that may impact U.S. security in the future. This Panel of experts decided to explore three nodes with incredible potential to effect national security and thus warrants the attention of policy makers. The Panel decided upon Water Scarcity, Biotechnology, and Information Technology as critical intersections with the ability to alter the state of life within and outside the United States.

The three issues share similar characteristics in their potential dynamics that distinguish them from traditional security threats and demonstrate the value of using a node model for analysis. Each issue could produce effects or changes across themes that will in turn have even further implications in other themes. In essence, they will have a 'ripple effect.' By their nature, they cannot be effectively analyzed in isolation. Furthermore, the rates of change of these events and their implications are not necessarily linear. The rates of change of these events and their effects may vary. There are four possible rates of change: linear, exponential, stepped, and disjointed. Their impacts have the potential to overwhelm the state or society because of their velocity or scale.

It is critical for OTSA to identify and address nodes because they have the potential to surprise the state or society, despite their current 'long-term' status. By their nature they have the ability to cause great change to the environment, society, or governance. It is necessary to take preventative measures where appropriate to adjust and enable the USG to protect its interests. This is a long-term and continuous process in itself. This is why the USG needs an institutionalized body to practice *forward engagement*.

It is suspected that enthusiasm for a *forward engagement* mechanism in the executive branch may not be forthcoming. The departments and offices of the USG may not immediately

embrace structural or functional changes that may be necessary to address long-term threats. Early identification and *forward engagement* is in the interest of the each of the individual components of the government and the Executive Branch. After OTSA defines and evaluates a node, the issue is assigned to the existing departments and offices through the National Security Council's interagency process for action. Their participation grants them the opportunity to frame these issues, insuring that the work and contributions of the department will be utilized. Long-term assessment will allow Congress and the departments to invest resources and make the appropriate allocations to address approaching events thereby avoiding potential budgetary crises.

The previous Panels concluded that the government must become more flexible to respond to future developments and their rates of change. The need for government to become more flexible is also magnified by the nature of a networked world, which can serve to affect the rates of change and the magnitudes of developments. Networks create new linkages that may enhance or threaten the state's ability to govern and protect its citizenry. A more flexible government will allow for a more rapid and effective response to these threats, increasing the security of the state. For these reasons, this Panel expanded upon the duality of purpose of OTSA that has emerged in the previous reports. OTSA should serve as a model of how the government may reorganize itself to maximize its awareness, response capability, and security while executing its primary function of *forward engagement* in the Executive Branch.

This report first investigates and explores the nodes of Information Technology, Water Security, and Biotechnology. Each section demonstrates the multi-thematic nature of the node, and explores the far-reaching implications it may have. Each section concludes with policy recommendations the USG should take to protect U.S. national security.

The final section of the report outlines the structure and purpose of OTSA. This includes a mission statement, a detailed recommendation for the structure of the office, the personnel who will comprise it, and how and where it will operate. OTSA as designed will serve as both a mechanism of *forward engagement* and a model of networked government. The following sections demonstrate *forward engagement*.

Information Technology Node Report

Introduction

The node of information technology will have a major impact on long range United States security because of how it intersects with state stability, security and governance. New forms of information technology will be at the heart of future governmental security policy. The efforts of the international community to deal with the implications of this could transform the character of individual states and in turn, the entire international system. In an increasingly networked world potential pressures on the state may include: major demographic shifts, strains on natural resources, the increasing power of multinational corporations, and the increasing influence of international organizations and NGO's in society. In the future, the state's vulnerabilities will continuously be exposed. However, we believe that the state will continue to be the most competent structure in responding to these challenges because of its vast resources and its legitimate monopoly on the use of force. International and domestic events that affect the United States government and its ability to govern will occur at varying rates of speed requiring it to shift priorities and act accordingly to prevent or mitigate impending threats. The government must respond equally well to advances, as well as to threats, if it is to remain viable. Therefore, the state must become more agile and malleable in order to confront new challenges infringing upon its authority to protect its citizens.

Building on the work of our predecessors, we have considered how advances in information technology will impact the efforts of the United States government to carry out its most important duty, that of maintaining security for its citizens. First, we will consider some of the overall effects of information technology. Then we will examine its impact on warfare, and finally its implications for future terrorist threats. This is not an exhaustive list as there are many other areas worthy of investigation, but we have limited this set for analytical purposes. Our purpose at present is not to determine how the state and its citizens will react to such pressures but, rather, to create a jumping point for future OTSA NWGs to consider this problem in-depth and across a broader range of issues. The paper concludes with some policy recommendations for dealing with some of the issues that may arise.

Security vs. Privacy

It is quite probable that in the 21st Century, new information and communication technologies will contribute to the strengthening of the State at the expense of individual

liberties. While this scenario may appear extreme, it is certain that these new technologies will be at the heart of the future debate concerning the State's role in providing security for its citizens. The information age continues to evolve, creating an increasingly open and interconnected society. Yet, as 9/11 has clearly demonstrated, unforeseen events can have profound effects on the dynamics between an open government and a secure nation. The inherent conflicts between security and privacy will continue to be a contentious aspect of governmental policy and will have profound implications both domestically and internationally

On the domestic level, the ease and speed of information sharing and real-time communication will continue to pose problems for a government seeking to ensure its own survival. While new technologies continue to fuel this information revolution, they are simultaneously breaking down individual privacy barriers. A more open society that is increasingly interconnected lends itself more easily to State monitoring and surveillance. A type of Orwellian political state is not entirely unfathomable considering the justifications for such measures based on state security. Imagining such a future is not difficult considering certain technologies and programs already in existence.

In the wake of the 9/11 terrorist attacks, the US government proposed the use of existing information technologies, in the interest of national security, with broad implications for individual liberties. The most prominent of these is a Pentagon-sponsored, data-mining program known as TIA (Total Information Awareness). Essentially, TIA would link databases of credit card companies, banks, health insurers, motor vehicle departments, travel agencies, Internet sites, etc. in an effort to counter possible asymmetric threats to US national security. In addition, an FBI diagnostic tool known as Carnivore has been used for several years to monitor various types of internet communications. These examples could merely be first steps by a vulnerable State to protect itself from internal and external threats. Other technology prototypes currently being researched for use by the government include: information collaboration and sharing across agency boundaries via internet based TCP/IP networks; biometric signatures of humans (retinal scans, fingerprints); real-time learning, pattern matching and anomalous pattern detection; human network analysis and behavior model building engines, event prediction and capability development model building engines, and biologically-inspired algorithms for agent control.

Other State uses of technologies may include the following: Monitoring of all types of communication (phone, fax, internet, email, etc.) via digitalized programs similar to the FBI's

Carnivore program; wireless video surveillance in private homes; microchips embedded into citizens that include all personal identification information (including DNA details) and GPS to monitor individual activities. These possible State actions will be justified in the name of national security to protect the freedoms enjoyed by US citizens. Without use of these aforementioned technologies, it is doubtful that the State would have the capacity to play such a powerful role in the lives of its citizens. Yet by employing these new technologies, the State will have the capacity to become even stronger and more forceful.

These possible sacrifices of individual freedoms could be somewhat offset by the prospect of 'online voting', which would enable the citizen to participate more easily and often in domestic political structures. Referendums and other voting measures could be conducted online in a private household at the click of a button, possibly providing necessary checks on the increasing power of the State. Finding this balance may prove increasingly difficult. Instantaneous voting does not mean that voters will be better informed about the issues on which they are voting. Therefore, an increased facility to vote does not necessarily result in better governance.

The implications are also becoming apparent on the international level. The Internet and other forms of media, such as satellite television, have already demonstrated the manner in which real-time footage can serve as a call to arms for various international lobby and special interest groups. New technology will facilitate not only further instant communication and information sharing, but also the ability to organize and respond more rapidly.

Net Centric Warfare

Advances in information technology will also change warfare leading to the rise of a new mode of conflict known as 'net centric' warfare. Net centric warfare changes the power structure on the battlefield from a hierarchical structure, to a flatter, network structure. The two important technological advances inherent in net centric warfare are information sharing and real time communications. The effects of these advances will become visible as a reduction in casualties, and the increased ability for commanders to monitor all aspects of their forces in real time. Net centric weapons provide new possibilities in traditional warfare and the United States government is actively pursuing the development of this technology. In fact, the U.S. has already used these techniques in Afghanistan. Probably the most dramatic instance of net centric

warfare was the use of an armed Predator unmanned aerial vehicle (UAV) to attack and destroy a car carrying terrorists in Yemen.

The advances inherent in net centric warfare create important implications for governance both domestically and internationally. Domestically, they present potential threats to democratic principles like accountability, transparency and perhaps even the rule of law. Through real time information and decision-making, net centric warfare allows power and decision-making to be controlled by a small, centralized group of individuals. These technologies could shift the balance of power within government to increasingly favor the executive branch, as the instantaneous ability to respond to threats militarily would allow it to act independently of the legislative branch, weakening the system of checks and balances. Net centric technologies could also facilitate an overzealous military leader or group to usurp control of the United States government.

Net centric warfare may also create new security threats for the United States internationally. Advances in net centric warfare could affect power relations between countries. For example, small wealthy countries, traditionally non-militaristic due to the lack of human resources, could use the benefits of net centric warfare to advance their interests. Likewise, terrorist groups could obtain net centric warfare technologies. The result would be an increasingly violent world—as humans become more detached from the physical act of war through advanced technologies. It is possible that the number of military encounters will increase. Thus, technological advances, while making traditional military battles more accurate, could raise the overall level of conflict and increase the amount of conflict in the world. As these technologies proliferate, the United States government must consider what states and groups could obtain them and how their use could threaten national security.

One final area in which new net centric warfare technology could hold important implications is space. Today, the United States has the advantage in space. Currently, the government is developing the National Missile Defense, a missile shield, and Warfighter I, a camera with hyperspectral imaging capabilities. As future technologies develop, space could become weaponized. The weaponization of space has numerous implications for states and individuals.

Techno-terrorism

Information technology will contribute to the continuing evolution of techno-terrorism, in terms of the weapons that terrorists have at their disposal and their organizational structure. A major challenge of the USG will be to anticipate the nature of techno-terrorism and develop policies to combat this continuing threat to national security.

As technologies improve, terrorists will become capable of attacking an increasing variety of targets. Space based assets, which the United States is becoming increasingly dependant on, is prime target for terrorists and other opponents. The capability of such groups to "hack" into strategic and tactical space-based military and civilian assets would enable a small group of individuals to cause tremendous chaos. On the ground, disrupting financial networks could create turmoil that would ripple throughout the world, similar to when the Russian ruble collapsed, setting off a chain of events that led to the Asian financial crash in the 1990's.

The United States must be prepared to identify areas from which major terrorist threats will emerge. The decline in social revolutionary terror has been offset by the rise in religious fundamentalist terror. Will this trend continue? The USG must delve deeper into not only the immediate sources of terrorism, but it needs to identify and analyze the roots of discontent.

The nation-state must prepare not only for international terrorism, but it must be mindful of domestic terrorism as well. An increase in the government's use of technology and the ensuing debate over security vs. privacy could cause the development of more anti-government terrorist groups within the United States. A backlash of discontent could have major ramifications upon governance and could lead to issues over the USG's use of force against U.S. citizens. Concerns over an increasingly independent and powerful military structure could prompt fears of martial law and a breakdown of the civil government's power should any domestic terrorist movement become too strong.

Information technology will enhance terrorists' ability to communicate via channels beyond government surveillance, and will make it increasingly easy for them to carry out attacks using the organization, tactics and strategy of "netwar." This has already become evident in Al-Qaeda's operations. Netwar can include the use of new technologies utilized in "net centric warfare" such as unmanned predator drones, but the idea of netwar encompasses not just new capabilities to organize and carry out attacks, but also a revolution in how war is conceptualized, and executed.

Netwar involves actors who are networked via cells that share a common purpose, but are linked horizontally, not hierarchically. No one cell is necessarily any more powerful than the other, and each can operate autonomously. Offense has the advantage in netwar, because it can stage stealth attacks against an enemy using "swarming tactics," then retreat and hide until a future attack. Attackers who are networked are more nimble and it is easier for them to organize an attack than it is for old and cumbersome bureaucracies like the USG to mount an effective defense.

As seen in their organization and tactics, the strategy used by terrorists capitalizing on netwar is more diffuse. Attacks are "epistemological." They are not connected to a specific demand, but their purpose is vague, causing victims to become confused about their societies and governments, and powerless to confront threats. Paralleling this strategic vagueness is the nature of netwar. It is hard to define—there is no clear beginning or end, defeat or victory. It can be difficult to tell whether attacks are offensive or defensive in nature.[1]

Conclusion

Advances in information technology will challenge our traditional notions of democracy; change the face of warfare and in some ways increase the United States' susceptibility to new forms of terrorism. Information technology is making it easier for the State to control various aspects of monitoring its citizens and fighting war, while simultaneously making the state more vulnerable to new threats. However, the United States can also utilize such advances to more effectively address these threats. Democracies have always exhibited a tension between freedom and security, and the current climate of international affairs magnifies this to an unprecedented degree. The United States will not be able to confront the threats mentioned above without a major reorganization that allows it to capitalize on the latest technological advances while preserving constitutional liberties. This reorganization would be a monumental effort, but the establishment of OTSA is surely an important first step in this direction.

Recommendations

- Institute legislation that reorients the major mission of US military forces from fighting conventional wars to confronting netwar. Ensure that US forces have the latest developments in information technology at their disposal.

[1] John Arquilla and David Ronfeldt, Networks and Netwars: The Future of Terror, Crime, and Militancy.

- Ensure that the USG includes resources devoted to developing countermeasures to netwar, but also to studying the broader societal and security impacts of info technology advances.[2]
- Ensure that the Fourth Amendment is upheld and the system of checks and balances is maintained

[2] Ibid.

Water Scarcity Node Report

Introduction

As a commodity, a finite natural resource and a perceived entitlement, water is essential to human well-being. The threat of water scarcity is well defined and presents a growing environmental problem for populations and ecosystems that is likely to lead to new regional and global conflicts. Consequently, the threat of water scarcity is an issue that should be central to any *forward engagement* governmental agency, such as OTSA. For this analysis, a background on the freshwater crisis and its implications will be examined, followed by several short- and long-range policy options intended to mitigate the impact of this threat. Here, water is a node because several issue areas, such as governance, science and technology, economics, and security intersect and thus all contribute to and are affected by a shortage in the water supply.

Background

"While 70 percent of the earth's surface is water, only three percent of it is fresh water – and almost all of that three percent is inaccessible for human use."[3] Nearly three-quarters of all fresh water is contained in ice caps and glaciers, and only "0.01 percent of the world's total supply of water is considered available for human use on a regular basis."[4] In a theoretical sense, the planet contains enough fresh water to sustain roughly 20 billion people, but only a small amount of that is accessible on an annual basis. Moreover, the fresh water supply is not distributed evenly around the globe, nor does it lie in the most heavily populated regions. In fact, about 75 percent of global annual rainfall reaches areas with less than one-third of the world's population. The scarcity of water is already a serious problem for many regions and as global populations continue to grow exponentially and consume water at increasingly exponential rates, acute water scarcity crises can be foreseen to develop in twenty-five years, if not before.

One such crisis includes the possibility that if inhabitants living in water deficit countries believe they are not getting enough water, they could decide to go to war over water resources. The Aral Sea Basin is an example of a region with keen competition over a limited supply of water. Turkmenistan, Uzbekistan, Kazakhstan, Kyrgystan and Tajikistan all depend on water

[3] Don Hinrichsen and Henrylito Tacio, The Coming Freshwater Crisis is Already Here, Woodrow Wilson International Center for Scholars (2002) 2.
[4] Ibid.

from the Amu Darya and Syr Darya Rivers; their dependence on, and demand for, fresh water have caused several land, irrigation and draining disputes that continue to fester. Moreover, as a result of diverting water to feed intensive crops, the rivers have receded in recent years and no longer reach the Aral Sea. For these countries, water scarcity remains a serious threat to their economies, their infrastructures, and their overall peace and stability.

More severe than the Aral Sea Basin are the prospects for water in the twenty countries of the Near East and North Africa. In fact, the entire region essentially ran out of water in 1972. "Since then, the region has withdrawn more water from its rivers and aquifers every year than is being replenished."[5] In particular, Saudi Arabia faces one of the worst cases of unsustainable water use in the world. This arid country currently must mine fossil groundwater for three-quarters of its water needs. In addition, Saudi Arabia and three other Gulf States – Bahrain, Kuwait and the United Arab Emirates – have so little fresh water available that they resort to desalinization, the costly conversion of seawater into fresh water. "Without desalinization, the Gulf States would be unable to support anywhere close to their current populations. Desalinization, however, is far too expensive and impractical for most water-short countries, not to mention land-locked countries, either today or in the foreseeable future."[6]

Both rapid population growth and increasing per capita consumption of water have, over the recent past, strained water resources and created shortages in China, India and Africa, as well as the Persian Gulf region. With the population growing at an average rate of 78 million per year as of 2000, the demand for fresh water in these regions has increased while supply has steadily decreased. "By 2025, the number of countries with water stress or scarcity will rise to 54, and their populations to 4 billion people – 40 percent of the projected global population of 9.4 billion."[7] The combination of increased population and increased demand for water – without concomitant increases in water supply – has the potential to create intrastate and interstate conflicts that would undermine regional peace and security, and that may pose a direct threat to US interests.

It is not inconceivable that, along with the increased danger of conventional war over water, terrorist attacks against another nation's water supply could take place. Terrorists who simply aim to inflict harm on a population for political and ideological reasons can do so by

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[5] Ibid, 8.
[6] Ibid.
[7] Ibid, 7.

adding harmful chemical and biological agents to the water supply. This has the potential to affect thousands if not millions of people who might not show signs of immediate sickness, thereby allowing greater contamination to occur without the knowledge of federal or local authorities. Thus, unlike a dirty bomb, which yields casualties noticeably and quickly, contaminants in the water supply can slowly produce a large number of deaths depending on the water supply itself – well water, reservoir water – and bring greater fear because the threat is virtually undetectable.

Water deficit countries will need to obtain water from the water rich countries either through aid or by buying it. This could result in the water rich countries being depended on in the 21st century as the oil rich countries were depended on in the 20th century. Some of the countries that need water the most are rich in oil, and therefore have the resources to buy it, or buy access to it. Although it is a costly alternative, they could develop desalinization technology to treat water that they have access to. The problem will come in 50 years when many of these countries' oil supplies have been nearly exhausted. Unless they manage to diversify their economies soon, not only will those economies will collapse when the oil runs dry but those countries will suffer huge deficits in available water. In addition, many poor countries are also often in need of fresh water. Sub-Saharan African countries, for example, have neither water nor money, or have no water and large amounts of money from natural resources, but the government misspends the money. What this means is that water deficit countries, without the means to pay for the water, will grow more and more dependent on and more resentful of the water rich countries.

As water scarcity becomes more severe, efficient use of hydropower to provide electricity will decrease. Several sub-Saharan African countries, including Kenya, Tanzania, and Mozambique, have already experienced difficulty relying solely on hydropower as their dams can only operate efficiently during the rainy season[8]. Even Norway, which is 99% reliant on hydroelectricity,[9] is finding that it must import electricity from other countries during dry seasons. During dry spells, these countries also have to rely on oil or coal-fired electricity, which is highly inefficient and not environmentally friendly. In fifty years, with a significant

[8] U.S. Department of Energy's Energy Information Administration http://www.eia.doe.gov/emeu/cabs/content.html.
[9] Ibid.

decrease in oil, natural gas, and water supply, many areas could once again face the challenges of development, as they remain unable to maintain access to vital natural resources.

Also, as countries anticipate these problems, many could decide to turn to nuclear power to meet their energy needs. Countries predicted to be in dire need of conserving water and finding alternatives to energy production are those such as Iraq, Iran and North Korea. Their attempt to begin and maintain nuclear power programs, however, has the potential to create global instability, as they are all viewed as rogue states. In addition, other nations may find that nuclear power is an inefficient means of energy production. Due to the enormous costs of developing a nuclear energy program, most lesser-developed countries (LDCs) will find it beyond their reach. Such societies may be forced into deeper poverty due to a lack of water resources if they are unable to gain sufficient means of energy through nuclear power or hydropower sources. Even developed nations that already have the capacity to generate nuclear energy are finding that it is a poor alternative. For example, British Energy, the only nuclear energy generator in the United Kingdom, is currently receiving hundreds of millions of dollars in government subsidies due to high operating costs and low wholesale energy prices. In addition, the Italian public has pressured its government into shutting down all four of the nation's nuclear power stations due to environmental and security concerns. Moreover, Spain has frozen its capacity to generate nuclear energy, and may phase it out completely as old facilities age (the life span of a nuclear generator is approximately 30 years) and no new ones are built because of high costs and lack of government incentives.

A shortage of water has the potential to significantly impact demographics and the movement of people within and across state lines. Gradually, we can expect that people will immigrate to countries with a higher abundance of water resources. This can happen either slowly or quickly depending on periods of drought and famine. We can also expect people to move from the countryside to the cities, as a lack of water will make farming more and more difficult. This urbanization trend will contribute to the decrease in water supplies of cities as well as continue to tax the cleanliness of these cities' water supplies.

It is also possible to imagine that nations rich in water would strive to limit immigration from water-scarce countries, in order to protect their water supply. This scenario is reminiscent of recent efforts by European nations, even those that were once tolerant of and encouraged immigration from LDCs, to take more severe measures to stem the tide of immigrants flowing

into their countries. Instead of using the excuse that they are trying to maintain economic solvency and cultural purity, they could maintain that they were merely protecting their water resources for current citizens. In fact citizens, instead of accusing immigrants of stealing jobs, could accuse them of draining the nation's water resources.

It is important to underscore that the United States is not immune to the effects of water scarcity within its borders. Although the United States has abundant renewable water resources that average almost 10,000 cubic meters per person per year, groundwater reserves are being depleted in many areas. In particular, "the huge Ogallala aquifer, which underlies parts of six states and irrigates 6 million hectares, has been overexploited and in some regions, half of its available water has been withdrawn."[10] Moreover, the fresh water supply in the United States is shrinking due to pollution from municipal sewage, toxic industrial effluents, and harmful chemicals, primarily from agricultural activities.[11]

Aside from the impact on human populations, Water scarcity creates problems for the aquatic ecosystems that depend on water to survive. "Of the world's 734 species of endangered fish in 1996, 84 percent are found in freshwater environments."[12] In Africa, Lake Chad has shrunk in size by 75 percent in the last three decades because of massive diversions of water for irrigation. The lake's fisheries have collapsed entirely. Closer to home, "California has lost over 90 percent of its wetlands, and nearly two-thirds of the state's native fish are extinct, threatened, or in decline."[13] Healthy ecosystems are vital to regulating water quality and quantity. They help conserve and filter human drinking water and thus are instrumental in our well-being and security.

As shown, the demand for water cannot be isolated from associated social, political and economic issues. Reducing the risk of water conflicts involves tackling a number of issues simultaneously. While effective simultaneous action may be difficult in dealing with such a global issue, water scarcity needs to become an issue that governments and non-governmental organizations give importance to as this problem intersects and affects so many other crucial issues to society, including health, economy and security.

Recommendations (Short and Long Term)

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[10] Rita P. Pearson, "Managing Water Scarcity Southwestern Style," USIS Global Issues (March 1999) -- http://usinfo.state.gov/journals/itgic/0399/ijge/gj-06.htm
[11] Don Hinrichsen and Henrylito Tacio, 16-17.
[12] Ibid, 14.
[13] Ibid.

- **First**, governments should cooperate with the private sector to build advanced computer models that can handle the complexity of global weather patterns. Advances in computer modeling will be of crucial assistance to our understanding of this issue. As computers become increasingly complex and their ability to process and to create models for large amounts of data increases, it should be possible to input all environmental data on water issues such as flow, evaporation, rain, etc, into the computer and to be able to extrapolate with some success where in a given season water will be most scarce and where it will be most in abundance. This could help policymakers in individual countries and in global organizations such as the UN to better plan how to meet the water needs of specific regions before this problem becomes an emergency.
- **Second**, governments in coordination with scientists in the private sector should investigate how genetic manipulation could be used to control how much water plants need in order to grow. Genetically engineered crops could be designed to grow in even arid areas with much less water, furthering conservation efforts. Also, since nanotechnology holds such potential to efficiently clean up contaminated and unusable water resources, governments should be developing these machines or encouraging the private sector to do so. It is possible that these micro-machines may be able to clean up polluted water at the molecular level leaving it clean to use.
- **Third,** both governments and NGOs should implement an intensive long-term information campaign on the dangers of water scarcity. To change the way people use (and abuse) their water resources, governments at all levels (federal, state and local) must make the public aware of the scarcity issue. Simply asking the public to conserve water is not enough. People must be given information explaining why conservation is necessary. Just as there are television advertisements discouraging people from smoking, drinking, and doing drugs, there must be ads that discourage the wasting of water resources, especially in developed countries. Specific ads could show computer-generated models of what California or other water-scarce states would look like in 50 years if action were not taken now. The ads could also demonstrate simple conservation techniques, such as taking showers instead of baths; installing water-efficient shower heads; placing a small, plastic object such as a child's sand bucket, into the toilet tank to "fool" it into using less water; turning off the water while brushing one's teeth; using water-efficient sprinkler systems for watering lawns, and not

watering them at all during rainy weeks. Not only will the ads convey the severity of the issue, they will help make people feel involved in the solution.

Apart from the developed world, educating the public in the developing world will be a hands-on challenge. Peace Corps volunteers and international NGOs that are concerned about the environment could teach conservation techniques. Whenever possible, foreign aid should be provided to help LDCs pay for water conservation technology, especially in the agricultural sector. Otherwise, the world runs the risk of increased water salinization, desertification, and an altogether worsening of environmental conditions.[14]

- **Fourth,** with respect to the developed world, general education about the imminent water crisis may not suffice to convince the entire public that water is a finite resource that must not be abused. For such individuals (and possibly industries), only water regulation will effectively promote conservation, especially if overuse will affect their wallets. At first, outright water rationing may be too extreme. Instead, governments can set limits on water usage per month (i.e. a certain number of gallons per person, depending on age), with users fined if they exceed the limit. Many houses and apartment buildings already have meters that monitor water usage so that residents can be billed monthly; these meters could serve the additional purpose of alerting the regulating body when limits have been exceeded. This revenue could be used to cover costs of addressing water scarcity.

- **Fifth,** governments in countries rich in water resources should develop plans of how to move large amounts of water within short notice to drought areas in an effort to mitigate a drought's social, health and political consequences.

- **Sixth,** population control may be the most effective way to decrease the strain on water resources. It is often the case that overpopulated nations (i.e., nations that lack sufficient amounts of natural resources to sustain their populations) suffer the most from water scarcity. The United Nations Population Fund (UNFPA) estimates that by 2050, the world's population will increase to 9.1 billion, with 88 percent located in less developed countries. This means that areas of the world that already have trouble sustaining their populations will find it even more difficult to spread scarce resources equitably and effectively. By

[14]UNFPA website, accessed February 17, 2003. http://www.unfpa.org/population/poverty.htm.

promoting smaller, healthier families in these countries, the UNFPA hopes to relieve environmental strain.

The U.S. government should pay special attention to UNFPA's program, including the Millennium Declaration by the United Nations, which hopes to halve the number of people without access to safe drinking water from its 1990 level by 2015. This program is worthy of increased funding, not only from the U.S. but also from all nations that are concerned about the future of the world's water resources.

Conclusion

Water must be regarded as a finite resource with enormous economic, political and social value. A comprehensive water management strategy must be developed and implemented, with close attention paid to developing useful technologies and greatly increasing the public's education on the dangers of water scarcity, while giving other actors such as non-governmental environmental organizations a larger role in the water management system. In this way, the demand for water can be curbed and the efficient use of available supplies enhanced. With a "Blue Revolution," the security threat posed by water scarcity will decrease, and needy populations will have better access to a resource essential to life.[15]

[15] Don Hinrichsen and Henrylito Tacio, 19.

Biotechnology Node Report

Biotechnology is a node because it will change the relationship between individuals and society. Innovations in biotechnology will give humans the means to modify themselves in drastic and unforeseen ways. These innovations will challenge spiritual and philosophical assumptions about human nature, carrying serious social, political, security, and economic ramifications.

Introduction

The more we uncover about nature, about the environment, and about our own biological makeup, the more we can manipulate nature to enhance our lives through technology. As this technology advances however, we can use it to alter the very nature we sought to discover. As man begins to manipulate nature in ways never before conceived, the individual's relationship to society will be revolutionized. Societal organization has historically relied on constraints originating from forces outside of man's control, such as perceptions of human nature or belief in the divine. Biotechnology will put man in control of his own nature eliminating these traditional asymptotes guiding socio-political evolution.

This Panel will assess advances in Biotechnology and Biomechanics and recommend policies that will enable the USG to absorb technological shocks and manipulate or moderate the effects of new capabilities. These findings should help serve as a guide to be amended and expounded upon by future presidential Panels and OTSA.

Biotechnology

Biotechnology is the emerging field in which humans use technology to alter the make up of their own biology. This can be done either in isolation from evolution or through genetics, which encodes the change for future generations. These technologies include neuropharmacology, genetic engineering and cloning, and biomechanics.

Neuropharmacology

Neuropharmacology, mentioned by the previous Panel only briefly, involves "knowledge of brain chemistry and the ability to manipulate it [as] a source of behavioral control."[16] Neurotransmitters in the brain control the firing of nerve synapses to "affect the subjective feelings of wellbeing, self-esteem, etc."[17] Psychotropic drugs modify the level of neurotransmitters in the brain, in order to correct an abnormal imbalance causing emotional or psychological irregularities. The subjective nature of the effects of these drugs makes them very difficult to administer on an empirical or scientific basis. Use of psychotropic drugs to merely enhance the norm rather than cure a disease or illness will have many political, social and physical ramifications.

Primarily, these expensive psychotropic drugs may further the disparity between the rich and educated and the poor, first domestically and eventually internationally. Students who benefit from all the perks of the upper-middle class will also have access to perhaps concentration-enhancing or intelligence-enhancing drugs without the medical need for them. This will further reinforce cleavages between the accelerating students and those students who must overcome the hurdles of poverty as well as educational challenges.

Secondly, the biological ramifications of psychotropic drugs cannot be entirely discerned. It may be that the drugs may control behavior in one area such as discipline or sensitivity, but may dull the senses in other areas such as creativity or innovation. These traits are subjective, and while significant improvements in one area may be noticeable, a gradual decay in another may become apparent only in advanced stages. Finally, widespread use of behavior-control drugs may lead to a social control that is undesirable. A drugged populace that will acquiesce to authority, bypassing individual whims that stimulate revolutions, may be undesirable in the grand scheme of social progress.

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[16] Francis Fukuyama, Our Posthuman Future. 42-43
[17] ibid. 42-43

Recommendations

- Given the aforementioned repercussions, the use of neuropharmacology to treat mental disorders should be strictly regulated to avoid widespread social misuse.
- A Panel of qualified psychiatrists and neuroscientists should identify a threshold above which a clinical diagnosis of mental disorders can be treated with drugs. This Panel may be similar in mission and makeup to the President's Council on Bioethics created by Executive Order on November 28, 2001.

Senescence (Human Aging)

Another goal of biological manipulation is to prolong life. Through stem-cell research, immunological advances, and nanotechnology, the already increasing life span of humans may become even longer. This trend seems to point towards an 'aging crisis' involving social security deficits and increasing socio-economic costs, which Francis Fukuyama describes as the "national nursing home scenario."[18] While bettering life expectancy has always been a goal of mankind, doing so will create additional concerns that must be addressed. Significantly increasing the average life span will affect nearly everything relating to human interaction and production. It will: change the demographics in the workforce and unemployment rates as fewer people seek early retirement, strain social security as more people need it for longer periods of time, further strain a finite number of essential natural resources such as water, greatly strain the already overloaded and still insufficient food production lands, and burden education and other social services provided by the government.

Since the gap between rich and poor areas of the world is on track to widen further, this change also poses security concerns on top of the economic concerns stated above. Since the developed world will be the only place that sees development of stem-cell research, immunological advances, and nanotechnology any time soon, it alone stands to benefit. As such, the gap between developed and less developed will widen further as the have's continue to gain, and the have-nots continue to suffer. The resentment and desire for 'justice' that stews today in the LDCs will surely increase exponentially with the gains that the developed world continues to create for itself. Given the width of the gap between rich and poor in today's world and the unlikelihood that it will narrow soon, senescence should be a top concern for US national security today as well as the in the future.

[18] ibid. 69

Recommendations

- Given that most humans would like to live longer, to see great grandchildren or great-great grandchildren, the USG must channel human productivity, address environmental stresses, food shortages and diverging social trends through increased innovative uses of technology.
- Through inventive imaginations in the advanced sciences coupled with informed governmental oversight, the same advanced technologies that lengthen life may make the technology itself more sustainable – mutually reinforcing. The keys are a knowledgeable and interactive government.

Genetic Engineering

The mapping of the human genome was completed in June of 2000.[19] While scientists succeeded in decoding genetic material, it will be much longer before genetic engineering becomes possible or widespread. The complex interaction of genes ensures that there is much more data to be understood. However, parents will have greater control over the phenotype and genotype of their children. The most incipient of practices is that of pre-implantation genetic diagnosis and screening. Parents will be able to have their embryos screened for disorders and even unwanted characteristics.[20]

Human cloning is another technology that will (or has) come before genetic engineering itself. Reproductive cloning is under scrutiny by policy officials on the grounds of ethics and human experimentation. Cloning may also be used for stem cell research. This is more controversial as the benefits of stem cell technology may be immense.

Finally, genetic engineering itself may grant humans the power to guide their own biological evolution. Genetic engineering can be accomplished by either somatic gene therapy, altering only the make up of the individual embryo (not offspring), or germ-line engineering which will transfer the changes to the individual's offspring. Also, artificial chromosomes can be created using an additional chromosome to bypass the complicated manipulation of the natural chromosomes themselves.

[19] ibid. 73
[20] ibid. 77

The potential dangers of genetic engineering, assuming the physical and psychological effects are perfected, are primarily socio-political. It is possible to imagine an entire human race genetically engineered to specialize in specific tasks; such as the intentional creation of inferior humans to fulfill roles in society that more genetically perfected people do not want to fill. A flexible notion of humanity will challenge the inalienable rights that serve as the pillar of our liberal democratic socio-political organization.

Recommendations

- The government should scrutinize genetic engineering. While this technology may prove to be life enhancing and prolonging, it comes with severe socio-political challenges if its progress is not regulated and ethically guided. The President's Council on Bioethics should be the forum for national discussion on these bioethical issues.[21]
- Progress in genetic engineering should be undertaken in a governmentally controlled environment. This would ensure a respectable amount of planning and attempted foresight to help ensure betterment for the whole of humanity.

Biomechanics

"[Biomechanics] is all about humans and technology interacting"[22] - the interfacing of machines with the flesh and bones of individuals. This research, as with most scientists' intentions, is being performed for the great potential the technology has, medical advancement and the betterment of mankind. In terms of medicine, biomechanical technology could make prosthetic limbs that interact with a person's central nervous system allowing the limb to be controlled like a normal body part. Another medical accomplishment may be cybermedicines or cybernarcotics where a computer, outside or inside the body, would diagnose what is wrong and stimulate the body to produce the necessary antibodies and chemical reactions, resulting in a mechanically controlled natural process to treat illness as opposed to taking actual medications.

Other foreseen benefits stem from the "smart" building networks that would monitor and assist the biomechanical person by identifying them, opening doors, turning on lights, and many

[21] The *President's council on Bioethics* has been tasked with the mission of "[Undertaking] fundamental inquiry into the human and moral significance of developments in biomedical technology, providing a forum for national discussion on bioethical issues, and to explore specific ethical and policy questions related to these developments" as outlined in Section 2 of the November 28, 2001 Executive Order. Its website can be located at http://www.bioethics.gov

[22] http://www.madlab.rdg.ac.uk/

other possibilities. It seems a bit farfetched; however the reality is that experiments are now being performed on how to interface computer technology with the human body. Biomechanics may only be in development, but as the technology becomes more of a reality it will have profound effects on the world that humans know.

Economics

The United States Government should prepare for two significant aspects, including the research and production of biomechanical technology, and how a possible use of the technology in the financial markets could be destabilizing. The research and development in fusing man and machine is an expensive process that includes increasingly advanced technology, computers, programs, and more. This limits the places that the research is being performed, but the significant point here is that many of the advances are found in countries other than the United States. The University of Reading, in the United Kingdom, for example, has some of the more advanced biomechanical research projects under the supervision (and participation) of Professor Kevin Warwick.[23]

Not only is research outside the borders of the U.S., but there is also little government control or regulation on the developed technology (mainly because there is not yet a need for such control due to the limited supply of biomechanics research being performed). If one looks at the sponsors of Warwick's research, the variety of investors is astounding. Included in this list is a British government agency, but as of now this Panel is not aware of how much control the agency exerts over any of the research findings.

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[23] Kevin Warwick has performed two significant experiments with biomechanics, and his research goals are also notable to the field of biomechanics. The first experiment entailed the insertion of a device into his arm composed of a silicon chip transponder that interfaced with a "smart" laboratory. This laboratory was set up in a manner that when Professor Warwick moved around, a computer would track the motion and allowed him to open doors; turn on lights and computers; operate heating systems and other menial tasks "without lifting a finger." His second experiment was more indicative of how biomechanical technology will advance in that a "one hundred electrode array" with a similar transmitter was fused with the medial nervous system in the Professors forearm. The transmitter interfaced with a computer that in turn controlled a model hand and an electric wheelchair. The significance here is the ability to replace lost limbs, a new age of prosthetics. Another part of this second experiment was the ability to create "artificial feeling" with the electrode array.

Most notable, however, is the end goal that Professor Warwick pursues. His research in biomechanics, or cybernetics as he calls it, is focused on how humans could 'upgrade' in the future. For instance, "Humans understand the world in three dimensions," states his website, "and [they] communicate in a very slow, serial fashion called speech." Where biomechanics takes the human race through Professor Warwick's research is possible communication between humans without speech. Another series of experiments is planned that use silicon chip transponders similar to the first experiment which allow Professor Warwick and his wife to work together. [http://www.kevinwarwick.org/]

The potential economic gain that biomechanical technology has to offer is great, and as the U.S. has a well developed silicon industry it could be advantageous to have domestic industries conducting such research to develop into production when it is possible. Also, since scientific journals only print original material, the US is likely to learn about particular developments only after they have been developed, thereby placing us behind the power curve so to speak.

The second and possibly more important issue related to the economic affects is the control and use of financial transactions that biomechanical technologies would give to people. The quantum leaps in communication and transaction speeds, which have propelled and continue to propel globalization and increased economic interconnectedness, could move into the realm of hyper-efficiency. Economies would be influenced at rates all but instantaneous to the time that the decisions to make certain financial decisions are made. Essentially, the second a person enhanced with her personal biomechanical computer decides to sells her stock is the precise second it is done.

We are not talking about a person having the means via her personal desktop computer to interact with the world's financial markets any time she sits down at her desk, or calls her broker. We are foreseeing a future where everyday people – the doctor in the city and the farmer in the countryside – will be able to access any open-economy stock market via the personal computer embedded in his body. With Dr. Reading's research (and others like him) the world may one day soon go from opening doors using only brain power and a computer processor (which they can already do) to opening bank accounts, taking out loans, and selling stocks at the instant the decision traverses the brain's synapses to the computer processor. The jump in transaction speed alone would be phenomenal – and ungovernable?

This is however, a double-sided coin. This technology opens up vast new possibilities for economic efficiency, free trade growth, and resource sharing. Financial markets could attain a volume and operating speed that facilitates countless transactions. With this increased speed and connectedness, however, come greater risks, leaving the US more vulnerable to international financial crises. This technological increase guarantees less governmental control and therefore less stable markets overall.

Additionally, as computational speed increases, the possibility looms of creating a machine that "thinks" as fast as, or even faster than humans. In relation to the economy, this

would mean decreased economic stability. It could fatally connect the US to sick and failing economies, relinquishing control of our financial independence to that of the super-machines. Strategies must be developed in the financial sector (e.g. the US Department of Treasury, the Federal Reserve Bank, the Securities and Exchange Commission, and others) to prepare the transaction systems of all types (e.g. stocks, bonds, bank accounts, etc.) for the increased rate of transaction that could be possible given biomechanical technology, and an individual's instantaneous access to information and transaction ability. These economic implications are important for the USG to watch and prepare for, but other aspects are quite possibly more profound in the way that people interpret the world now and how it could be perceived in the biomechanical future.

Recommendations

- First-hand knowledge is essential to controlling information and developments within the field of biomechanics. As such, the USG should use incentive tactics, government grants, and investigations to gain increased knowledge for itself - as a first step.
- It is necessary for the United States to have good relations with other countries where biomechanics research is being performed. Developing an international regulating or info-sharing regime will be imperative, and the USG should take the lead in laying the foundation. This way the countries with the technology will be able to monitor the development and use of biomechanics more easily.
- Such USG regulation and monitoring should be done in a way that attracts domestic investment, and keeps as much of the technology in the hands of those whom can be trusted not to proliferate it to those who would use this technology for objectionable purposes.

Human Nature, Human Rights, and Governance

Biomechanics may call into question basic principles of humanity, many of which serve as the fundamental pillars of social organization and governance in today's societies. By augmenting the human natural composition with man-made machines capable of calibrating neural transmissions and controlling human whims, feelings, and spirit, we may begin to call into question the sanctity of our souls. Religion, in whatever form it assumes, has been the most successful socializing agent in history. The belief in the human spirit endowed by an omnipotent

creator(s) has perhaps guided human interaction, internalized civilized behavior, and spared humans from confronting the futility of mortal life.

In addition to the religious based social organization, governmental organizational structures are also challenged with the advent of biomechanical technology. The principles, around which the United States Constitution was founded, are rooted in the equality of human beings. A question arises when humanity is joined with technologies and how those biomechanical beings would be treated under the legal framework of the state. This is not just something of which the United States Government must be aware, but also the international community will need to deal with these issues upon the widespread use of biomechanical technology in the future.

The international community would have to take into account their own individual legal frameworks to adapt to the new sentient being, as well as interpreting the Universal Declaration of Human Rights. Would it be renamed the Universal Declaration of Sentient Rights? It is a matter of philosophical principle and debate right now, but when faced with the reality of such altered humans, what will governments and societies do? The theory of human rights purports to be based on the fundamental biological nature of humanity. The recent inroads in individual rights could be stripped of their validity if the basic first principles of this 'universal' tenet are challenged.

Presently, many governments face the problem of national and ethnic conflict. These conflicts pose threats to the exclusive authority of sovereign governments as well as the assumption that the nation-state will continue to be a main characteristic in world order. Granted, these governments are not always of the liberal democratic form promoted by the United States Government, however, the societal cleavages seen today have not always resulted in institutionalization of liberal democracies. More importantly, the implications that biomechanics hold for the future of governance could create similar ethnic differentiation between the biomechanic beings and natural humans. Circumstances within democratic countries that have resources for the research and development of such technologies could threaten the foundation of our society.

To understand the reasoning, one must first look at the premises on which national and ethnic identities are based. The two examined here include the extent of differentiation between groups within a nation as examined by Jack David Eller, and the notion of “high culture” found

in the work of Ernest Gellner.[24] "It is just as important, ideologically, that a nation be internally undifferentiated as that it be sharply differentiated from other nations," writes Eller.[25] For the nation-state system, cultural homogeneity and self-consciousness are considered crucial to the stability of the governed populace. Biomechanic technology, however, poses a threat to the homogeneity of the governed population being natural human beings. Once a sufficient number of humans have been enhanced or limited by biomechanics, there lies a possibility of creating a sub-cultural awareness amongst those biomechanical humans who would want to separate from the governing state. Once the awareness comes to light, the intra-national differentiation exists, and thus possible unstable governments as well.

Supporting this is Gellner's idea of high-culture that helps to create the identity of a populous. "Nationalism is, essentially," states Gellner, "the general imposition of a high culture on society, where previously low cultures had taken up the lives of the majority…of the population."[26] Currently there exists one high culture within the United States, as Gellner defines the term, of "standardized, literacy- and education-based systems of communication," with the federal education plans.[27] As noted above, these biotechnologies could potentially revolutionize methods of communication, learning, and processing of information. Thus, those altered humans subjected to such biotechnology could potentially create their own high culture independent of the high culture known today. This differentiation, if it occurs, would lead to a separate identity around which the altered humans could join and form their own ethnic group and possibly undermine the state systems familiar today.

One might argue that biomechanical limbs used as prosthetics are no different than a replacement limb that a victim of a car accident might receive. However, if technology is used to interface brain functions and thoughts with actual actions, as in the case of bank transactions, will those biomechanical beings be considered human and granted the same rights as someone without the technological advancements? The altered humans would have an advantage over the natural human in their heightened awareness and abilities while the natural human must rely on what evolution has given her. As has been postulated, are we now researching and creating something that might one day make humans subservient? It is a scary thought for most people to

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[24] Jack David Eller, From Culture to Ethnicity to Conflict, 24., and Gellner, Ernest *Nations and Nationalism* p. 57
[25] Ibid.
[26] Ibid.
[27] Ibid. 54.

think that humans are not the most powerful, intelligent beings on the planet, and governments must now prepare to maintain the human power structure that mankind has been so adamant about preserving in order to prevent any such loss of control.

Recommendations

- The USG should continue to work through the President's Council on Bioethics, incorporating experts in medicine, law/government, philosophy, theology, human rights, and others. Optimistically, by the time biomechanics and genetic engineering emerge in practice; their uses will be controlled. Hopefully, the now nascent international Human Rights regime will be internalized and technicalities of humanity will be overlooked.

Security and Defense

Not only should the USG be concerned about the future and how the biomechanical technology may alter the perceptions of life, social order, and human rights, but it should also be concerned about what the research in biomechanical technology might mean for the security and defense of a state. As with other technologies that are present in the world today, biomechanical research and knowledge has dual-use potential. The technology is futuristic and resultantly it is difficult to determine exactly what the capabilities will be.

However, as mentioned previously, would altered humans turn into a superior form of life? Would they be able to think more quickly, resist disease more efficiently and effectively, and live longer, healthier lives? Especially given today's concerns about nuclear, biological and chemical warfare (NBC) it is plausible to think that the biomechanical technologies would possibly withstand such attacks while the human body might not. In terms of warfare, the altered humans would give any nation or group with the technology an advantage in the military aspect of international relations. In these terms it seems even more important that there be limitations placed on the technology and proliferation thereof.

Like nuclear technology, biomechanics will be too expensive in the near future to be available in most countries. The advanced science involved is also beyond these countries' scientific abilities. This is a threat that the USG has time to counter, or at least delay, if it so chooses. It is unrealistic to think that the government can prevent biomechanical technological development, or to even argue that it should. The possible benefits are too great to ignore and

private industry has forged too far ahead to turn back now. However, this does not relegate the USG to becoming a mere spectator.

Recommendations

- The US should first inform itself on the differing technologies and their anticipated advancements. Knowledge is power, and in this case the power may be inextricably linked to the knowledge.
- The USG should then seek to influence biomechanical uses and proliferation. In this way, the USG may be able to influence who gets it as well as how they may be able to use biomechanical technology.

Conclusion

The evolution of technology is as natural as evolution itself. Just as favorable genetic traits emerge through continual replication and ensure a species survival, "so expanding the reach of one's physical capabilities… [and] mental facilities through technology is clearly useful for survival."[28] The reciprocal interaction between science and technological innovation, and the human socio-political organization, in which it thrives, stimulates the continuation of evolution beyond the glacial pace of genetic mutation. The acceptance of technology as an extension of human evolution involves a paradigm shift much like that which took us from geo-centricity to helio-centricity in the 13th century. Rather than comprehending evolution as the path leading to humanity, we must see humanity on the path of evolution. Departing from this anthropomorphic evolutionary teleology will allow humans to embrace technology, both in body and mind, and perpetuate an intelligent species, whatever form it may take.

Further research

The Biotechnology Node Working Group has identified the following issues that remain to be explored and feels this serves as a good place for a subsequent NWG to start.

- The increasing computational capacity of computers.

[28] Ray Kurzweil, The Age of Spiritual Machines.

- Reverse engineering of the human brain to create technology that will replicate and evolve more successfully than humans - and ultimately replace them?
- The continuing debate on whether or not privacy can be sustained in the presence of these technological advancements, and whether or not liberty can continue to exist in the absence of privacy lost to these technological advancements?
- The Rates of Change of the various technological innovations should be addressed further, assessing the implications of disjointed inventions and innovations.

The Office of Technological and Strategic Assessment (OTSA)

Introduction to OTSA: Why, What, Who, How, and Where?

Networks, as a topic of investigation, became part of the Forward engagement Project with the work of the Spring 2002 Panel. That Panel saw networks as the future of United States governance. They felt that in the next two decades the U.S. Government must become network-centric in order to reflect, "fundamental changes in American society."[29] The Spring 2002 Panel recommended that a new USG agency be created, the Office of Technological and Strategic Assessment. Their mandate for OTSA was to, "assess and improve the sophisticated operational capacity of the USG by providing a forward-looking mechanism to guide all U.S. policymakers."[30] Situated in the Executive Branch, OTSA would report directly to the President.

Fleshing out the details, and further defining the role of OTSA, the FEP – Fall 2002 Panel structured OTSA to be a "hybrid of a pure network and a traditional hierarchy."[31] The Panel saw OTSA as an example of how the USG should utilize the advantages of a network structure to become lighter, more flexible, and ultimately more responsive. Yet, the Panel felt that a purely networked agency with no hierarchical, brick-and-mortar component would be unable to interact with existing USG offices. Therefore, OTSA would exist as a working model of network-centric governance, while its primary function would be the long-range analysis of national security issues.

Picking up where the Fall 2002 Panel left off, the Spring 2003 Panel would like to provide more complete answers to the questions of why, what, how, who, and where, as they relate to OTSA. As the Fall 2002 Panel suggested, the creation of OTSA serves a dual purpose: first, to serve as a body for long-range analysis; and second, to serve as a model of networked government.

Why OTSA?

One group within the FEP – Spring 2003 Panel was tasked to analyze the phenomena of networks and the effects of an increasingly networked world on the security of the United States. It concluded, in accordance with the previous Panel, that such occurrences would have a

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[29] Report of the FEP – Spring 2002 Panel, p. 8.
[30] Ibid, 9.
[31] Report of the FEP – Fall 2003 Panel, p. 3.

tremendous effect on 'rates of change,' the amount of time governments will have to react, and the actual nature of future security threats to the United States.

This group adopted Thomas Homer-Dixon's term "simultaneity" to explain the impact of networks.[32] Networks are increasing the capacity to disseminate information in real-time. Thus, a networked world would allow for access to information and reaction to events to happen simultaneously (or nearly simultaneously). No longer would events or information impact one community first and later others (who work from the assumptions and the model of reaction from the first). The effect of this is a reduced reaction time for all impacted (including the state), and the potential to create the phenomenon that Homer-Dixon called the "cascade effect."[33]

As Thomas Friedman, among others, has noted, globalization is providing those who are 'plugged-in' to the network access to information, technology, culture(s), and resources. Increased and immediate access to these categories of information and events holds the potential for positive and negative effects on people and communities linked to the network. This duality is created by the fact that networks deliver all four categories at once. Communities and people cannot be selective in the categories they access from the networks. In this way, the networked are potentially subjected to the combined experiences and information of everyone on the network, and with little or no 'lag time' in dissemination. Reality for those who are 'plugged-in' becomes synchronized.

One result of the condition of simultaneity will be increasing levels of volatility.[34] With immediate dissemination of information and linkages in civil and professional society as well as communities, reactions will be simultaneous and immediate.[35] Such a phenomenon of increased volatility, because reaction time is reduced as the number of reactions is compounded means that the U.S. government could be caught off guard or overwhelmed by both an original event and the reaction. This possibility and increased volatility requires a capacity for *forward engagement* within the USG, which would help prevent the state from being taken aback by events or developments in a world of differential rates of change. Identification and analyses of long-term security threats can minimize the needed response time of the USG as threats and implications

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[32] From Homer-Dixon's Robert J. Pelosky Lecture on "Synchronous Failure," Fall 2002.
[33] Ibid. This term was used to describe the precipitous actions that resulted in the 1998 Asian Financial Crisis.
[34] Asian Financial Crisis for example – or World Bank/IMF protests
[35] John Arquilla and David Ronfeldt have referred to this as "swarming." They describe it fully in their book Networks and Netwars: The Future of Terror, Crime, and Militancy, 12.

will be identified and addressed in advance. Therefore, OTSA's primary function would be *forward engagement*.

Networks, through simultaneity, and possible resulting linkages between individuals and communities could also present the government with diminishing control over individuals and groups. As society no longer must utilize certain official channels to obtain information or to create linkages outside of their own communities, it could change the essence of governance as well as pose new security risks to the U.S. This Panel agrees with the previous Panels that utilizing networks to make the government more responsive and less vulnerable to new threats is the key to the future success and security of the USG. This is the secondary purpose of OTSA. As a model of network-centric governance, it will serve as a test-bed for the USG to become more responsive to dynamics outside of the traditional structure of government, and less vulnerable to the reverberations of networked reality.

OTSA will provide a model by which other parts of the USG could engage persons or groups to keep the government connected with its citizens. The model could capture the linkages and dynamics that take place amongst a networked constituency. In the future the government, particularly the legislative branch, will have to utilize networks to engage constituents. If not offset by USG actions, linkages between communities and individuals happening in "real-time" could present a challenge to the USG because of the rapid political mobilization that is possible.

Porous communities with individuals linked through interests, will likely increase the vulnerability of states, as terrorist and criminal groups utilize the network for their own benefit. Yet, the other side of networks is that they may provide more security and flexibility to states and governments because of their non-hierarchical structure. One component of the network may be attacked, but the rest can keep functioning effectively without that component as information, commands, and functions can continue to flow between the unaffected components of the network. For this reason, networking may become the best defense of states and governments against the circumstances and reality produced by networks.

With these purposes and functions envisioned for OTSA, the Panel created a mission statement to guide our answers to the four basic implementation questions of what, who, how, and where?

OTSA Mission Statement

> The mission of the Office of Technological and Strategic Assessment is *forward engagement*. That is, to explore long-range 'nodes'—issues where multiple themes intersect, which could have a major impact on American society and on the world in general. To determine whether such nodes could prove to be especially challenging to the security of the United States, and to improve the capacity of the United States Government to perceive and respond to the erratic onrush of these nodes.

Below, we recommend answers to those four basic questions in order to further clarify the composition, function, and organization we envision for OTSA.

What?

- OTSA should be a networked composition of experts (see who below) from outside and within the government that will act as a forward-looking mechanism to address and alert the USG to possible long-term developments that may pose a security threat to the U.S.

The inclusion of current government experts is particularly important in regards to OTSA's primary and secondary functions. First, the work that these experts perform in OTSA will result in policy recommendations. As the experts return to the NSC and the various departmental policy planning staffs they will have a personal stake in seeing those recommendations through the interagency process, and ultimately to implementation. Second, the experts' work in OTSA will expose them to the advantages of network-centric governance, and they will take this experience back with them to their offices. Eventually, if enough people are exposed, there will be a cultural shift in the USG from a hierarchical to a network structure.

- OTSA should be part of the Executive Branch.

The *forward engagement* function of the office is at the request of the President. However, OTSA's conclusions and recommendations should be made available to all relevant branches and departments of government because these other agencies and branches will be supplying the governmental expertise to analyze a node, and will be ultimately responsible for implementing the recommendations produced.

- The Networked structure of OTSA should also incorporate the dynamics and developments that occur outside of the USG.

This will force the government to become more responsive and increase its awareness of developments that cannot be constantly monitored or replicated in traditional intelligence or policy planning. Through OTSA, the USG will be able to include and consult the innovation and expertise of private industry, academia, and non-profits.

- OTSA should not be a traditional office or department within the USG.

It is to be a model for network-centric government that is more flexible and responsive than the traditional "brick-and-mortar" offices. OTSA is structured with a hierarchical administrative core with experts from various fields networked in its service. Consultation for OTSA would be extremely flexible, allowing projects and studies to include the expertise that serves the analysis.

- As implied above, OTSA should not replicate the functions of existing departments.

OTSA will primarily focus on nurturing and exploring nodes (see who below) where traditional themes[36] and interests intersect in long-term analysis. Such examination will require experts from different fields to work together to identify possible developments and implications. The synergy between different sectors, industries and disciplines will be unique to OTSA. The desired effect will be for OTSA to be sensitive to budding developments that the USG may not have identified as problematic or possible. It will also not be characterized by bureaucratic obstacles when working on issues that incorporate different themes, departments or sectors because it will remain an independent office within the executive branch (similar to the NSC).

- Node Working Groups and the administrative core will be based on a six-part construct adding the Environment and Humans and Society to the existing four parts.

The Spring 2002 Panel developed OTSA around a four-part construct with experts in the areas of Economics, Science and Technology, Security and Defense, and Governance. The Fall 2002 panel disagreed with this and recommended a two-part construct centered on Humans and their Environment and Organized Human Behavior. Our Panel has chosen to follow the Spring 2002 Panel's recommendation, but has added two additional groups in the areas of Humans and Society and the Environment, based on the Fall 2002 Panel's recommendation.

[36] We use "themes" because the categories of OTSA do not correspond exactly to either academic 'fields' like biology or computer science, or the 'functional' departments of the USG, like energy or agriculture.

Who?

- The administrative core of OTSA should consist of a Director (DOTSA); six Deputies—one for each of the themes[37]— each with a small staff of 2-5 individuals; an Assistant Director for Information Technology with a technical support staff; an Assistant Director for Administration with an administrative staff; and a Congressional Liaison. (See attached OTSA Org. Chart)
- The President should appoint the Director of OSTA (DOTSA), who will also serve as a Deputy National Security Advisor.
- The Director of OTSA will report to the President through the National Security Advisor.
- The staffing process for OTSA should be similar to that of the NSC.

The DOTSA, once appointed, chooses his deputies and assistants based on their expertise in their respective themes. They will serve two-year terms. The deputies will be elite individuals from government, business, academia, or the NGO/Think Tank community who are already looking forward and identifying issues that are not yet on the policy community's "radar." To give an example of the caliber of people we are talking about, we see Thomas Homer-Dixon, Bill Joy, Andy Marshall, and Susan Pharr, as outstanding Deputies.

- Each deputy should have at least one Strategic Advisor (SA).

This would ensure that the highest-level expertise from working physical scientists and business people is incorporated into OTSA. In thinking about examples of who would be in the core of OTSA, and thus be in charge of identifying nodes, we realized how unlikely it would be for a CEO to give up control of her company for two years to be the DDE of OTSA; or for a researcher on the cutting-edge of nanotechnology to give up two years of lab-work, for the opportunity to serve as DDT. All of the Strategic Advisors together would compose a Strategic Advisory Board (SAB).[38]

- The core of OTSA—the DOTSA, his/her Deputies, and the SAB—should be responsible for identifying the nodes that need exploration.

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[37] *Environment, Defense, Science & Technology, State Stability & Governance, Population and Human Rights, and Economics*

[38] The term and idea of a Strategic Advisory Board came from recent discussions with outside-experts Jonah Czerwinski of the Center for the Study of the Presidency, and Linda Zall of the CIA. Mr. Czerwinski got us thinking about how to ensure the participation of top-minds, and Ms. Zall about avoiding 'groupthink'.

- Once a node is identified, a Node Working Group (NWG) should be formed to explore it.

The DOTSA will assign a deputy to Chair each NWG. Each Chair, in consultation with his/her fellow deputies and the SAB, taps non-core experts from each field required to understand the implications of the node.

- Regarding the non-core experts: any expert, in any field, inside or outside the USG, by the production of their day-to-day work, should be a resource for OTSA.
- Within this vast pool of experts is the intellectual reserve. That is made up of those experts who are eligible for a USG security clearance, and thus may be tapped, based on their expertise, to be in a Node Working Group (NWG).

We have decided to do away with the labels "member" and "non-member," and the categories "latent" and "active" that were used by the last Panel.

How?

- OTSA should be non-partisan.
- The focus of OTSA should be qualitatively different from the existing executive branch agencies.

The missions of the existing agencies are defined by themes—defense, transportation, education, etc. OTSA's mission is defined by time—25+ years in the future. While the other agencies are tasked to deal with a particular theme, without regard to a specific timeframe, OTSA should be seen as dealing with a specific timeframe, without regard to a particular theme.

- OTSA should be a warning mechanism, examining nodes (i.e. where themes intersect) that are still too distant, and too nebulous to attract the attention of the thematic agencies.
- OTSA should be a "hybrid institution," having both a hierarchical and network structure.

We recognize the wisdom in the last Panel's belief that OTSA needs a hierarchical core to interact with other USG agencies. In addition, we see the core as necessary to manage and impose deadlines on the networked NWG's.

- NWG's should meet in OTSA headquarters at the beginning and conclusion of each project.

During the past five weeks, we have found the value of face-to-face meetings to be remarkably high, particularly when decisions needed to be made.

- In between these face-to-face meetings, all NWG collaboration should be done in a secure, password protected, online network application accessible by all of the participants in that NWG, the Chair, and the DOTSA.

This will allow non-core experts to keep their regular employment, and the DOTSA to keep his finger on the pulse of each NWG.

- When a node assessment is complete, and before the NWG disbands, the assessment should be tagged for periodic reevaluation.

The NWG decides the appropriate length of time between reviews, based on the rate of change they perceive for that node. The original NWG, new experts, or some combination of the two should conduct these periodic reviews, and update the assessment as necessary.

- Once a node is identified, examined, and assessed, the NWG should make recommendations to the President.

These recommendations would take the form of 'here and now' policy options that are meant to affect the long-term development of the node.

- The interagency process should then take charge of these recommendations, via the National Security Council.

This would ensure that the actual policies needed to deal with a node's national security implications would be made by the established USG policymakers, particularly the President. Again, it is thought that by involving NSC members in NWG's, the NSC will be more willing to shepherd the recommendations through the interagency process.

- OTSA should not be involved in the actual making of policy, as that would increase bureaucratic resistance to its creation.

Where?

- The Panel recommends OTSA be located in an area like the Tyson's Corner/Dulles Corridor of Northern Virginia.

The physical location of OTSA's core is not important. Because of the long-term nature of its work, very little that it does will be time-sensitive. In fact, we feel that a distal location is favorable to a proximal one, so that the Office is fully insulated from the day-to-day demands of the White House. Also, because of the high-tech nature of its communication and data storage

equipment, and the need to occasionally fly non-core experts in and out of the Washington, D.C. area; a Northern Virginia location would be ideal.

- Whatever facility is chosen, it should possess additional workspace for when non-core, NWG participants are in town.

Alternative approaches to OTSA

After speaking with outside experts Jonah Czerwinski and Linda Zall about the obstacles they faced in implementing their own projects, we have decided to put forth some obstacles and alternatives for future Panels to consider as they continue to address the 'real-world' feasibility of OTSA.

Mr. Czerwinski works at the Center for the Study of the Presidency. He has worked on launching two projects that bear likenesses to our own, a President's Strategic Advisory Board (PRESAB) and the Homeland Security Roundtable (HSR). Ms. Zall, in her capacity at the CIA, was responsible for Medea, a comparable network of experts. Both spoke to us at length about the obstacles that kept their projects from ever getting off of the ground (PRESAB), or that have slowed their work (HSR and Medea). The two obstacles that we think have the largest potential to disrupt the implementation of OTSA as we have envisioned it are the *Federal Advisory Committee Act* (FACA), and bureaucratic resistance to change.

Mr. Czerwinski noted that the FACA was what kept PRESAB from taking flight, because it was used by Congress to put an end to Vice-President Cheney's policy-shaping energy task force. After reading through it ourselves, the implication of the FACA—as we understand it—for OTSA, is that the congressional oversight required of advisory boards may hamper the agility of OTSA as it tries to tap the necessary 'advisors' for its Strategic Advisory Board and Node Working Groups. For example, Section 2.5 of the FACA reads "the Congress and the public should be kept informed with respect to the number, purpose, membership, activities, and cost of advisory committees." This could result in an almost constant need for OTSA to report to Congress, because Node Working Groups are designed to be assembled, expanded, contracted, and disbanded as the analysis of the node progresses. Also, while our recommendations have tried to minimize the bureaucratic battles that OTSA's implementation might face, we were reminded by both of our experts of the bureaucratic 'red-tape' that comes with any government endeavor.

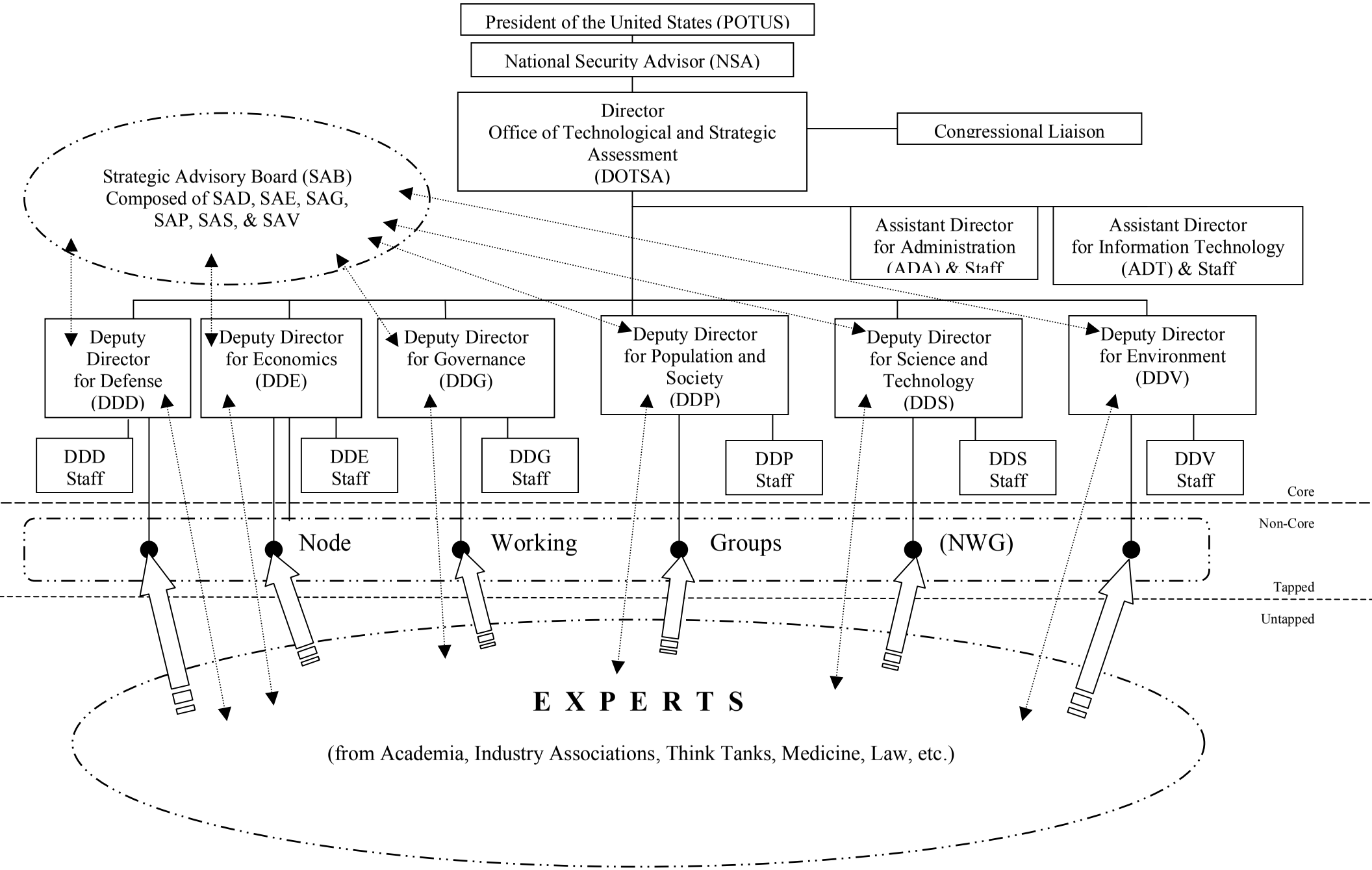
Thus, two alternatives have emerged for future consideration: (1) create OTSA within CIA, and with DOTSA carrying the rank of DDCI instead of Deputy NSA; or (2) create this same forward-engagement mechanism outside of the government as the Center for Technological and Strategic Assessment—the President's, government-funded, non-profit think-tank. Creating OTSA within CIA eliminates the restrictions of Congressional oversight by utilizing an exception in the FACA. Section 4(b) states that, "Nothing in this act shall be construed to apply to any advisory committee established or utilized by – (1) the Central Intelligence Agency; or (2) the Federal Reserve System." The other option gets around both the bureaucratic 'red-tape' and the FACA by removing OTSA from the government altogether. Such a government-established, -supported, and –funded think tank is not uncommon, particularly within the Defense community. In fact, this alternative is very similar to the USAF's creation of the RAND Corporation after WWII.

Conclusion

It is important not to forget the underlying purpose of the President's initiative. As stated in the OTSA Mission Statement, the primary function of the office is *forward engagement*. Utilizing an analytical structure of nodes, this Panel identified three key issues that demand attention. They have the potential to quickly or drastically revolutionize society and its associated systems. Due to the erratic nature of nodes and their development, Information Technology, Water Scarcity, and Biotechnology, hold the potential of thrusting an unexpected reality upon the international system. They warrant assessment and preparation. These developments do not exist in isolation, nor are they the only issues that exist with this potential. Therefore, the USG and its citizens will best be served by the institutionalization of *forward engagement*.

The interdisciplinary nature of the developments and the character of node assessment require participation and preparation by several agencies and offices of the USG. Interconnectivity, cooperation, and flexibility will be required of the government with increasing frequency. OTSA demonstrates the effectiveness of a non-hierarchical, networked structure.

It is the conclusion of this Panel that the next group should continue by identifying and evaluating other nodes utilizing the recommended structure. Our experience as a Panel was first to assess the validity and utility of the previous Panels' findings, adjust the model as we determined appropriate, then assess the implications and threats by future developments. Due to the limited working periods of each Panel, it is our recommendation that the next Panel simulate the function of OTSA, performing *forward engagement*, and enlisting outside experts. After the simulation, the Panel can then assess the utility and structure of OTSA and recommend changes where appropriate. This Panel may also design a plan for interdepartmental action and cooperation to implement the approved policy recommendations that result. The Panel should assess whether networked government is effective in responding to future threats. Finally, the next Panel should assess whether OTSA, as this Panel envisions it, is an appropriate model for government networking and *forward engagement*.


President of the United States (POTUS)
National Security Advisor (NSA)
Director
Office of Technological and Strategic Assessment
(DOTSA)
Congressional Liaison
Strategic Advisory Board (SAB)
Composed of SAD, SAE, SAG, SAP, SAS, & SAV
Assistant Director for Administration (ADA) & Staff
Assistant Director for Information Technology (ADT) & Staff
Deputy Director for Defense (DDD)
Deputy Director for Economics (DDE)
Deputy Director for Governance (DDG)
Deputy Director for Population and Society (DDP)
Deputy Director for Science and Technology (DDS)
Deputy Director for Environment (DDV)
DDD Staff
DDE Staff
DDG Staff
DDP Staff
DDS Staff
DDV Staff
Core
Non-Core
Node
Working
Groups
(NWG)
Tapped
Untapped
E X P E R T S
(from Academia, Industry Associations, Think Tanks, Medicine, Law, etc.)

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We would like to thank all the outside participants without whom this report would not have been possible.

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