Proteus Futures Digest

A Compilation of Selected Works Derived from the
2007 Proteus Workshop

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Second Edition

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Compiled and Edited by
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William Wimbish

Proteus USA

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Comments about this publication are invited and should be forwarded to Chair, Proteus USA, 650 Wright Avenue, Carlisle Barracks, Pennsylvania 17013-5049. Copies of this publication may be obtained by calling the Proteus USA at 717-245-3366.

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FOREWORD

Proteus USA is an international consortium and "think tank" focusing on the refinement, continued development, and practical application of new and emerging innovative futures-related concepts. Proteus USA assembled this anthology from selected works by Proteus Fellows and Associates. This collection includes an eclectic group of essays designed to explore complexity in the future global security environment with its discrete threats and opportunities, as well as to examine related new and innovative concepts, strategies, and processes to meet the United States national security challenges in the 21st century. These works are not designed to be predictive or prescriptive; rather, they examine issues filtered through different lenses. It is our intent that these essays will assist strategic- and high-operational-level decision makers, planners, and analysts in "outside the box" consideration and critical analysis of national military and intelligence issues within the Joint, Interagency, Intergovernmental, and Multinational environment. We hope that they will encourage the consideration of the values and perceptions of future target audiences by systematically looking "outside" of the values contained in western civilization when considering the application of all elements of national power (Diplomatic, Informational Military, and Economic). Finally, we believe that they will be useful in identifying and considering the second- and third-order effects and unintended consequences of policy and strategy decisions.

Many of these essays were first presented at the second annual Proteus Futures Academic Workshop: "Creative Strategic Intelligence Analysis and Decision Making Within the Elements of National Power" at the Collins Center for Strategic Leadership, United States Army War College, Carlisle Barracks, Pennsylvania.

We are grateful to all the authors for their work and its contribution to a fuller understanding of the future geo-strategic environment and new ways to address key complex 21st century challenges. Further information on Proteus USA can be found at https://www.carlisle.army.mil/proteus.

Bill Waddell
Chair, Proteus USA

CHAPTER ONE

Introduction

This anthology is compiled from selected works presented by Proteus Fellows and Associates at the 2007 Proteus Futures Academic Workshop: "Creative Strategic Intelligence Analysis and Decision Making within the Elements of National Power." The workshop provided scholars from various organizations across the Department of Defense, the Interagency, academia, and the private and corporate sectors the opportunity to present papers on topics and issues that explore complexity in the future global security environment. Authors addressed new and innovative concepts, strategies, and processes to meet the United States' 21st century national security challenges. Each of the first four panels was organized to examine novel approaches to analysis and decision making within each of the elements of National Power, the so-called DIME. Finally, the presentations from Panel 5 addressed advanced scientific approaches, strategic scenario development, modeling, simulation, and gaming that enhance intelligence analysis, experiential education, decision making, and problem solving across the Elements of National Power. The panel themes make up the outline of this work.

Instruments of National Power

Joint Publication 1, *Doctrine for the Armed Forces of the United States* identifies four components of a nation's elements of power: Diplomatic, Informational, Military, and Economic (DIME). They are the instruments our government uses to apply its sources of power, to include our culture, human potential, industry, science and technology, academic institutions, geography, and national will. They are coordinated to ensure that the government can achieve our national strategic objectives. The National Security Council plays a key role in the integration of all instruments of national power to facilitate mutual understanding, cooperation, and unity of effort. This coordinated use of complementary elements is termed the interagency process, which identifies the ways in which military and nonmilitary capabilities best complement each other. Our government strives to ensure that the use of the military element to conduct combat operations is the last resort, applied only when the other instruments of national power have failed to achieve our nation's objectives. Chapters 2 through 5 contain papers addressing aspects of the instruments of national power, which are briefly described below.

Diplomatic

Diplomacy is the principal instrument the nation uses to engage with other states and foreign groups to advance our values, interests, and objectives. Diplomacy is under the auspices of the Department of State, which is the U.S. government's lead agency for foreign affairs. Diplomacy is used in conjunction with economic and informational activities. The threat of military action underscores, and in some cases, enables the diplomatic process.

Informational

The informational instrument of national power is widespread throughout civil society and the government. It is composed of a complex set of components with no controlling entity. In our democratic society, information is freely exchanged with little government control. Information influences both domestic and foreign audiences, including citizens, adversaries, and governments. Our government uses strategic communication to provide guidance in how to use the informational element of national power in specific situations. The informational element of power is used to engage key audiences to create, strengthen, or preserve conditions favorable to advancing national interests and objectives through the use of coordinated information, themes, messages, and products that are synchronized with the actions of the other instruments of national power.

Military

The purpose of the Armed Forces is to fight and win the Nation's wars. In their role as the military instrument of national power, our Armed Forces must ensure that they strictly adhere to U.S. values, constitutional principles, and standards for the profession of arms. The United States employs the military instrument of national power at home and abroad in support of its national security goals in a variety of military operations. Under the President's leadership, military power is integrated with the diplomatic, informational, and economic instruments of national power to promote and defend our national values, interests, and objectives. The armed forces interact with other government agencies to ensure there is a mutual understanding of both the military's capabilities and its limitations, and of the consequences of military and civilian actions. The government must also identify the ways in which military and nonmilitary capabilities best complement each other.

Economic

The economic element of power is the size and strength of our economy and its interaction with the economy of others. In the current globalized economy, economics is a common thread in international relations, but it must be wielded skillfully to avoid unforeseen repercussions in other areas. Our free market economy is only partially controlled by governmental agencies. In line with our national values, constitutional imperatives, and laws, individuals and companies have broad freedom of action in the economic arena. The government's responsibility is to facilitate the production, distribution, and consumption of goods and services worldwide. A strong U.S. economy with free access to global markets and resources is a fundamental engine of the general welfare, the enabler of a strong national defense, and an influence for economic expansion by U.S. trade partners worldwide. The economic element also includes fiscal and monetary tools that can be used to influence the behavior of another entity. These tools can be employed as carrots (e.g., loan guarantees and grants) or sticks (e.g., seizing assets, banning trade, etc.).

Panel Five

Papers presented in the fifth panel comprise Chapter 6. They are an eclectic group and present ideas that span the elements of power described above. Although they did not fit into the overall workshop theme, they were so provocative that they needed to be presented in order that their ideas could be shared and vetted.

Bottom Line

In summary, this is a collection of essays derived from an eclectic gathering designed to present novel ways to examine "future complexity." The essays are not designed to be predictive or prescriptive; instead, they examine the cogent issues from a variety of perspectives.

CHAPTER TWO

Future Political and Diplomatic Challenges and Thoughts for the Future

Creative and holistic analysis and decision making within the Diplomatic element of national power for the 21st century will only be possible and successful if the United States and her allies can holistically address the crosscutting complex challenges that a new global political and diplomatic landscape has dictated. This landscape has changed dramatically over the past two decades. New technological advances and convergences, especially in information and transportation, have flattened the playing field and have allowed new asymmetric and idiosyncratic capabilities by an ever-increasing number of empowered non-state actors: groups and individuals to assail and threaten every aspect of society, presenting new imminent and dangerous threats to U.S. national security interests around the globe.

Comprehensive and viable diplomatic action, governance, and political prowess can only be achieved by looking beyond seemingly short term and single issues. "New diplomacy" must scan the horizon and develop strategic forecasts and scenarios in order to identify, as completely possible, new and emerging threats as well as opportunities to shape the environment and then use new, innovative and dynamic complex systems approach to thinking, policy, and decision making. This systems approach will help immeasurably in developing viable long-term adaptive solutions to existing and emerging, extremely complex interdependent issues that cut across generational, cultural, social, political, psychological religious, and economical boundaries and can prevent or mitigate unwanted and unintended consequences and cascading second- and third-order effects.

The following essays examine, survey, and analyze several vexing and complex world challenges that have great potential to threaten stability and security in the future geo-strategic environment. Each essay then explores new and innovative ways to view and address these future concerns.

In her essay, "Ahmadinejad and Islamic Just War," Cindy Ayers discusses implications of the Iranian president's public overtures and the potential impact of his bellicosity on the global community. Displaying an ability to skillfully manipulate the concerns of Western diplomats and politicians and by utilizing culturally inspired hatred and "true belief," the president appears to be attempting to mobilize the Muslim world for the onset of an apocalyptic "Islamic just war." Will he succeed or will he be ushered into obscurity? History may show that the impact of one empowered actor can change the course of the world and threaten the peace of future generations.

She notes that Iranian President Mahmoud Ahmadinejad has made no secret of his hatred for Israel, the United States, and the West in general. He has accused the United States and Great Britain of sponsoring covert attacks within his country, while senior officers in the Islamic Revolutionary

Guard Corp openly recruit Iranian youths as potential suicide bombers for operations against Israel and the West. He has overtly met with and supported leaders of terrorist organizations that publicly proclaim—and act on—their intention to destroy Israel. The Iranian government continues the process of uranium enrichment while Ahmadinejad remains defiantly noncompliant, in spite of diplomatic requests, offers of incentives, and a new United Nations Security Council resolution. He has crafted strategic alliances based on common enmity and has made no attempt to hide his apocalyptic vision of the future from the world.

Seen by many as belligerent and irrational, Ahmadinejad has been dismissed by Western media and political pundits as a "madman," yet cautiously compared to Adolph Hitler in regard to his potential global impact. His statements and actions to this point appear as unmistakable provocations to some; yet there are Western analysts who believe that neither the general Iranian population nor the clerical leadership agree with their president's fanatical views—thus, they believe he will soon fall from his current position of power. But like Hitler, Ahmadinejad's talent rests in his ability to seduce individuals and the masses, friend and foe. As Hitler proved to the world, extreme hatred—when combined with "true belief"—can be a powerful tool.

Ayers asserts that the key to the realization of Ahmadinejad's apocalyptic vision may lie in his ability to manipulate the world using extreme hatred, "true belief," and traditional Islamic concepts of "just war."

The second essay, by Thomas Ferleman and Dennis Walters, titled "The Future of the Middle East in 2040: A Forecast of Drivers of Stability," applies a "framework forecasting" method using the International Futures (IFs) model developed by Barry Hughes of Denver University to forecast drivers of stability in the Middle East out to the year 2040. The paper uses publicly available information for forecasting trends and modeling the future and includes data from the United Nations (UN), World Resource Institute (WRI), the World Bank, CIA and other institutions and research centers.. While most futures research uses basic linear extrapolation in order to examine future environments, the IF model uses a causal-loop architecture in order to measure the degree of change that multiple interacting variables will have on each other under various scenarios.

The authors illustrate how countries presently considered as a threat to the United States may become the most stable by 2040, including Iran and Lebanon. These bright initial conditions are offset by the perpetuation of conditions that helped bring about Al Qaeda. Forecasts show that increased military spending in the region, even among western-friendly nations, may not improve stability. However, a better balance of spending (economic power) with the other elements of national power and assistance may help to ensure hope, provide for the common needs of the population, and consequently improve stability.

Ahmadinejad's Dangerous World View: A Nightmare Scenario

Professor Cynthia E. Ayers

Introduction

In October of 2005, a "microsatellite"—believed to have "rudimentary" visual surveillance capabilities—was launched by the Russian government for the Islamic Republic of Iran. Reports concerning the timing of a subsequent launch (also to be performed by Russia for Iran) ranged from sometime within "the next few weeks" of a 4 April announcement[1] to roughly two years from the first launch,[2] with projections by Iranian leadership to have a total of six satellites in orbit by the year 2010. A *New York Times* article concerning the October 2005 event expressed great "concern [among Western experts] …that Tehran could one day turn such advances to atomic ends."[3] What wasn't specified was the extent to which those "atomic ends" could potentially impact opponents. Iran's satellites could be built for the purpose of guiding missiles with nuclear warheads—or alternatively as "high-altitude nuclear EMP [electromagnetic pulse]" weapons.[4]

A Nightmare Scenario

Christmas Morning

00:01 EST/05:01 GMT: Two explosions occur approximately 275 miles above the United States—one seemingly centered over the eastern and the other over the western half of the continent. Lights across North America—stretching into southern Canada and northern Mexico—go out. A few minutes later, a megaton-sized nuclear device is detonated on a cargo ship in dock at Honolulu Port on the Island of Oahu. Simultaneous reports of explosions (later believed to have been a combination of nuclear suitcases and dirty bombs) close to Pearl Harbor (also on Oahu), in Kahului (Maui), and Hilo (Big Island) add to the chaos.

00:10 EST/05:10 GMT: A ten-kiloton weapon held within the cargo container on a lorry is detonated on Vauxhall Bridge in London. Three small kiloton-size nuclear devices—one located within the boundaries of Heathrow airport, another close to White Hall, and one near RAF Lakenheath—explode. Dirty bombs are discharged almost simultaneously within the cities of Cheltenham, Birmingham, and Glasgow, and at Gatwick airport, as well as downtown Paris, Saint-Pol-de-Leon, Istres, Luxeuil, Berlin, and Frankfurt. Large conventional explosions rock Manchester, Edinburgh, Dublin, Calais, and Munich. Smoke and debris are expelled from the openings of the English side of the Channel Tunnel—the result, it is assumed, of detonations from within.

00:20 EST/05:20 GMT: Missiles rain down on Israel, and although some are initially intercepted, Nazareth, Tel Aviv, and Dimona sustain a substantial number of hits—all are reportedly on fire. The surrounding areas are believed to be heavily radioactive.

Almost simultaneously, dozens of small, conventional missiles are fired against U.S. military targets in South Korea. Japan (within the general vicinity of Tokyo) is hit by a nuclear-tipped Taepodong missile fired from North Korea. Although several warnings had been issued by the United States to the government of North Korea while preparations for an apparent missile launch were being made, intelligence sources had consistently presented the activity as a probable test.

00:30 EST/05:30 GMT: Cargo ships explode at Port Adelaide, Port Melbourne, and Sydney Harbour in Australia. While the extent of the damage is being assessed, small and medium-scale terrorist operations begin in major cities throughout the continent.

05:00 EST/10:00 GMT: North Americans gradually awaken to a very quiet world. The first thing they notice is the lack of electricity—a nuisance on Christmas morning, to be sure, but not anything out of the ordinary. They soon notice, however, that emergency generators aren't working. Neither landlines nor cell phones are responding, and battery-powered radios seem to be broken. Even worse—automobiles of all sorts (except for a few very old models) have either stopped working or won't start.

Police and emergency personnel who live relatively close to their duty stations set out on foot—the lucky ones travel by bicycle. Along the way, they meet up with stranded motorists and stupefied neighbors. Upon arrival at their destinations, they are greeted with confusion bordering on chaos, especially within the hospitals. All are aware of the fact that something is dreadfully wrong, yet assume that the problem must be short term. Many cannot help but issue an occasional grumble "why does this have to happen on Christmas day?"

Within the next several hours, urban areas throughout the continent erupt. Major cities, to include Dallas, New York, Washington, D.C., Los Angeles, San Francisco, and Chicago in the United States and Vancouver, Montreal, Quebec, and Ottawa in Canada, explode with combinations of conventional, radiological, and portable nuclear weapons.

08:00 EST/13:00 GMT: Iranian president Mahmoud Ahmadinejad makes an announcement from his office in Tehran. It is recorded and transmitted live via the major Middle East networks and throughout Russia, China, and Latin America. "*Al-Mahdi*," he states, "has returned as promised, and will be addressing the world within 24 hours." Ahmadinejad reminds his audience that he has been chosen by *al-Mahdi* to relay messages to followers, at least until the Hidden Imam's appearance has been finalized. The most immediate message, he says, is this: "It is the duty of all who wish to please *Allah* to help *al-Mahdi* usher in the period of his rule—the period we know of as 'The End of Time'."

Getting There

This "Nightmare Scenario" is, of course, fictional and slightly futuristic—but the potential for at least part of it to become reality—and relatively soon—exists. Iran's controversial president, Mahmoud Ahmadinejad, has apparently been given "*carte blanche*" (at least by a significant portion of Iran's clerical leadership, and more officially "as the number-two commander in chief of all Iran's armed forces"[5]) to act in any manner necessary to further the country's nuclear program;[6] and most Western

analysts (as well as Iranian ex-pats) see few indications that the program is intended specifically and solely for what Westerners would perceive as "peaceful" intent. In fact, the body of evidence, when taken as a whole, points to the contrary.[7]

Although Ahmadinejad claims to have been divinely appointed for his leadership role,[8] it would appear that he owes his presidency to more earthly intervention by the Ayatollah Khamenei, with a bit of help from the IRGC. For Khamenei, electoral manipulation may have served the purpose of limiting the growing power of former President Akbar Hashemi Rafsanjani,[9] but there could also have been another—possibly more important—intention. Ahmadinejad's brash revolutionary rhetoric and shocking apocalyptic imagery could have been specifically solicited to keep the world at bay while Iran's nuclear weapons program was brought back on line and/or accelerated.[10] Lessons learned from North Korea's nuclear negotiations (some might say "non-negotiations") may have indicated that the "Great" and "Little" Satan (the U.S. and Israel), aided by the United Nations and the European Union (EU), would merely debate Ahmadinejad's rationality ad nauseam while agreeing to the employment of limited diplomacy and sanctions for a lengthy period (perhaps even gaining concessions in the meantime)—long enough for ultimate success, in the form of nuclear weapons production, to be achieved.[11]

Given the likelihood that Ahmadinejad is acting in a bellicose manner for the purpose of buying time for the regime, he seems to be playing his part to perfection and making strategic alliances along the way. In accordance with the old Arab saying "the enemy of my enemy is my friend," he has initiated partnerships with the most boisterous, if not vitriolic, of anti-U.S. entities, to include the leaders of Cuba, Venezuela, Belarus,[12] Sudan,[13] Bolivia, Nicaragua, Ecuador, and North Korea.[14] He has been seen in the company of the likes of Hezbollah's Imad Mughniyah (one of the FBI's "most wanted" prior to his death in February of 2008) at "terrorist conferences" in Damascus[15] and has bolstered ties with Syria, Lebanon,[16] China, and most importantly, Russian President Vladamir Putin.[17]

Both Russia and China are among the five permanent members of the United Nations Security Council (the other three are Britain, France, and the United States) and are thus able to heavily influence the decisions and the makeup of sanctions against Iran for their continued defiance regarding uranium enrichment and other unauthorized nuclear efforts.[18] More often than not, and even in the face of overwhelming evidence of Iran's illicit activities, both countries tend to disagree with the prognosis presented by the United States, much of Europe, and Israel concerning Iranian affairs in the realm of nuclear threat, as well as with the importance of implementing punitive measures.

The United States and EU countries have generally seen the reluctance of Russia and China to impose sanctions on Iran as, at a minimum, an obstacle to overcome—a delaying tactic applied in accordance with their own agendas, as opposed to a green light for Iran to continue with their nuclear ambitions. China usually sides with Russia, in what could be termed a vague oppositional stance to sanctions against Iran, while taking a more protective stand regarding North Korea. Russia, on the other hand, seems to be almost belligerent in its protection of the Islamic Republic.[19] Russia built and supplied Iran's Bushehr Nuclear Power Plant,[20] has launched at least one Iranian satellite,[21] and has made a variety of business deals with Iran, to include sales of military and civilian aircraft.[22] These activities were seen mainly as contractual agreements for capitalistic purposes; yet contacts between Iran and Russia may be far more important, and possibly more detrimental, to Western interests than previously assumed.

Vladimir Putin may see Iran as useful in achieving his own goals. One objective might simply be a renewed effort to quell Islamic extremism within Russian borders. Iran's influence would be invaluable in attempts to influence the conduct of Chechen rebels; and it is indeed interesting that Russia has not sustained a large-scale terrorist attack since the Beslan massacre of September 2004[23]—just prior to the 2005 election of Mahmoud Ahmadinejad. But another, perhaps more pertinent goal, might be seen in light of recent research conducted by Isabella Ginor (a research fellow at the Harry Truman Research Institute, Hebrew University) and Gideon Remez (radio journalist, editor, and presenter). In their book *Foxbats Over Dimona: The Soviets' Nuclear Gamble in the Six-Day War*,[24] Ginor and Remez provided compelling evidence that Russia may have instigated the Six-Day War by encouraging Egypt to provoke Israel into initiating a "first strike." The intent was apparently to label Israel as the aggressor; thus providing an overt reason for a Soviet-Arab invasion force. The desired outcome was the destruction of Israel's nuclear facilities and the reduction of Israel's national boundaries to the 1947 partition, with an additional aim of countering U.S. interests in the area. If current events—including but by no means limited to a revitalized and more public relationship between Iran and Russia, a bombardment of anti-Israel and anti-U.S. rhetoric from Iran's president, eyebrow-raising increases in arms sales by Moscow to Iran, Syria, North Korea, and Venezuela, and a surprising escalation of tension between the United States and Russia[25]—are indicative of a pattern, as described by Ginor and Remez, there is great cause for alarm. Additional research may be necessary to determine what further evidence there may be regarding adoption of such a pattern; but the time needed to achieve a complete understanding of the nature of collaborative enmity that is beyond doubt, may be slipping away.

The need for both Putin and Ahmadinejad to use one another as a *deus ex machina* (albeit, each in a different ideological sense) based on common adversarial pursuits (at least for the time being) would be enough to maintain alliances; yet considering the long-stated ultimate goal of the Islamic Republic (global Islamic domination)[26] as well as a possible perception or even obsession of restored Russian superpower status (with Putin at the helm, of course),[27] one of the parties is bound for disappointment should common enemies eventually be neutralized or destroyed. When the enemies of enemies have been vanquished, alliances between victors who retain mutually exclusive ideologies fade quickly.[28]

Detractors would still say that the idea of conquering the United States, Israel, and their allies in one fell swoop, is fictional nonsense—but is it? There are several points that might contribute to an opinion that places such a scenario within the realm of possibility—perhaps not exactly as depicted in the "Nightmare Scenario," but close enough to warrant increased scrutiny at Cold War levels, if not at levels that should have been employed long before the United States entered into World War II.

The Apocalyptic Context of the Islamic Revolution

> *"The 'disinherited of the earth' will hasten the coming of the Mahdi through vigorous resistance to the 'corruptor of the earth' and triumph over 'satanic forces.'. . . [They will] actively bring about a 'revolution of universal scale,' destroy the satanic superpowers and realize the dictate of history.'"*
>
> —Shi'a Sociologist Ali Shari'ata, 1972[29]

During the late 1970s, one of Iran's most radical clerics, the Ayatollah Ruhollah Khomeini, managed to cobble a coalition of diverse anti-Shah groups together long enough to achieve a successful revolution—largely through deception and misrepresentation, although he did not refrain from using

ultra-conservative religious rhetoric within his discourse. Following his anointment as Supreme Leader, the Ayatollah dispersed with the flimsy façade he had erected as an inclusive, freedom-loving, man of God and began to exterminate dissenters within the ranks—starting with the Marxists and secularists who helped him come to power. In retrospect, it may have been the general appeal or charisma, for which he has since become famous, that kept his co-revolutionaries from fully realizing what was in store for them and for their country. Regardless, the purges and the conservative theocratic crackdown appeared to be quite a surprise to many during the critical post-revolution period.[30]

Khomeini's objectives were ultimately spelled out in the initial constitution of the Islamic Republic. The section entitled "The Form of Government in Islam" states "…in the development of international relations, the Constitution will strive with other Islamic and popular movements to prepare the way for the formation of a single world community." This concept is cited as "one of the two main pillars" in the formation of Khomeini's foreign policy. The second pillar denotes the power of the Supreme Leader as the messenger of *Allah* and his duty to maintain power by ensuring submission to *Allah*'s Islamic government and thus to *Allah*'s will.[31]

In other words, Khomeini's agenda was apocalyptic. He believed himself to be a forerunner of the *Mahdi* with a mission to facilitate global Islamic dominance by means of exporting the revolution.[32] This was not simply a product of the Ayatollah's (or in a later context, Ahmadinejad's) overactive imagination—the apocalyptic objectives of his agenda are theologically and culturally based. The foundation of the Islamic Republic rested on this "end of time" context. Khomeini understood his own leadership to be that of "ruler of the world" by default, as there was (as of 1979) only one true government of *Allah*—the Islamic Republic of Iran.[33] Many of the activists who followed him felt it their divine duty, if not destiny, to provoke their version of the Apocalypse—to facilitate or bring on "the end of time"[34] and the appearance of the *Mahdi*.[35]

The *Mahdi* is recognized, albeit in slightly different contexts, throughout virtually all sects of Islam. Over the past thirty years, however, popular literature and discourse have served to "homogenize" apocalyptic expectations[36] so that "historical and theological [differences] gradually dim into insignificance, [and] messianic characteristics…seem to embrace a common pattern."[37] The main apocalyptic cast[38] includes the following:

- The *Mahdi* (the "savior" or "guided one"—the last direct male descendant of the Prophet Muhammad, who was "hidden" or removed from earth [or from view] as a child.)
- Jesus (as a prophet)
- The *Dajjal* (the Islamic version of the Antichrist).

A generalized, "popular" description of the *Mahdi* is that he will be tall, fair in complexion, have a "broad forehead," a pointed or "prominent" nose, and a humble nature.[39] He will be approximately 40 years old upon his entrance or appearance on the world stage.[40] His name will be similar to that of the Prophet Muhammad ibn 'Abdullah.[41] He will be riding a white horse,[42] wearing the Prophet Muhammad's white turban and "the cloak of the prophet," will carry or use a cane (believed to be the walking stick of Moses), and possess the sword of Ali (the Prophet's son-in-law).[43] He will have a few hundred close "helpers," and that number will grow to include tens of thousands[44] and receive the "pledge and help of [what are now referred to as the] Iraqi people."[45]

The generic (and very basic) version of the apocalyptic scenario is one in which *al-Mahdi* will reappear during a period known as the "last days" to unite all Muslims under the banner of Islam and convert or kill all remaining infidels.[46] Many *Shi'a* believe that *al-Mahdi* has been living in or around a well that is located at the Jamkaran Mosque (just outside of Qom).[47] At some point, it is understood that he will reappear and travel along a specific path to Tehran.[48] Jesus will return at approximately the same time and submit to al-*Mahdi*'s leadership. He will tell Christians that they had been mistaken and must convert to Islam. In some scenarios, Jesus is destined to help the *Mahdi* kill the *Dajjal*.[49] Modern popular interpretations have noted that at a point before or during the fighting, "planes and satellites will fall," and "computers will fail."[50] "Every power of technology will stop." [51] Nuclear weapons will be used, not only "in the Valley of Jezreel (Armageddon)," but also in many other areas of the world. And while all of the Jews and other infidels in the irradiated areas will die, Muslims will be protected by *Allah*.[52] *Al-Mahdi* will then establish Islam globally and rule the world for a period of 7 to 9 years[53]—first from within the area of Kufa in Iraq,[54] and then from Jerusalem.[55] His rule will culminate in "Judgment Day," which is essentially the "end of time" as the world is destroyed and all are sent either to paradise (good Muslims) or to hell (non-believers).[56]

There are three main points of the generic scenario:

- True believers should (actively) seek out martyrdom for the sake of a global jihad
- Both Iraq and Israel (specifically Jerusalem) are crucial to the *Mahdi*'s rule[57]
- There is to be a "cataclysmic," probably nuclear "end of the material world" followed by Judgment Day[58]

The Concept of Power in Post-Revolutionary Iran

> *"Too often analysts retreat to the broad covering concept and pay too little attention to the actual complexity of the component factors at work. The result is overconfidence in a power explanation that has the pretense of parsimony, but that actually diverts attention from the real variables at work . . ."*
>
> —Richard K. Herrmann & Jong Kun Choi[59]

Power (or that equal to the Western concept of power) within Iran has been shifting ever since the Islamic Revolution of 1979.[60] Some observers have noted the gains made by "moderates" or "reformists" as irrefutable and irreversible. Many continue to bet on the reformists' ability to permanently change the Islamic Republic from within the leadership structure; and a few believe in a pending reconstructive revolution of the dissatisfied and disenfranchised (mostly youth).[61]

Yet the same analysts who claim trust in the capabilities of the moderates to effect change, often paradoxically cite the power structure that was created following the establishment of the Islamic Republic as if it were a rock-solid institution, with the Supreme Leader in the position of ultimate authority. They use this authority structure to brush the current president aside as irrelevant.[62] These individuals invariably discount the power of those who are seen as the most extreme of the rightwing senior clerics (e.g., those in line with the Ayatollah Mesbah Yazdi) as well as the non-clerical conservative elite,[63] such as Mahmoud Ahmadinejad.[64] Following this logic, it would seem that when the country is ruled in-part by moderates, Iran's governing system, to include the quantity and quality of power that comes with status, is determined to be highly flexible; but when ruled almost entirely by hard-line

conservatives, any consideration of unofficial or conceptual power shifts—especially when the topic of discussion is the power that rests with the Supreme Leader—is simply thought to be out of the question.

With others who are dismissive of the president's influence, the assumption of Ahmadinejad's irrelevancy is apparently based on a theory that there is a definitive difference in ideology, goals, and objectives between the current president and the Supreme Leader, but the two are consistently reported as compatible on those terms.[65] In fact, Ahmadinejad has been cited as a loyal and obedient servant to the Supreme Leader—one who most probably knows from whence his support originally came.[66] There has, nevertheless, been a slight power shift to the president—and it could well be a situation that is actually desired by the Ayatollah Khamenei.[67] It is possible that the Supreme Leader believed that more could be accomplished in the nuclear arena by allowing Ahmadinejad the opportunity to become the face of a nuclear Iran. Discussion of this topic could go on at length; but suffice it to say that Ahmadinejad owes a great deal to his own charismatic leadership (regardless of whether Westerners or even all Iranians see him as charismatic[68]), an ability to manipulate the masses with rhetoric reminiscent of the founder of the Islamic Republic, a special array of connections developed during the post-revolutionary period, and a degree of freedom to act with at least the appearance of having a great deal of power—whether it be issued from within the governing structure of the Islamic Republic or granted by the *Mahdi* himself.

To carry the aforementioned paradox a bit further, contemplation of Western perceptions of power and status regarding the current Iranian president and Supreme Leader reveals an interesting display of an almost desperate and subconscious need to see universal conformity to secular hierarchical reasoning as well as to Western concepts of "justice," "governance," and even "peace." Secular humanists (among others), for instance, might see Ahmadinejad as an eccentric, if not completely irrational, "true believer,"[69] yet may have no actual understanding (e.g. personal experience) of "true belief" beyond that of a descriptive nature. It would not make sense for Khamenei to support or relinquish power to an irrational actor such as Ahmadinejad; nor would it make sense for the public to continue to support him, such Western analysts reason. Such a power shift could only occur with an individual seen by the world-at-large as peaceful, moderate, secular-leaning, and progressive (from a Western perspective).

But within the context of an apocalyptically based theocratic nation-state, true belief is neither eccentric nor irrational—it is an essential qualification for leadership. Power and status in Iran (and elsewhere within the Middle East) are determined not only by measurements which have earthbound connotations, but also by estimations of spiritual ordination, either officially or unofficially.

Furthermore, given this dual frame of reference (the earthly and the spiritual), concepts of justice, governance, and peace are very different in the Iranian cultural context than they are in the West. Justice and governance can only be provided by *shari'a* under the guidance of strict Islamic principles.[70] "Peace" is not simply the absence of a state of war—it is the state of existence which will arrive only after a global conflict in which Islam will prevail and subsequently provide order to the entire world.[71]

Power in Iran is in actuality a complex mixture of many elements, to include social and tribal status; perception of familial honor; educational affiliations; individual personality; ethnicity; networks facilitated by marriage; dedication to the ideology of the revolution; religious credentials, zeal and support from the clerical elite; personal social networks; age; current or former military and national organizational affiliations; gender; general health; perceptions of emotional and professional strength

vs. weakness; ability to use leverage and obtain consensus; and even the extent to which corruption is accepted, tolerated, or rejected. It is the flexible basis of power that determines who actually "holds the reins." Governmental power in terms of positional status has evolved over time, and often in accordance with the placement of persons by virtue of tribal influence, control (usually on the basis of corruption) over specific portions of wealth-bearing industries, and income amassed (usually illegally or at least at the expense of the poor) by elitists.[72] The degree to which individuals may be willing to defend their power by killing others (or having them killed)[73] may, in fact, determine their status and the esteem in which they are held by others at any particular time. The Supreme Leader is no exception.[74]

It is essential to keep in mind that, while power changes with the personalities involved, "few actors dare conduct important operations without at least the tacit approval of the senior leadership."[75] Any military or terrorist operation for which an Iranian connection could be made, is most likely done with the support of the regime—no matter how much of an attempt is made for it to look otherwise—and "'rogue operations' by security officials are generally not likely."[76]

Additionally, manipulation—for the purpose of gaining control over others—has become an art form. As former CIA director James Woolsey recently cautioned: "Remember, the Persians invented chess. They're good at it."[77]

While Iran has an active military—the IRGC (Islamic Revolutionary Guard Corps), the Artesh (the Regular Armed Forces), and the Basij (paramilitary forces recently brought under the umbrella of the IRGC[78])—they are heavily supplemented by a wide variety of terrorist groups (Sunni, Shi'a, and nationalist), which are supported by Iran.[79] As former "media director and chief congressional liaison for the National Council of Resistance of Iran, U.S. Representative Office (NCRI-U.S.)" and current President of Strategic Policy Consulting, Inc. Alireza Jafarzadah stated, "Iran is ground zero for international terrorism."[80] The U.S. State Department maintains that the Islamic Republic is an active state sponsor of Lebanese Hezbollah, "HAMAS, Palestinian Islamic Jihad, the al-Aqsa Martyrs Brigades, and the Popular Front for the Liberation of Palestine-General Command."[81] Members of the elite Qods Force (a unit of the IRGC that was recently identified "as a supporter of terrorism" by the U.S. Treasury and State Departments for the assistance it has provided to the Taliban[82]) acting in conjunction with representatives of Hezbollah have been implicated in training, funding, and arming anti-coalition and anti-Iraqi government militias within Iraq and Afghanistan.[83] Iran has also been cited as having retained unnamed or unidentified al-Qaeda "senior leaders" in "custody" since the attacks of 11 September 2001.[84]

The complex nature of power within Iran's leadership structure can be seen in the manner in which leaders' organizational affiliations and fulfillment of functions are intertwined with military units, terrorist groups, and individual "martyrs" or assassins. The affiliations portrayed at any particular point in time may depend highly on the type of support that is sought from or by the leader in question. The flexibility afforded by various levels of association with military organizations and terrorists or terrorist groups, combined with a certain amount of institutionalized secrecy, can provide the appearance of enigmatic power that is better left unquestioned. This is the type of power that is most often attributed to Mahmoud Ahmadinejad[85]—Iran's controversial apocalyptic president.

Mahmoud Ahmadinejad

> *"What makes Ahmadinejad different? The key element here, and one due to his own words and behavior, is that he seems not to be held back by caution, or any rational calculation of the balance of forces. In other words, he seems capable of anything and consequently far more dangerous."*
>
> —Barry Rubin, Jerusalem Post[86]

Regardless of Western perceptions, Ahmadinejad is not mad, nor is he irrational.[87] Neither are his objectives for the Islamic Republic. His beliefs are no different than those overtly espoused by either the Ayatollah Khomeini or the Ayatollah Khamenei.[88] Indeed, Ahmadinejad has been called "the most authentic voice of the regime since Khomeini himself lambasted the United States as the 'Great Satan.'"[89] He remains completely loyal to the current Supreme Leader; yet possibly because he has a more vibrant personality than the Ayatollah Khamenei and possibly because the Ayatollah has allowed and encouraged it, Ahmadinejad has been able to adroitly manipulate the mechanisms of and negotiate the pathways to power within the Iranian system.[90] In fact, his personality may be the reason that, as former Mayor of Tehran, Ahmadinejad was being groomed for the presidency—long before the election of 2005.[91] Khamenei may have seen complementary qualities in Ahmadinejad—qualities that he, himself, lacked—as well as the loyalty necessary to maintain the integrity of the leadership structure. Indeed, the Supreme Leader may actually believe that Ahmadinejad has the persistence and the audacity to take the Islamic Republic to its "logical" or constitutional conclusion.[92]

To Westerners and many allies, there seem to be no obvious external indicators of Ahmadinejad's "tremendous potential"—at least not as apparently seen by the Ayatollah Khamenei. It is more-or-less understood that he is an "ultra-conservative" with a "murky" past.[93] Some reports have connected him to a Hojjatieh sect, indicating that his beliefs are considered even more extreme than the ruling clerics'[94]—but these reports have never been confirmed.[95]

A rather poorly-dressed[96] son of an ironworker (which has reportedly been mistranslated as "blacksmith"),[97] Ahmadinejad became a student revolutionary leader while in college. According to some sources, he may have been involved in the U.S. embassy takeover in 1979.[98] He is later said to have joined the IRGC working as an intelligence agent, interrogator, torturer, and executioner, and is believed to have masterminded a series of assassinations in the Middle East and Europe.[99] Significant gaps and contradictions in his official biography tend to lend credence to at least some of this information, as do various bits of circumstantial evidence, legal documentation, and after-the-fact reporting by persons claiming that he had been involved in various international "incidents." Ahmadinejad later served as a cultural affairs advisor, governor general of a northwestern province, and a University Professor in Tehran, where he organized radical youth groups. He was appointed to the position of Mayor of Tehran in April of 2003.[100]

Circumstances surrounding Ahmadinejad's election to the presidency were highly unusual. Even before the actual election, he claimed knowledge of a supernatural influence that had assured his success;[101] and indeed, if his election was not due to human "engineering," there would almost have to have been a supernatural reason for the astounding outcome. His open discourse concerning personal contact with the *Mahdi* upon and after his election supposedly embarrassed and angered some senior

clerics,[102] yet due to the nature of the claims (as well as to the possibility that the Ayatollah Khamenei may be encouraging them), it is probably perceived as highly difficult, if not dangerous to refute them.

Whether or not his robustly held belief in apocalypticism is merely a by-product of wishful thinking or of an intentionally initiated and ongoing self-fulfilling prophecy, the clerical regime—to include the Supreme Leader—professes similar views.[103] Indeed, the Ayatollahs cannot be seen as defying Ahmadinejad based on his apocalyptic beliefs as long as they are in line with those upon which the Islamic Republic was founded. The position of Supreme Leader embodies only the "Imam of the Time,"[104] while the Twelfth or Hidden Imam (the *Mahdi*) could be called the "Imam of All-Time," and in the apocalyptic context—the Imam of the "End of Time."[105] Because the Ayatollah Khomeini believed himself to be the forerunner of the *Mahdi*,[106] his near-term successors were regarded as destined to be amongst those who would see the *Mahdi*'s return. Even if Ahmadinejad does not truly belief that he is the *Mahdi*'s "nail" (a helper or facilitator, of sorts) as followers have claimed him to be,[107] the president has firmly nailed a method of maintaining power that is reminiscent of the First *Valiy-e Faqih* (Supreme Leader).

Furthermore, the Ayatollah Khamenei nearly always backs the president, even when Ahmadinejad's rhetoric and behavior seem most outlandish to Western pundits. The limited amount of rebuke from the direction of the Supreme Leader could be explained by a need to maintain a balance of opposition between Ahmadinejad and Rafsanjani—a tactic possibly employed by the Ayatollah Khamenei to retain his own power by perpetuating a degree of infighting within the next positional level of the governing structure.[108] But there may also be other reasons.

In fact, there are indications that Ahmadinejad was elected with the help of the Supreme Leader.[109] Besides being a counterweight to the growing power of the Ayatollah Rafsanjani, Ahmadinejad was probably seen as valuable to the regime in keeping the nuclear regulatory wolves at bay. He may have been chosen as the most likely force to reinvigorate the nuclear weapons program and as a front-man for an extensive outreach program that would ultimately include all potential foes of the United States and Israel. Yet some would say that Ahmadinejad's invocation of the *Mahdi* in conjunction with his belligerent rhetoric regarding Iran's nuclear efforts and his growing influence within the IRGC and the Basij, are not-so-subtle revelations of his true personal goals. Journalist, editor, and professor at the Herzliya Interdisciplinary Center (IDC) Barry Rubin has deduced that "Ahmadinejad's goals, then, are his control over Iran, Iran's control over the Persian Gulf area (especially Iraq), Israel's destruction, Iranian leadership of the Middle East, and even world domination, in roughly that order."[110]

Islamic "Just War" and Global Jihad

> *"In the context of struggle between the early Muslims and their Qurayshi opponents, these sources [the Qur'an and hadith] suggest a developing sense that fighting is an appropriate means by which Muslims should seek to secure the right to order life according to divine directives. The notion of a just war is therefore an aspect of the foundational narrative of Islam."*
>
> —John Kelsay, *Arguing the Just War in Islam*[111]

The Islamic "just war" tradition is apocalyptic in nature and global in ultimate intent. It is waged against all unbelievers in accordance with the Qur'anic command to establish Islam (and therefore

"peace") throughout the world.[112] Scholar and Richard L. Rubenstein Professor of Religion John Kelsay, in his book *Islam and War*,[113] detailed similarities between the structure of Western (or Christian) and Islamic just war traditions, and in-so-doing, he noted vast differences in the associated meanings given to structural components.

In both traditions,[114] war should only be waged with "proper intent" and declared by a "right authority" after having established "just cause"; and then only as a "last resort." Participants must exhibit "proportionality and discrimination" and there must be a "reasonable hope of success." In the Western sense, each of these components could be argued at length when applied to specific cases, yet their generic definitions are relatively self-explanatory.[115] In the Islamic sense, argumentation and interpretation of components are judged in accordance with what Kelsay referred to as "Shari'a reasoning."[116]

University of Gottingen Professor of International Relations and Harvard Research Associate Bassam Tibi described an Islamic "just war" as "any war against unbelievers." It should be used as "a 'last resort' in following the basic Qur'anic precept to *guarantee* [italics added] the spread of Islam ['just cause'], usually when non-Muslims hinder the effort to do so."[117] He further describes it as a "Qur'anic command to spread Islam as a way to peace" ("proper intent"). It should be noted that true "peace" is established when Islam is global in nature.[118]

Similarly, Kelsay's understanding of "just cause" within the concept of a "just war" in the Islamic tradition is "the imperative to extend the boundaries of the territory of Islam" and the need to overcome obstacles to the spread of Islam—such as that posed by "the refusal of a non-Islamic political entity to acknowledge the sovereignty of Islam." The promotion of peace through the spread of Islam is considered to be "proper intent"—as once the entire world bows to Islam, there will be peace.[119]

Any Islamic "just war" must be preceded by an "invitation" to the ruler or leader of the opposition, issued via a communication by the "proper authority"—the "head of the Islamic state," a recognized prophet, *al-Mahdi*, or an individual designated by either *al-Mahdi* or *Allah*. The communication "invites" the ruler of the infidel opposition to convert or pay tribute, and the ruler or leader makes the decision for his or her entire population. The invitation to convert is accompanied or followed by a "declaration of Muslim intentions" or a "declaration of resolve of the Muslims to fight, should the enemy refuse the invitation."[120] The Muslim "right authority" must believe that there is a "reasonable chance for success," should a fight become necessary, and must have made arrangements for all manpower, weapons, and other resources to obtain a successful outcome prior to issuing the invitation. The "last resort" would be that of war—the default option that accompanies a decline or rejection of the invitation. In an Islamic "just war," fault for "excessive enemy casualties" lies with the opposing ruler, since it is that ruler's "recalcitrance…in the face of truth that has led to suffering for their people."[121]

Ahmadinejad's Apocalyptic "Just War"

> *"Now then, I invite you to Islam, embrace Islam and you will be safe; embrace Islam and Allah will bestow on you a double reward. But if you reject this invitation of Islam, you shall be responsible for misguiding the peasants."*
>
> —Bukhari, 4.52.191[122]

> *"Will you not accept this invitation? That is, a genuine return to the teachings of prophets, to monotheism and justice, to preserve human dignity and obedience to the Almighty and his prophets?"*
>
> —Mahmoud Ahmadinejad, Extract from the Letter to President Bush[123]

Ahmadinejad began his presidency with blasts of vicious rhetoric aimed at Israel and the United States, while overtly joining hands with known terrorists such as Imad Mughniyah and an array of leaders from anti-American nation-states. He sponsored, or at least approved of, a series of recruitment campaigns for suicide bombers reportedly for use against the West and Israel.[124] His threats against Israel have been seen as genocidal,[125] while those against the United States, border on suicidal. He appears (with a little help from Vladamir Putin, perhaps[126]) to be attempting to provoke an attack against Iran—and indeed, such an attack would reinforce his apocalyptic agenda. Popular Islamic apocalyptic scenarios begin with a nuclear attack launched by or from Israel, supported by the West.[127] But while a preemptive attack against Iran would be a win-win situation in regard to the establishment of "proper intent" for a "just war" (not only would retaliatory efforts be considered "just" in regard to a defensive posture, but the apocalyptic global spread of Islam is the very definition of "proper intent"), Ahmadinejad would still be complying with "just war" tradition if it was ultimately decided that Iran should attack first—especially if such an attack was directed by the *Mahdi*. "Last resort" could be claimed either way.

Perhaps the most astounding aspect of Ahmadinejad's presidency has been his seemingly unwavering belief that *al-Mahdi* will return during his presidency. At some point after his election, he stated that *al-Mahdi* would return within approximately two years.[128] Over the winter months of 2006 to 2007, a TV series entitled "The World toward Illumination" (sponsored by the Iranian government) was aired. With the final episode, came the announcement that *al-Mahdi* could possibly return as soon as the coming spring equinox (March 21st, 2007).[129] All the while, Ahmadinejad has repeatedly declared that he believes himself to be in communication with, and that his government has been blessed by, both *Allah* and the *Mahdi*[130]—thus establishing himself as speaker for the "ruler of the Muslim world,"[131] with the "right authority" to act in accordance with "just war" tradition. In fact, many of his public statements, such as the proclamation he made while in Indonesia (May 2006), serve to bolster this perception: "Resistance [against the West, nuclear protectionism, and sanctions]…will not only be for Iran but for all independent minded states including Indonesia, Malaysia, Turkey, Egypt and other Muslim countries**."**[132]

Apparently as *al-Mahdi*'s "designate," Ahmadinejad began to write letters not long after his election. In accordance with the Islamic "just war" tradition, communications consisting of "invitations" to convert have been forwarded to President Bush, the American people, and the newly elected Democratic Congress.[133] Letters (presumably of similar intent) have been sent to the Pope and French President Nicolas Sarkozy.[134] German Chancellor Angela Merkel received a letter with a much more vague "sales pitch."[135] Approximately 30 days after Ahmadinejad's visit to Indonesia, cleric and alleged spiritual leader of *Jemmah Islamiyah* (a terrorist organization with ties to *al-Qa'ida*) Abu Bakar Bashir (a Sunni) publicly called on President Bush and Australian Prime Minister John Howard to convert during a press conference seemingly convened specifically for that purpose.[136] *Al-Qa'ida* subsequently got into the act, when Adam Gadahn (a.k.a. Azzam the American) released a video entitled "An Invitation to Islam."[137]

The combination of *Shi'a* and *Sunni* voices calling for the conversion of the West may be an intentionally symbolic portrayal of the unity of the Muslim *ummah*—another element of apocalyptic Islam.[138]

Ahmadinejad demonstrated his belief that there was a "reasonable chance for success"—that sufficient resources were available to wage a war and succeed—by advertising a major military exercise, which had apparently been timed to make a very large impression on the West. The "Great Prophet" wargames (4-11 April 2006) were held just prior to the beginning of his letter-writing campaign. During this period, several new missiles were tested, the Straits of Hormuz were threatened, and the fact that Russia had launched a Sina-1 Satellite for Iran was revealed. The festivities culminated with an announcement of success with Iran's nuclear enrichment program.[139]

Within a few days of the delivery of Ahmadinejad's letter to President Bush, European Union Negotiator Javier Solana announced the preparation of a "bold package" of incentives (backed by the EU, Russia, China, and the United States) to be provided to Iran in exchange for cooperation with the IAEA and an end to Iran's uranium enrichment program. It was later decided that the incentives package would be delivered personally by Solana, who would be utilizing an interesting tactic—while the incentives were to be provided in writing, the disincentives, or "sticks" were to be issued verbally.[140] The exact reasoning for this odd method of negotiation remains unclear,[141] but the resulting impression it may have given to Iranian leadership (or at least perhaps to Ahmadinejad) may not have been the desired outcome.

Nevertheless, Solana delivered the incentives package, as planned, on the 6th of June 2006—just over a week prior to Abu Bakar Bashir's call for Western leaders' conversion to Islam. Ahmadinejad waited until the 17th to comment on the package—saying that the offer was a "step forward" and noting that his government intended to "offer changes" to the proposal. Following some pressure, Ahmadinejad reported that Iran's response would be forthcoming on the 22nd of August. A bizarre give-and-take with Ahmadinejad followed, where the EU would set a specific date for Iran's response to the incentives package that became a different, usually later, date with each warning (thus giving the coalition the appearance of being weak and indecisive), while Ahmadinejad continuously countered with "22 August."[142]

Overall, the attitude of Iranian leaders did not appear to be conciliatory; indeed, the impression was that Iran had the upper hand. And it became increasingly apparent that Ahmadinejad had something in mind for the 22nd of August. The nature of just what that might be was brought to the world's attention by Middle East scholar and Princeton professor emeritus Bernard Lewis: the 22nd of August in 2006 just happened to be the date commemorating Muhammed's *mi`raj*, or "Night Journey," on a winged horse (or "*buraq*") to heaven and then to "the furthest Mosque" (Jerusalem), returning to Mecca. Against the backdrop of Iran's attempts to obtain a nuclear capability, the belief that this was a symbolic reference to nuclear war against Israel was inevitable.[143] Ahmadinejad even stated that the 22nd of August would "change their destiny."[144]

The month of June was turbulent. Hamas "ended a 16-month truce" with Israel, vowing "an earthquake in Zionist cities."[145] Both Hamas and Hezbollah began to escalate rhetoric and physical attacks against Israel. Reports indicated that cash, personnel, and weapons smuggling had increased at alarming rates.[146] On 12 July, approximately three weeks after Corporal Gilad Shalit was captured in Gaza,[147] two more Israeli soldiers, Ehud Goldwasser and Eldad Regev, were kidnapped by Hezbollah

operatives, adding to the general assumption that Ahmadinejad had something in mind for August 22nd.[148] Israel decided to retaliate, and the Israeli-Hezbollah War of 2006 began.[149]

Yet after weeks of projecting the "upper-hand" attitude, Ahmadinejad suddenly seemed agitated. On the 30th of July, the spokesman for Iran's Foreign Ministry, Hamid-Reza Asefi, stated during a press conference: "If tomorrow a [U.N. Security Council] resolution is released against the Islamic Republic, then the P5+1 [incentives] package will no longer be an issue."[150] Could this have been a rejection of what Ahmadinejad had believed was an offer of tribute?

The next day, the U.N. Security Council Resolution 1696 passed with a "'mandatory and binding requirement' for Iran to comply with IAEA demands" or face the possibility of sanctions. The resolution gave Iran until the very last day of August to suspend uranium enrichment.[151] Amazingly, Ahmadinejad countered with a response date of "22 August."[152]

That is when things began to get interesting. Ahmadinejad, evidently aggravated by a lack of response from President Bush to his letter, unexpectedly offered U.S. newsman Mike Wallace a personal interview—an offer Wallace could not refuse. The interview was hastily arranged, conducted, and taped on the 8th of August; then subsequently aired on the 13 August broadcast of "60 minutes."[153] During the interview, the topic of the letter to President Bush was raised. When Wallace asked what the Iranian president had expected to gain with the letter, Ahmadinejad pointedly told him that he "*was expecting Mr. Bush to give up"* [italics added]; but continued: "or I should say to change his behavior." He then used the opportunity to send a "message" to President Bush: "*Those who refuse to accept an invitation to good will not have a good ending or fate* [italics added]."[154] (The "offer of tribute" was officially denied, and "just cause" for war was established.)

A "declaration of resolve" followed on the 16th of August in the form of an announcement of another impending exercise, codenamed "Blow of Zolfaghar" [155] (a reference to the sword of Imam Ali, the Prophet's son-in-law, which is to be carried or worn by *al-Mahdi* upon his return [156]). The "declaration" was punctuated with a statement issued by the Deputy Commander of the Artesh, Brigadier General Mohammad-Reza Ashtiani: "We must show the enemies the Islamic Republic's military capability."[157]

The 22nd of August was, however, anticlimactic. Ahmadinejad's response to Solana's package of incentives was essentially—"No!" Whatever it was that had originally been planned for the 22nd of August remains a mystery. Insistence on that particular date may simply have been a delaying or diversionary tactic—an attempt to do anything that might garner more time to further Iran's nuclear agenda.[158] It might have been a ploy to push the infidel leaders into accepting Islam—one that Ahmadinejad, for some reason (perhaps out of fear of a nuclear attack against Israel), believed would work. More plausibly, something big really was in the works—something which was disrupted by the Israeli-Hezbollah War. It is possible that the war began all too soon—before all of the necessary resources were in place—and resulted in a premature use of the resources that had been rallied in support of the effort. Furthermore, Israel may have responded with more force than expected, as they had done in the Six-Day War.[159] Regardless, it would seem that Ahmadinejad (or Iranian leaders) felt a need to delay the original plans.

A brief recap of this period reveals the "just war scenario" unfolding:

- There was an initial demonstration of sufficient resources for a "reasonable chance for success" in April 2006 (the "Great Prophet" exercise).

- During a May trip to Indonesia (2 days after writing a letter to President Bush), Ahmadinejad publicly proclaimed himself to be the "ruler" of the Muslim world (establishing "right authority").
- President Bush received invitations to convert from both Shi'a (Ahmadinejad) and Sunni (Bashir and Gadahn) leaders (showing unification and establishing "proper intent").
- A Coalition of nations offered a package of "incentives" with no written "disincentives." EU Negotiator Javier Solana presented the "sticks" verbally and in person. (Ahmadinejad may have assumed it was an "offer of tribute" in submission to Islam.)
- At this point it's Ahmadinejad's move:
  - He could simply comply with UN Security Council demands to halt uranium enrichment (which he would not do, if he believed the offer of tribute to be real—or especially if he wanted to make it look to others as if it were an offer of tribute)
  - He could accept the incentives as an offer of "tribute"
  - He could declare a "just war"
- His actions and discussion with Mike Wallace would seem to tell us that:
  - He was upset with the lack of response and possibly with the manner in which "tribute" was offered, and/or
  - He was upset that his plans for 22 August had been thwarted; so,
  - He has declared war.

Consideration should therefore be given as to whether the "appearance" of offering "tribute" was intentional on the part of the United States and European Union. Was it really "tribute," and if so, was it a way of playing Ahmadinejad's game or simply playing for time? Could it have been a "face-saving" gesture for Ahmadinejad's benefit? Or was the Islamic "just war" tradition even considered?

On the 15th of October 2006, Ahmadinejad announced that only one more step remained before Iran would attain "the Summit of Nuclear Technology." He told Iranians that he had spoken to *Allah*, and that *Allah* told him to anticipate victory—that the infidels will not harm believers. Ahmadinejad further attempted to encourage his public by stating: "…I told you that the second wave of the [1979 Islamic] Revolution has already begun [with my election to the presidency in 2005], and that it is bigger and more terrible than the first."[160] Six days later he followed up with a threat to Europe and the United States—warning that they will "pay" for backing Israel.[161]

In November, following the American general elections, Ahmadinejad wrote another letter—this time, to the newly installed Democrats within Congress and to the "American people" in general.[162] His message to Congress was:

> *"It is possible to govern based on an approach that is distinctly different from one of coercion, force and injustice."*
>
> *"It is possible to lead the world towards the aspired perfection by adhering to unity, monotheism, morality and spirituality and drawing upon the teachings of the Divine Prophets."*

His message to the American people:

> *"I am confident that you, the American people, will play an instrumental role in the establishment of justice and spirituality throughout the world."*

—meaning the people should impress upon their government the importance of submission and conversion to Islam, and

> *"The promises of the Almighty and His prophets will certainly be realized, Justice and Truth will prevail and all nations will live a true life in a climate replete with love, compassion and fraternity"*[163]

—meaning peace will be obtained when the world is one under Islam.

Ending the letter with a warning, Ahmadinejad said: "The US governing establishment, the authorities and the powerful should not choose irreversible paths"—the rulers should not choose unwisely for their people. "As all prophets have taught us, injustice and transgression will eventually bring about decline and demise." He then invited all to convert: "Today, the path of return to faith and spirituality is open and unimpeded." [164]

Conclusion

> *"The fact that Ahmadinejad's policy of deliberate provocation has been cost-free so far has made it impossible for the more pragmatic elements of the Khomeinist regime to develop an alternative to his quest for a "clash of civilizations." Most Iranians, including those opposed to the Khomeinist regime as a whole, do not see why Iran should change any aspect of its nuclear program when there is no risk in pursuing it."*
>
> —Amir Taheri, "Eye of the Storm: Hiding in a Paradox" [165]

Would Iran launch nuclear weapons having achieved a capability to do so? Some would say "not necessarily"[166]—that the capability is most probably for the purpose of prestige and power within the region, with the added bonus of additional energy resources that could either be used internally or sold to other countries. Others would say "absolutely"—and that "the decision [to launch nuclear weapons] will be easy, based on a 25-year tradition of rule by a wholly manufactured, false version of Islam that justifies launching such an apocalypse"[167] But more to the point—is it possible that a coalition of nations, terrorist groups, criminals, and arms proliferators, fronted by Iran and supported by Russia could band together with sufficient determination to plan and wage a coordinated attack against the United States, Israel, and all Western allies? Unfortunately, this scenario is becoming more likely by the day.

Ahmadinejad is very close to being cornered. The return of the *Mahdi*, as promised after his election in 2005, is late—and although timing in the Middle East isn't as exact as it often is in the West, if a *Mahdi* doesn't appear soon, Ahmadinejad's credibility will be questioned. Additionally, more pressure for Iran to end uranium enrichment and divulge its weapons program in its entirety is being exerted by the United States, the EU, and Israel. All realize that time is short—many are saying that something must be done soon.

If Ahmadinejad's Iran could be likened to an "apocalyptic cult," a reasonable conclusion could be drawn. Historically, apocalyptic cult leaders have done one of three things when cornered. In Ahmadinejad's case, he could expand the list to a fourth option:

> *He could change his apocalyptic scenario to match the situation at hand (just as many cults have done—this would not be out of line with Islamic apocalyptic beliefs, as it is said that al-Mahdi will return only when the followers are sufficiently prepared, "wise enough and ready to accept justice"* [168] *or when "corruption and injustice reach their zenith"* [169]*)*
>
> *He could commit suicide with his followers (similar to the Jonestown or Heaven's Gate cults,*[170] *yet on a much larger scale—especially if attempted via provocation of a nuclear strike by the United States and Western Allies)*
>
> *He could make the rest of the world convert or "go away" (meaning "die," perhaps similar to the manner in which the blind leader of the Aum Shinrikyo cult, Shoko Asahara had planned)* [171]
>
> *He could attempt all of the above—leading to "a cataclysmic end of the material world"* [172]

It is virtually certain that all roads are leading to a nuclear Tehran; but much damage could be done to Western nations, Israel, and allies worldwide, whether or not nuclear capability is ever achieved by Iran. Ahmadinejad may have lots of help—he has successfully courted almost every anti-American and anti-Israeli dictator around the globe. And perhaps even more disturbing—Vladimir Putin could be working behind the scenes, using Iran and its proxies to achieve his own objectives.

So—what would you do if you were the U.S. president? How do you counteract a "group of global reach" with leaders who truly believe they can carry out a global apocalypse? How could you mount a defense of your nation and culture based on Western politically correct expectations while the "group of global reach" is free to use any and all means available—to include political correctness—to obliterate the very foundation of Western culture? How do you fight an enemy who actually wants to bring about a "cataclysmic end of the material world?"

These are all difficult questions to answer. There may, in fact, be no answer. The United States, the EU, and Israel are, after all, still floundering with the very basic question of whether or not to attack Iran's nuclear facilities before they have an opportunity to build nuclear weapons. An instructive attempt to obtain clarity regarding the latter can be seen in a recent report by policy analyst Larry Derfner. After discussing the issue with three Israeli experts identified in an article he wrote for the *International Jerusalem Post,* Defner noted:

> *On the supreme strategic dilemma of our time— whether to bomb Iran's nukes or not— the expert view is: "Yes, no, I don't know."* [173]

Endnotes

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2. Reuters, "Iran sees second satellite in orbit in two years," Iran Focus, 10 April 2006 [news service on-line]; available from http://www.iranfocus.com/modules/news/article.php?storyid=6685; Internet; accessed 10 April 2006.

3. Broad & Sanger, "Iran Joins the Space Club, But to What End?"

4. Ibid.; Brian T. Kennedy, *Assessing Iran's Missile Threat in the United States* (A Robert Guzzardi Lecture Series event, Philadelphia, PA: Middle East Forum, 26 March 2008). John Lewallen (Ed.), High-Altitude Nuclear War: U.S. House of Representatives Electromagnetic Pulse Hearings (Mendocino, CA: NuclearPress.com, 2002).

5. Alireza Jafarzadeh, *The Iran Threat: President Ahmadinejad and the Coming Nuclear Crisis* (New York: Palgrave Macmillan, 2007), p. 82.

6. Jafarzadeh, The Iran Threat, p. 31-32. Yonah Alexander & Milton Hoenig, *The New Iranian Leadership: Ahmadinejad, Terrorism, Nuclear Ambition, and the Middle East* (Westport, CT: Praeger Security International, 2008).

7. Al J. Venter, *Iran's Nuclear Option: Tehran's Quest for the Atomic Bomb* (Philadelphia, PA: CASEMATE, 2005). Efraim Inbar, "An Israeli View of the Iranian Nuclear Challenge," *Foreign Policy Research Institute* E-Notes, 4 April 2008. Gordon Corera, *Shopping for Bombs: Nuclear Proliferation, Global Insecurity, and The Rise and Fall of the A. Q. Khan Network* (New York: Oxford University Press, 2006). Jafarzadeh, *President Ahmadinejad and the Coming Nuclear Crisis*. U.S. Rep. Mike Rogers, "Beware Iran: Debate Over Intelligence Blurs an Increasing Threat," *Detroit Free Press*, 05 September 2007 [Online]; http://www.iranfocus.com/modules/news/article.php?storyid=12308; Internet, accessed 18 September 2007. Yossi Melman & Meir Javedanfar, *The Nuclear Sphinx of Tehran: Mahmoud Ahmadinejad and the State of Iran* (New York: Carooll & Graf Publishers, 2007). Zalmay Khalilzad, "Iran's Nuclear Threat," *The Wall Street Journal*, 4 March 2008 [Online]; http://www.wsj.com; Internet, accessed 4 March 2008.

8. Amir Taheri, "The Frightening Truth of Why Iran Wants a Bomb," *The Daily Telegraph*, 16 April 2006 [newspaper on-line]; available from http://www.telegraph.co.uk/opinion/main.jhtml?xml=/opinion/2006/04/16/do1609.xml; Internet; accessed 16 April 2006. "Iran Threatens to Carry Out Missile Strikes on Enemies," *Iran Focus*, 28 January 2006 [news service on-line]; available from http://www.iranfocus.com/modules/news/article.php?storyid=5514; Internet; accessed 2 March 2006. "Iran's President: Islam to Dominate World in 'Near Future'," *Iran Focus*, 2 March 2006 [news service on-line]; available from http://www.iranfocus.com/modules/news/article.php?storyid=6032; Internet; accessed 2 March 2006. Iran Focus, "Iran Cleric Says Islam Must Conquer World," Iran Focus, 4 March 2006 [news service on-line]; available from http://www.iranfocus.com/modules/news/article.php?storyid=6057; Internet; accessed 4 March 2006. Lindsey Hilsum, "Preparing for Judgement Day." The New Statesman, 5 December 2005 [magazine on-line]; available from http://www.channel4.com/news/special-reports/special-reports-storypage.jsp?id=1262; Internet; accessed 31 March 2006.

9. Anoushiravan Ehteshami & Mahjoob Zweiri, *Iran and the Rise of its Neoconservatives: The Politics of Tehran's Silent Revolution* (London & New York: I.B. Tauris, 2007), p. 41-48. Jafarzadeh, *The Iran Threat*, p. 21-35.

10. Jafarzadeh seems convinced of this (see Jafarzadeh, *The Iran Threat*, p. 173). As to the specifics of restarting or accelerating the weapons program, the latest Intelligence Community NIE stated a judgment "with high confidence that in fall 2003, Tehran halted its nuclear weapons program." See *National Intelligence Estimate: Iran: Nuclear Intentions and Capabilities*, November 2007 [Online], available from: http://www.terrorisminfo.mipt.org/pdf/National-Intelligence-Estimate-Iran-Nuclear-Intentions-November-2007.pdf; Internet, accessed 28 January 2008. This NIE has since been under extremely heavy scruitiny, however (see Eli Lake, "U.S. Spy Chief Retreats on Iran Estimate," *The New York Sun*, 6 February 2008 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=14078; Internet, accessed 6 February 2008; and Rowen Scarborough, "Intelligence Officials Downplay Iran Report," *The Washington Times*, 4 April 2008 [Online]; available at: http://www.washingtontimes.com; Internet, accessed 4 April 2008. Also see Elaine Sciolino and William J. Broad , "Iran Expanding its Nuclear Program Agency Reports," *The New York Times*, 30 August 2007 [Online]; available at: http://www.nytimes.com; Internet, accessed 30 August 2007.

11. David Horovitz, "Stopping Iran," The Jerusalem Post, 24 April 2008 [Online]; available at: http://www.jpost.com /servlet/Satellite?cid=1208870487135&pagename=JPost%2FJPArticle%2FShowFull; accessed on 25 April 2008. In fact, Iran and North Korea may have been and may still be cooperating in many areas of nuclear capability and weapons development (See Bill Gertz, "How the 'Axis' Seeks the Killer Missile," *The Washington Times*, 30 January 2007 [Online]; available from: http://www.washingtontimes.com; Internet, accessed on 31 January 2007 and Clair Lopez, "Mind War Victory for Iranian Nukes," Gerard Group International, 16 October 2007 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=12814; Internet, accessed 16 October 2007.) More recently, North Korea has been cited as helping Syria with a plutonium-based facility, at least part of which was destroyed during an Israeli air strike (See Jay Solomon, "North Korea Helped Syria's Nuclear Program," *The Wall Street Journal*, 22 April 2008 [Online]; available at: http://online.wsj.com/article/SB120889732155735901.html; Internet, accessed 22 April 2008.) Regarding mutually assured success via belligerence and manipulative behavior, see: David E. Sanger, "Nuclear Tag Team: The Lone Superpower That Couldn't," *The New York Times*, 15 October 2006 [Online]; available at: http://www.nytimes.com; Internet, accessed 19 October 2006. Edith Lederer, "Bolton Says Regime Change is Only Option to Resolve Iranian, North Korean Nuclear Crises," *Associated Press* and *Boston Herald*, 21 March 2007 [Online]; available at: http://www.nti.org/d_newswire/issues/2007_3_21.html#BE477E4B; Internet, accessed 21 March 2007.

12. Karim Sadjadpour, Reading Khamenei: *The World View of Iran's Most Powerful Leader* (Washington D.C.: Carnegie Endowment for International Peace, 2008), p. 14.

13. Amir Tahiri, "Eye of the Storm: The Thumpin' as Seen from the Middle East," *The Jerusalem Post*, 14 November 2006 [Online]; available at: http://www.jpost.com/servlet/Satellite?cid=1162378399309&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 14 November 2006.

14. Alan Clendenning, "Iran Strengthens South American Ties," *Associated Press*, 27 September 2007, [news service online]; http://www.iranfocus.com/modules/news/article.php?storyid=12603; Internet; accessed 28 September 2007. Con Coughlin, "Inside Abroad: Tehran Thinks It Has Moved One Step Closer to a Nuclear Arsenal," *The Daily Telegraph*, 06 April 2007 [Online]; http://www.iranfocus.com/modules/news/article.php?storyid=10781; Internet, accessed 07 April 2007. Michael Sheridan, "North Korea's Plutonium Pile Attracts Iran," *The Sunday Times*, 29 January 2006 [Online]; http://www.timesonline.co.uk; Internet, accessed 29 January 2006. Reuters, "Iran Secure with Missiles, Centrifuges," Reuters, 19 November 2006 [Online]; http://www.iranfocus.com/modules/news/article.php?storyid=9256; Internet, 20 November 2006. "Iran, Nicaragua Deepen Links Despite U.S. Concerns," *Reuters*, 02 August 2007, [news service online]; http://www.iranfocus.com/modules/news/article.php?storyid=12001; Internet, accessed 03 August 2007.

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16. Ehteshami & Zweiri, *Iran and the Rise of its Neoconservatives*, p. 139.

17. Ehteshami & Zweiri, *Iran and the Rise of its Neoconservatives*, p. xiv,129, 141. Neil King, Jr., "Technology Shipments Frustrate Bid to Curb Tehran's Nuclear Program," *The Wall Street Journal*, 27 July 2007 [Online]; http://www.wsj.com; Internet, accessed 29 July 2007. Melman & Javedanfar, The Nuclear Sphinx of Tehran, p. 158.

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2007 [Online]; available at: http://www.nytimes.com; Internet, accessed 11 October 2007. Vladamir Isachenkov, "Putin Visits Iran, Sends Warnings to US," *The Associated Press*, 16 October 2007 [Online]; available at: http://www.washingtonpost.com; Internet, accessed 16 October 2007.

20. "Iran: Bushehr Plant Ready by March," *CNN.com*, 23 December 2007 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=13633; Internet, accessed 18 January 2008. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*, p. 62.

21. Broad & Sanger, "Iran Joins the Space Club, But to What End?".

22. "Iran Receives Russian Missiles," *The Jerusalem Post*, 24 January 2007 [Online]; available at: http://www.jpost.com/servlet/Satellite?cid=1167467804235&pagename=JPost%2FJPArticle%2FShowFull; accessed 25 January 2007. "Iran: Russia to Sell Us Aircrafts," *IranFocus.com*, 20 November 2007 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=13248; Internet, accessed on 20 November 2007. Yaakov Katz and Herb Keinon, "Iran to Buy Jets from Russia," *The Jerusalem Pos*t, 30 July 2007 [Online]; available at: http://www.jpost.com/servlet/Satellite?cid=1185379034835&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 30 July 2007.

23. This could be explained by aggressive counterterrorism efforts against rebel leaders on the part of the Russian Government; however, considering past Chechen activities, as well as the model that al Qaeda presents in regard to having potential leaders at hand for immediate replacement when needed, the question of an agreement with Iran to quell terrorism might be worth more research. See Reuters, "Chechen Rebel Surrenders to Russia," *CNN.com*, 18 August 2006 [Online]; http://edition.cnn.com/2006/WORLD/europe/08/18/russia.chechnya/index.html; Internet, accessed 18 August 2006.

24. Isabella Ginor & Gideon Remez, Foxbats Over Dimona: The Soviets' Nuclear Gamble in the Six-Day War (New Haven & London: Yale University Press, 2007).

25. "Putin Warns Against Using Caspian Territories For Attack On Regional Powers," *The Jerusalem Post*, 16 October 2007 [Online]; available at: http://www.jpost.com/servlet/Satellite?cid=1192380568009&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 16 October 2007. "Gates Responds to Putin's Tough Talk," *Military.com*, 12 February 2007 [Online]; available at: http://www.military.com/NewsContent/0,13319,124938,00.html?ESRC=eb.nl; accessed 12 February 2007. Fredrik Dahl, "Putin Gave Iran 'Special' Atomic Message," *Reuters*, 17 October 2007 [Online]; available at: http://www.reuters.com/article/topNews/idUSDAH74470120071017; accessed 17 October 2007. Jafarzadeh, *The Iran Threat*, p. 137, 168. Max Boot, "Alarm Over Iran Helps Bush," *The Los Angeles Times*, 7 March 2007 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=10385; Internet, accessed 7 March 2007. Oliver North, "Moscow's New Military Assertiveness Isn't Just Talk," *FoxNews.com*, 16 August 2007 [Online]; available at: http://www.foxnews.com/story/0,2933,293506,00.html; Internet, accessed 17 August 2007. Isachenkov, "Putin Visits Iran, Sends Warnings to US."

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27. Adrian Blomfield, "Vladimir Putin's Nuclear Threat to the West," *The Daily Telegraph*, 26 February 2008 [Online]; http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2008/02/15/wputin115.xml; accessed on 26 February 2008. Wall Street Journal Review & Outlook, "Putin the Great," *The Wall Street Journal*, 3 October 2007 [Online]; available at: http://online.wsj.com/article/SB119137825763247310.html; Internet, accessed 3 October 2007.

28. There are, however, alternative considerations—there exists the possibility, however slight, that Putin was asked to either convert or to pay tribute. If asked, he may have "converted" to Islam in order to retain the alliance (for purposes of political expediency)—or he may have offered a stronger commitment of Russian support to Iran , either militarily, or possibly in regard to finishing the Bushehr reactor after contractual and payment issues (see Global Security Newswire, "Russia Denies Changing Policy on Iranian Reactor," *National Journal Group*, 21 March 2007 [Online]; available at: http://www.nti.org/d_newswire/issues/2007_3_21.html#BE477E4B; Internet, accessed 22 March 2007; and Reuters, "Russia May Spur Tehran's Atomic Fuel Work," *Iran Focus*, 3 April 2007 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=10702; Internet; accessed 3 April 2007). This would explain why there has been no announcement made by the Islamic Republic of any letter of "invitation" being offered to the leader of Russia. On the

other hand, no known invitation has been made to China either. Neither has one been sent to the Prime Minister of the United Kingdom, but that mystery could be explained by the supposition (in Ahmadinejad's mind) that the position of leader of the European Union would most probably supersede that of the U.K. Prime Minister. It is also possible that any or all of these leaders have been beneficiaries of Ahmadinejad's pen, but that such letters have not become the topic of open source speculation.

29. Abbas Amanat, "The Resurgence of Apocalyptic in Modern Islam," *The Encyclopedia of Apocalypticism: Vol 3. Apocalypticism in the Modern Period and the Contemporary Age*, ed. Stephen J. Stein (New York: Continuum Publishing Company, 2000), 237-242. 'Ali Shari'ati, *Intizar Mazhab-i I'yiraz* (n.p. 3rd ed., 1396Q/1976), cited in Amanat, "The Resurgence of Apocalyptic in Modern Islam," p. 253.

30. Alexander & Hoenig, *The New Iranian Leadership*, p. 25. Hoveyda, *The Broken Crescent: The Threat of Militant Islamic Fundamentalism*. Jafarzadeh, *The Iran Threat*. Melman & Javedanfar, *The Nuclear Sphinx of Tehran,* p. 65. Reza Aslan, *No God but God: The Origins, Evolution, and Future of Islam* (New York: Random House, 2005), p. 189-190.

31. *Constitution of the Islamic Republic of Iran*, October 1979 as cited in Jafarzadeh, The Iran Threat, p. 55. .

32. Farhad Khosrokhavar, *Suicide Bombers: Allah's New Martyrs*, trans David Macey (London: Pluto Press, 2002), p. 33.

33. Bruce Hoffman, *Recent Trends and Future Prospects of Iranian Sponsored International Terrorism* (R-3783-USDP) (Santa Monica, CA: RAND Corporation, 1990), p. 3. In fact, It has been noted that the official Internet website of the Ayatollah Khamenei refers to him as "Supreme Leader of Muslims." (See Sadjadpour, *Reading Khamenei*, p. 22.)

34. Khosrokhavar, *Suicide Bombers*, p. 215-216.

35. Abdulaziz Abdulhussein Sachedina, *Islamic Messianism: The Idea of the Mahdi in Twelver Shi'ism* (New York: State University of New York Press, 1981). Ayatollah Ibrahim Amini, *Al-Imam Al-Mahdi: The Just Leader of Humanity* (trans. Abdulaziz Sachedina); (London: Al-Islam.com/Ahlul Bayt Digital Islamic Library Project, 1996); available from http://www.al-islam.org/mahdi/nontl/Toc.htm; Internet; accessed on 8 February 2006

36. Amanat, "The Resurgence of Apocalyptic in Modern Islam," p. 259. Timothy R. Furnish, *Holiest Wars: Islamic Mahdis, Their Jihads, and Osama bin Laden* (Westport, CT: Praeger Publishers, 2005).

37. Amanat, "The Resurgence of Apocalyptic in Modern Islam," p. 259.

38. Amini, Al-Imam Al-Mahdi: *The Just Leader of Humanity*. David Cook, Contemporary Muslim Apocalyptic Literature (Syracuse, NY: Syracuse University Press, 2005). Furnish, *Holiest Wars,* Sachedina, *Islamic Messianism*. Samuel Shahid, *The Last Trumpet: A Comparative Study in Christian-Islamic Eschatology* (Longwood, FL: Xulon Press, 2005).

39. Amini, Al-Imam Al-Mahdi: *The Just Leader of Humanity*. Idara Dawat-O-Irshad, *Identification of the Prophesied Imam Mahdi*, n. d. [Online]; available from http://irshad.org/islam/prophecy/mahdi.htm; Internet; accessed 20 September 2005. In regard to the "prominent nose" and "broad forehead," Idara Dawat-O-Irshad cites Abu Dawud, Sahih, Vol. 2, p. 208 and Fusul al-muhimma, p. 275. Mufti A. H. Elias & Mohammad Ali ibn Zubair Ali, Imam Mahdi (Descendent of Prophet Muhammad PBUH), n.d. [Online]; retrieved from http://www.islam.tc/prophecies/imam.html; Internet; accessed 28 August 2001.

40. Amini (Al-Imam Al-Mahdi: *The Just Leader of Humanity*) cites *Kitab al-hawi li al-fatawa*, Vol. 2, p. 135 as the source for the age of approximately 40. Elias & Ali, *Imam Mahdi*.

41. Shahid, *The Last Trumpet*, p. 118.

42. Sa'id Ayyub, *Al-Masih Al-Dajjal* (Cairo: Fath li-l-A'lam al-'Arabi, 1987), cited in Cook, *Contemporary Muslim Apocalyptic Literature*, p. 39. Ayyub identified al-Mahdi as the rider of the white horse in Revelation19:11-13. Others who have claimed that al-Mahdi will be riding a white horse include: Muhammad Ibn'Izzat and Muhammad 'Arif, *Al Mahdi and the End of Time*, (London: Dar Al-Taqwa, 1997), 4 cited in Joel Richardson, *Will Islam be Our Future?: A Study of Biblical and Islamic Eschatology*, [Online] http://www.answering-islam.org.uk/Authors/JR/Future/index.htm; Internet; accessed 18 May 2006, ch. 4 and The Gates of Isis, *The Twelfth Imam*, n.d. [Online]; available from http://www.sakshi.org/sakshi/poems/imam.htm; Internet; accessed on 18 May 2006.

43. Fabonline.com, *The Rising of Imam al-Mahdi* [Online]. retrieved from http://www.fabonline.com/Articles/IMAMSz12TheRisingofImamalMahdi.htm; Internet; accessed 28 August 2002. 'Ali al-yazdi al-Ha'iri, *Ilzam al-Nasib fi Ithbat Hujjiyat al-Gha'ib* (Tahran Press, 1351 H./1952), 208 as cited in Shahid, *The Last Trumpet*, 120-121.

44. Both Fabonline.com, *The Rising of Imam al-Mahdi*, and Melman & Javedanfar, *The Nuclear Sphinx of Tehran*, say the close helpers will number 313. Melman & Javedanfar say the number "will grow to 10,000" (see p. 44).

45. Elias & Ali, *Imam Mahdi*. Idara Dawat-O-Irshad, *Identification of the Prophesied Imam Mahdi*. Idara Dawat-O-Irshad cites Abu Dawood for pledge of Iraqi allegiance to al-Mahdi (p. 2-3).

46. Abdullah Azzam, *Join the Caravan: The Forgotten Obligation*; Religioscope, 2001; [Online] available from http://www.religioscope.com/info/doc/jihad/azzam_caravan_1_foreword.htm; Internet; accessed 5 September 2003. Amini, Al-Imam Al-Mahdi. Anjuman-e-Asghari Jamat, Al-Muntazir: *The Awaited One*, n.d. [Online] available from the http://www.mnjamat.org/../jamaat/munatzir/1.htm; Internet; accessed 21 July 2003. Cook, *Contemporary Muslim Apocalyptic Literature*, 26-27. Faud Salim, *Asrar Al-Sa'a Wa-Hujum Al-Gharb* (Cairo: Madbuli al-Saghir, 1998); quoted in Cook, *Contemporary Muslim Apocalyptic Literature*, 127. Furnish, *Holiest Wars*. 'Abd al-Wahhab 'Abd al-Salam Tawila, *Al-Masih Al-Muntazar Wa-Nihayat Al-'Alam* (Cairo: Dar al-Salam, 1999); quoted in Cook, *Contemporary Muslim Apocalyptic Literature*, 128. Jassim M. Hussain, *The Occultation of the Twelfth Imam: A Historical Background*. (Great Brittain: The Muhammadi Trust, 1982). Shahid, *The Last Trumpet*. Shaykh Muhammad Nazim Adil Al-Haqqani An-Naqshbandi, *Mystical Secrets of the Last Days*, (Chicago, IL: KAZI Publications Inc., 1994). It is important to note that Cook cites the works of apocalyptic writer Bashir 'Abdallah (*Zilzal al-Ard al-'Azim*, 1994), in which he claims that "the infidel community" will impose a similar choice on Muslims—either they succumb to "the atheism and the life of lust in accordance with the manner of the good life as the infidels and the atheists practice it—or [they will] be expelled, killed, and annihilated" (see Cook, *Contemporary Muslim Apocalyptic Literature*, 157). Furthermore, Cook notes that 'Abdallah believed that the U.S. was engaged in this activity using the Global War on Terrorism (GWOT) as a cover. This is an interesting example of an effect that Barry Rubin, the Director of the Global Research in International Affairs Center reported in an article for *Foreign Affairs* (Barry Rubin, "The Real Roots of Arab Anti-Americanism," *Foreign Affairs*, 81 no. 6 (2002), 73-85). Rubin claims that Middle Eastern interest groups have dominated public opinion by accusing Americans of doing exactly what those in the Arab Middle East would do—in other words, they are being "Middle East-Centric." According to Rubin, the people of the Middle East believe that imperialist Americans want to take over their oil fields because that is exactly what Arab leaders would do if they were in charge of a superpower state. If they had been graced with such opportunity and then not acted in an imperialistic manner, they would (within their own culture) be perceived as weak, and therefore not entitled to respect. This "Rubin phenomenon" appears often in Islamic apocalyptic writings.

47. Lindsey Hilsum, "Strong Words From Iran," *News Hour with Jim Lehrer*, 9 December 2005 [Online]; available at: http://www.pbs.org/newshour/bb/middle_east/july-dec05/iran_12-9.html ; Internet, accessed 30 January 2006. Hilsum, "Preparing for Judgement Day."

48. Hossein Bastani, *Ahmadinejad in Touch with the 12th Imam*, Rooz, 11 December 2005 [Online]; available from http://www.roozonline.com/english/012416.shtml; Internet; accessed 17 March 2006.

49. Accounts vary as to exactly who will destroy the *Dajjal*. Some claim that it will be al-Mahdi, while others say that it will be Jesus. Some say both. See Cook, *Contemporary Muslim Apocalyptic Literature*, and Yaakov Lappin, "Mahdi Will Defeat Archenemy in Jerusalem," *YnetNews.com*, 31 December 2006 [Online]; available at: http://www.ynetnews.com/articles/0,7340,L-3346589,00.html; Internet, accessed 5 February 2007.

50. 'Abdallah, *Zilzal Al-Ard Al-'Azim*; quoted in Cook, *Contemporary Muslim Apocalyptic Literature*, 73-75.

51. Al-Haqqani an-Naqshbandi, *Mystical Secrets of the Last Days*, 31.

52. Cook, *Contemporary Muslim Apocalyptic Literature*, 76, 126-145.

53. Amini, *Al-Imam Al-Mahdi*, chapter 1, p. 4. Idara Dawat-O-Irshad, *Identification of the Prophesied Imam Mahdi*, 2. Furnish, in *Holiest Wars*, noted that traditions differ. His research indicated that *al-Mahdi's* period of rule could be five, seven, or nine years (p. 7, 15-16). Amini said seven or nine (see ch. 1, p. 4). For *al-Mahdi's* seven year rule, Idara Dawat-O-Irshad (p. 2-3) cites *Abu Dawud*, *Sahih*, Vol. 2, p. 208 and *Fusul al-muhimma*, p. 275. There are some variations, for instance, Idara Dawat-O-Irshad (p. 4) also notes two traditions that claim that *al-Mahdi* will rule for "seven or nine years" (*Ahmad b. Hanbal*, Musnad, Vol. 3, p. 27, *Ibn Hajar, al-Sawa'iq al-muharriqa*, p. 161; and *Yanabi' al-mawadda*, Vol. 2, p. 177 as quoted in Idara Dawat-O-Irshad).

54. Interestingly, an Islamic website discussing "the last days," claims that *al-Mahdi's* "companions will be from Kufa and the brave ones who would assist him would be from Syria" (Fabonline.com, *The Rising of the Imam al Mahdi*). "The Mahdi will go to Kufa (Iraq), sitting on the throne of King Solomon with the staff of Moses in his right hand. The Faithful Spirit and 'Isa, Son of Mary will be his companions. He will be wearing the cloak of the Prophet, and girded

with Dh al-Faqqar (the Prophet's sword)." (From 'Ali al-yazdi al-Ha'iri, *Ilzam al-Nasib fi Ithbat Hujjiyat al-Gha'ib* [Tahran Press, 1351 H./1952], 208.) Also see MEMRI, "Waiting For The Mahdi: Official Iranian Eschatology Outlined in Public Broadcasting Program in Iran, (MEMRI Special Dispatch Series – No. 1436)," The *Middle East Media Research Institute*, 25 January 2007 [Online]; available at: http://www.memri.org; Internet, accessed 5 February 2007.

55. Bashir Muhammad 'Abdallah, *Zilzal al-Ard al-'Azim* (Cairo: n.p., 1994), 474, cited in Cook, *Contemporary Muslim Apocalyptic Literature*, 88-89. Lappin, "Mahdi Will Defeat Archenemy in Jerusalem." Muhammad 'Isa Da'ud, *Al-Mahdi Al-Muntazar 'Ala Al-Abwab* (Cairo: Dar Randa Amun, 1997), 41, 237, cited in Cook, *Contemporary Muslim Apocalyptic Literature*, p. 146. Shahid, *The Last Trumpet*, p. 121).

56. Amanat, "The Resurgence of Apocalyptic in Modern Islam," 237-238. Bernard Lewis, "August 22: Does Iran Have Something in Store?" *The Wall Street Journal*, 8 August 2006; [newspaper on-line]; available at: http://www.opinionjournal.com/extra/?id=110008768; Internet, accessed on 8 August 2006. Cook, *Contemporary Muslim Apocalyptic Literature*, p. 10. Khosrokhavar, *Suicide Bombers: Allah's New Martyrs*, 22.

57. Indeed, the Ayatollah Khomeini fought long and hard to obtain Iraq, even as resources dwindled beyond hope. The apocalyptic belief is that Iraq is important, not only because the Mahdi will rule from Kufa, but it is also foretold that "the Eurphrates uncovers a mountain of Gold. People will fight to the death to possess it." (Shahid, *The Last Trumpet*, p. 42). Additionally, the Iranian TV show "The World Towards Illumination" claimed that some sources say that the Dajjal will be hung near the dump of Kufa (see Lappin, "Mahdi Will Defeat Archenemy in Jerusalem").

58. Amanat, "The Resurgence of Apocalyptic in Modern Islam," 237-238

59. Richard K. Herrmann & Jong Kun Choi, "From Prediction to Learning: Opening Experts' Minds to Unfolding History," *International Security*, Vol 31(4) (Spring 2007): 132-161.

60. Arash Samiei, "Destroying the Planning Agency by Merging it into the President's Office," *Rooz*, 11 July 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/07/destroying_the_planning_agency.html; Internet; accessed 12 July 2007. Daniel L. Byman, Shahram Chubin, Anoushiravan Ehteshami, & Jerrold Green, *Iran's Security Policy in the Post-Revolutionary Era* (Santa Monica, CA: RAND Corporation, 2001). Hamid Ahadi, "State Expeditionary Council Enlarged," Rooz, 1 March 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/03/state_expediency_council_enlar.html; Internet, accessed 5 March 2007. Hoffman, *Recent Trends and Future Prospects of Iranian Sponsored International Terrorism*. Mehrdad Sheibani, "The Approaching Caliphate," Rooz, 22 November 2006 [Online]; available at: http://www.roozonline.com/english/archives/2006/11/the_approaching_caliphate.html; Internet, accessed 30 November 2006. Ray Takeyh, *Hidden Iran: Paradox and Power in the Islamic Republic* (New York: Henry Holt and Company, 2006). Vahid Sabetian, "Fragmentation in the Majlis," Rooz, 25 January 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/01/fragmentation_in_the_majlis.html; Internet, accessed 26 January 2007.

61. Hassan Zarezadeh Ardeshir, "From Regime Spokesperson to Demands for Democracy," Rooz, 20 December 2006 [Online]; available at: http://www.roozonline.com/english/archives/2006/12/from_regime_spokesperson_to_de.html; Internet, accessed 10 January 2007. Kenneth R. Timmerman, "Slippery Slope in Iran," *The Washington Times*, 19 June 2006 [Online]; available at: http://www.washingtontimes.com; Internet, accessed 19 June 2006. Takeyh, *Hidden Iran*. Sadjadpour, *Reading Khamenei*. Sina Hosseini, "Clergy Moves Away from Ahmadinejad Toward Rafsanjani," *Rooz*, 12 February 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/02/clergy_moves_away_from_ahmadin.html; Internet, accessed 20 Feb 2007.

62. Azadeh Moaveni, "Power in the Shadows: Iran's Supreme Religious Leader Keeps a Low Profile—and May be the U.S.'s Best Hope for Avoiding Another War," *Time*, 25 June 2006; [news magazine on-line]; available from: http://www.time.com/time/magazine/article/0,9171,1207798,00.html?cnn=yes; Internet, accessed 15 July 2006 Sadjadpour, *Reading Khamenei*. Simon Scott Plummer, "Don't Underestimate the Weakness of Iran's Theocracy," *The Daily Telegraph*, 10 May 2006; [newspaper on-line]; available from: http://www.telegraph.co.uk/opinion/main.jhtml?xml=/opinion/2006/05/10/do1004.xml; Internet, accessed 10 May 2006. On the other hand, at least one reporter noted just the opposite effect (see Neil MacFarquhar, "How Iran's Leader Keeps the West Off Balance," *The New York Times*, 17 December 2006 [Online]; available at: http://www.nytimes.com; Internet, accessed on 20 January 2007.

63. The First Supreme Leader, the Ayatollah Khomeini, laid the foundation for following leaders to be less qualified when he arranged for a constitutional revision on qualifications for positions to include that of the Supreme Leader. As of April in 1989, "the Leader needed only be an expert on Islamic jurisprudence and possess 'the appropriate political and

managerial skills'" to lead the people—thus the fact that Ahmadinejad is not a cleric should present no problem whatsoever. (See Sadjadpour, *Reading Khamenei*, p. 6.)

64. Sadjadpour, in *Reading Khamenei*, describes both Ahmadinejad and the Ayatollah Yazdi as friends of and ideologues in line with the Ayatollah Khamenei (see especially page 4). Ardeshir, "From Regime Spokesperson to Demands for Democracy." Takeyh, *Hidden Iran*. Sina Hosseini, "Clergy Moves Away from Ahmadinejad Toward Rafsanjani," *Rooz*, 12 February 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/02/clergy_moves_away_from_ahmadin.html; Internet, accessed 20 Feb 2007.

65. Jafarzadeh, *The Iran Threat*. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*. Sadjadpour, in *Reading Khamenei*, describes both Ahmadinejad and the Ayatollah Yazdi as friends of and ideologues in line with the Ayatollah Khamenei (see especially page 4).

66. Jafarzadeh, *The Iran Threat*. Omid Memarian, "Khamenei Supports Ahmadinejad," *Rooz.com*, 22 November 2006 [Online]; Available at: http://www.roozonline.com/english/archives/2006/11/khamenei_supports_ahmadinejad.html; accessed 25 March 2008. Sadjadpour, *Reading Khamenei*.

67. JPost.com Staff, "Khamenei Hails Ahmadinejad's 'Nuclear Success'," *Jerusalem Post*, 26 February 2008 [Online]; available at: http://www.jpost.com/servlet/Satellite?c=JPArticle&cid=1203847472750&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 26 February 2008. Michael Slackman, "Iran Chief Eclipses Clerics as He Consolidates Power," *The New York Times*, 28 May 2006 [Online]; available at: http://www.nytimes.com; Internet, accessed 28 May 2006. Moaveni, "Power in the Shadows." Sadjadpour, *Reading Khamenei*, p. 1.

68 It must be remembered that not everyone within Iran was enamored of the Ayatollah Khomeini when he came to power—many dissenters left the country in order to escape the revolution and its aftermath. Still others waged a continuous war against the clerical regime. (See Jafarzadeh, *The Iran Threat*.)

69. See Eric Hoffer, *The True Believer: Thoughts on the Nature of Mass Movements* (New York: HarperCollins Publishers, 1951). For Iranian/Ahmadinejad application, see Daniel Gallington, "Nuclear Brinkmanship," *The Washington Times*, 15 June 2006 [Online]; available at: http://www.washingtontimes.com; Internet, accessed 15 June 2006. Marc Perelman, "U.S. Studies Iranian's Religious Ideology," *Forward*, 3 March 2006 [Online], available at: http://www.forward.com/articles/7431; Internet, accessed 27 March 2006. Scott MaCleod, "A Date With a Dangerous Mind," *Time*, 18 September 2006 [Online]; available at: http://www.time.com/time/magazine/article/0,9171,1535827-1,00.html; accessed 30 September 2006.

70. John Kelsay, *Islam and War: The Gulf War and Beyond: A Study in Comparative Ethics* (Louisville, KY: John Knox Press, 1993). John Kelsay, *Arguing the Just War in Islam* (Cambridge, MA: Harvard University Press, 2007), p. 188-191. Sadjadpour, *Reading Khamenei*, p. 9-12.

71. Bassam Tibi, "War and Peace in Islam," in T. Nardin (Ed.), *The Ethics of War and Peace: Religious and Secular Perspectives*, Vol 1, pp. 128-145 (Princeton, NJ: Princeton University Press, 1996). Patrick Poole, "Ahmadinejad's Apocalyptic Faith," *FrontPageMagazine.com*, 17 August 2006 [Online]; available at: http://www.frontpagemag.com/Articles/Read.aspx?GUID=32B294D4-A21C-4095-8D59-1B49230E3F5D; Internet, accessed 24 August 2006.

72. Byman, et al., *Iran's Security Policy in the Post-Revolutionary Era*. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*. Sadjadpour, *Reading Khamenei*.

73. Jafarzadeh, *The Iran Threat*. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*, p. 67.

74. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*, p. 67.

75. Byman, et al., *Iran's Security Policy in the Post-Revolutionary Era*, p. xiii.

76. Ibid, p. 22. Also see Jafarzadeh, *The Iran Threat*, pp. 61-62.

77. Kenneth R. Timmerman, "Former CIA Director: Terrorist Strike Within U.S. Real Threat," *NewsMax.com*, 7 August 2007 [Online]; available at: http://archive.newsmax.com/archives/articles/2007/8/6/172905.shtml?s=lh; Internet, accessed 7 August 2007.

78. "Basij Leadership Subordinated to Revolutionary Guards," *Rooz*, 1 October 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/10/basij_leadership_subordinated.html; Internet, accessed 1 October 2007.

79. Byman, et al., *Iran's Security Policy in the Post-Revolutionary Era*. Jafarzadeh, *The Iran Threat*. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*.

80. Jafarzadeh, *The Iran Threat*, p. 61.

81. U.S. Department of State, *Country Reports on Terrorism* (Washington, DC: Office of the Coordinator for Counterterrorism, 30 April 2007), Chapter 3; [Online]; available at: http://www.state.gov/s/ct/rls/crt/2006/82736.htm; Internet, accessed 18 April 2008.

82. "U.S. Details Quds Force's 'Lethal Support' to Taliban," *CNN.com*, 25 October 2007 [Online]; available at: http://edition.cnn.com/2007/WORLD/meast/10/25/quds.force/index.html; Internet; accessed on 25 October 2007. Office of the Spokesman, *Designation of Iranian Entities and Individuals for Proliferation Activities and Support for Terrorism*, (Washington, DC: U.S. Government, 25 October 2007); [Online]; available at: http://www.state.gov/r/pa/prs/ps/2007/oct/94193.htm; Internet, accessed 2 April 2008.

83. Brian Bennett, "Iran Raises the Heat in Afghanistan," *Time*, Vol. 171(9), 3 March 2008. "Tehran's Murderous Role," *The Washington Times*, 7 April 2008 [Online]; available at: http://www.washingtontimes.com/article/20080407/EDITORIAL/924073184/1013; Internet, accessed 7 April 2008.

84. U.S. Department of State, *Country Reports on Terrorism*, Chapter 3. Also see Fereydoun Hoveyda, "Iran and America," *American Foreign Policy Interests*, Vol 28 (1), 2006, pp. 15-21.

85. MaCleod, "A Date With a Dangerous Mind."

86. Barry Rubin, "Ahmadinejad's Agenda," *Jerusalem Post*, 30 September 2007 [Online]; available from: http://www.jpost.com/servlet/Satellite?cid=1189411516214&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 30 September 2007.

87. Although he could be considered a cultural psychopath, borne out of a "culture of hatred." Psychologist Willard Gaylin defines "cultures of hatred" as "a natural community [a community with a common national, ideological, and/or religious culture] that breeds and encourages hatred." He also discusses "cultures of haters" and "communities of haters," both of which he describes as "an artificial community created when individuals who share a common hatred [but do not necessarily share nationalist concerns or geographic location] join forces in alliance against their enemy." See Willard Gaylin, *Hatred: The psychological descent into violence* (New York: PublicAffairs, 2003), 195, 144-145, 221-223. Also see Cynthia E. Ayers & David Cammons, "Ahmadinejad's Strategic Communication: A Dangerous Reflection of a World View," *Proteus Management Group*, 2006 [Online]; accessed on: https://www.carlisle.army.mil/proteus/index.cfm.

88. "Iran: Europe Will Become a Muslim Continent, Says Khamenei's Spokesman," *Adnkronos International*, 22 December 2007 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=13623; Internet, accessed 30 January 2008. Sadjadpour, *Reading Khamenei*.

89. Jafarzadeh, *The Iran Threat*, p. x.

90. Ibid, p. 11-23. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*. Memarian, "Khamenei Supports Ahmadinejad." Sadjadpour, *Reading Khamenei*.

91. Jafarzadeh, *The Iran Threat*, p. 21-22. Sadjadpour, *Reading Khamenei*.

92. Rubin, "Ahmadinejad's Agenda." Slackman, "Iran Chief Eclipses Clerics as He Consolidates Power."

93. "Iran's New President Has a Past Mired in Controversy," *IranFocus.com*, 25 June 2005 [Online]; http://www.iranfocus.com/modules/news/article.php?storyid=2605; Internet, accessed 5 December 2005.

94. See Poole, "Ahmadinejad's Apocalyptic Faith." Some descriptions of the Hojjatieh sect do not match the activities of Ahmadinejad—see Iran Report, *Is the Hojjatieh Society Making a Comeback?,* Radio Free Europe, n.d. [Online]; http://www.rferl.org/reports/iran-report/2004/09/31-130904.asp. Paul Hughes, "Iran President Paves the Way for Arabs' Imam Return," *Persian Journal*, 17 November 2005 [Online]; available from http://www.iranian.ws/iran_news/publish/printer_10945.shtml; Internet; accessed on 29 March 2006. The Baha'is, *What is the Hojjatieh Society?* Bahai's, n.d. [Online]; available from http://www.bahai.org/iranthreat/hojjatieh; Internet; accessed 26 March 2006. Sean Osbourne, "Special Reports: Armageddon and the Hojjatieh Sect of Shite Islam," *Northeast Intelligence Network*, 31 January 2006 [news analysis on-line]; available from http://www.homelandsecurityus.com/site/modules/news/article.php?storyid=65; Internet; accessed on 29 March 2006. See also Melman & Javedanfar, *The Nuclear Sphinx of Tehran*, p. 45.

95. Masood Farivar, "Armageddon and The Mahdi," *The Wall Street Journal*, 16 March 2007 [Online]; available at: http://online.wsj.com/article/SB117401728182739204.html; Internet, accessed 16 March 2007.

96. Much has been made of the famous light-colored blazer or jacket that Ahmadinejad likes to wear. It has actually been labeled "the Ahmadinejacket" and replicated for sale to supporters as more of a joke than as a fashion statement. (See BBC News, "Why Don't Iranians Wear Ties?" *BBCNews.com*, 6 April 2007 [Online]; available at: http://news.bbc.co.uk/1/hi/magazine/6528881.stm; accessed 10 April 2007. See also Jafarzadeh, *The Iran Threat*, p. 23.)

97. Jafarzadeh, *The Iran Threat*, p. 5.

98. Brian Knowlton, "Some Held Hostage In '79 Say Iran's Chief Was a Captor," *International Harold Tribune*, 1 July 2005 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=2709; Internet, accessed on 1 July 2005. Iran Focus, "Iran's New President Has a Past Mired in Controversy." Melman & Javedanfar, *The Nuclear Sphinx of Tehran*, p. 7.

99. Iran Focus, "Iran's New President Has a Past Mired in Controversy." Jafarzadeh, *The Iran Threat*. Melman & Javedanfar, *The Nuclear Sphinx of Tehran*.

100. Jafarzadeh, *The Iran Threat*, pp. 11-23.

101. Ibid, pp. 26-27.

102. John Swain, "Apostle of the Apocalypse," *The Sunday Times*, 18 June 2006 [Online]; available at: http://www.timesonline.co.uk/article/0,,2099-2217036.html; Internet, accessed 20 June 2006.

103. Bastani, "Ahmadinejad in Touch With the 12th Imam."

104. Ehteshami & Zweiri, *Iran and the Rise of its Neoconservatives*, p. 20.

105. Amini (1996). *Al-Imam Al-Mahdi: The Just Leader of Humanity*. Hilsum, "Preparing for Judgement Day."

106. Khosrokhavar, *Suicide Bombers: Allah's New Martyrs*, p. 33.

107. Taheri, "The Frightening Truth of Why Iran Wants a Bomb."

108. Melman & Javedanfar, p. 60. Sadjadpour, *Reading Khamenei*, p. 12.

109. Jafarzadeh, *The Iran Threat*, pp. 21-35. There is precedent for this "election rigging" of the presidency. In fact, Khamenei himself was "offered" the post of presidency under the Ayatollah Khomeini, and subsequently "won two non-competitive presidential elections overwhelmingly" (see Sadjadpour, Reading Khamenei, pp. 5 & 12).

110. Barry Rubin, "Ahmadinejad's Agenda."

111. Kelsay, *Arguing the Just War in Islam*, p. 97. Kelsay cites this point as being argued by Sohail Hashmi, "Interpreting the Islamic Ethics of War and Peace," in *The Ethics of War and Peace*, ed. T. Nardin (Princeton: Princeton University Press, 1996), pp. 146-168.

112. Amini, *Al-Imam Al-Mahdi: The Just Leader of Humanity*. Azzam, Join the Caravan: The Forgotten Obligation. Fereydoun Hoveyda, "The Danger of Militant Islamic Fundamentalism," *American Foreign Policy Interests*, Vol 25, no. 1, (February 2003), pp. 25-33. Ja'afari Islamic Center, *Anjuman-e-Asghari Jamaat*, n.d. [Online]; retrieved 7 July 2003 from http://www.mnjamat.org/../jamaat/munatzir/1.htm. Taheri, "Anti-West," pp. 111-116.

113. Kelsay, I*slam and War: The Gulf War and Beyond*.

114. See Jean Bethke Elshtain's *Just War Against Terror: The Burden of American Power in a Violent World* (New York: Basic Books, 2003); Kelsay's, *Islam and War*; and Bassam Tibi's "War and Peace in Islam," pp. 131-132.

115. This lack of detail is due to a need to conserve space. There are many excellent discussions of Western just war available elsewhere—but in keeping with the topic, Elshtain's *Just War Against Terror* is highly recommended. Additionally, the specifics of both traditions have been outlined in a previous article by Cynthia E. Ayers, "Ahmadinejad and Islamic Just War," *Proteus Management Group Proteus Futures Digest: A Compilation of Selected Works Derived from the 2006 Proteus Workshop* (Carlisle Barracks, PA: U.S. Army War College, 2006).

116. Kelsay, *Arguing the Just War in Islam*, pp. 1-7.

117. Elshtain, *Just War Against Terror*, p. 131. Tibi, "War and Peace in Islam," p. 131-132.

118. Tibi, "War and Peace in Islam," pp. 130-131.

119. Kelsay, *Islam and War: The Gulf War and Beyond*, pp. 34-36.

120. Ibid, p. 35. Kelsay, *Arguing the Just War in Islam*, pp. 102-105.

121. Kelsay, *Islam and War*, p. 36.

122. As reprinted in: Robert Spencer, "Fox News and Forced Conversions," *FrontPage Magazine*, 30 August 2006 [Online], available at: http://www.frontpagemagazine.com/Articles/Read.aspx?GUID=D8B967AE-2694-4F9B-A724-31F866DF06A5 and http://www.jihadwatch.org/archives/2006_08.php; Internet, accessed 10 April 2008. Spencer notates that (according to hadith) these words were written by Muhammad to the Roman Emperor in Constantinople. The meaning of the words "you shall be responsible for misguiding the peasants" mean "you [the ruler] shall be responsible for misguiding the peasants [i.e., your nation]."

123. Mahmoud Ahmadinejad, "Letter by Iran's Ahmadinejad to U.S. President Bush," *IranFocus.com*, 10 May 2006 [Online]; available at: http://www.iranfocus.com/en/iran-general-/full-text-letter-by-iran-s-ahmadinejad-to-u.s.-president-bush.html; Internet, accessed 30 May 2006.

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125. David B. Rivkin Jr. and Lee A. Casey, "A Legal Case Against Iran," *The Washington Post*, 6 June 2006 [Online]; available at: http://www.washingtonpost.com; Internet, accessed 6 June 2006. Justus Reid Weiner, Esq., *Referral of Iranian President Ahmadinejad on the Charge of Incitement to Commit Genocide* (Jerusalem: The International Association of Jewish Lawyers and Jurists and The Jerusalem Center for Public Affairs, 2007).

126. See previous discussion about possible Soviet use of Egypt in attempting to provoke the Israeli attack which began the Six-Day War as outlined in Ginor & Remez, *Foxbats Over Dimona*.

127. Faud Salim, Al-Sharr al-Qadim (Cairo: Madbuli al-Saghir, 1998), 196-197 cited in Cook, *Contemporary Muslim Apocalyptic Literature*, 69. Muhammad 'Isa Da'ud, (1995), 38-39 (no further information provided), cited in Cook, *Contemporary Muslim Apocalyptic Literature*, 76. See also Amin Jamal al-Din, Al-Qawl Al-Mubin Fi Ashrat Al-Sa'a Al-Sughra Li-Yawm Al-Din (Cairo: Maktaba al-Tawfiqiyya, 1997), 123-127 who indicates that "the Christian West will . . . betray the secure treaty with the Muslims, and . . . gather for the apocalyptic war (Armageddon) in a 'field with hills' (the valley of Armageddon)" cited in Cook, *Contemporary Muslim Apocalyptic Literature*, 56.

128. Arnaud de Borchgrave, "Later Than We Think," *The Washington Times*, 6 February 2006 [Online]; available at: http://www.washtimes.com/functions/print.php?StoryID=20060205-100341-6320r; Internet, accessed 6 February 2006. Bastani, "Ahmadinejad in Touch With the 12th Imam."

129. MEMRI, "Waiting For The Mahdi." Lappin, "Mahdi Will Defeat Archenemy in Jerusalem.".

130. Agence France Presse, "Victory Certain in Nuclear Row Due to Relation With God: Iran Leader," *IranFocus.com*, 16 October 2006 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=8947; Internet, accessed 25 October 2006. Mehdrad Sheibani, "A Model For the World," *Rooz*, 20 May 2007 [Online]; available at: http://www.roozonline.com/english/archives/2007/05/a_model_for_the_world.html; Internet, accessed 1 June 2007. "Government Supported by Hidden Imam," *Rooz*, 17 February 2008 [Online]; available at: http://www.roozonline.com/english/archives/2008/02/government_supported_by_hidden.html; Internet, accessed on 15 March 2008. Taheri, "The Frightening Truth of Why Iran Wants a Bomb."

131. Considering the Supreme Leader already publicizes himself as "Supreme Leader of Muslims" Ahmadinejad would be speaking for the "ruler of the Muslim world" in two ways—for the Mahdi and the Ayatollah Khamenei. (See Sadjadpour, *Reading Khamenei*, p. 22.)

132. Christine Hauser, "Bush Says Iran Leader's Letter Fails to Address Nuclear Issue," *The New York Times*, 11 May 2006 [Online]; available at: http://www.nytimes.com/2006/05/11/world/middleeast/11prexy.html?ex=1305000000&en=7fbc3b9cc34d120b&ei=5090&partner=rssuserland&emc=rss; accessed on 15 May 2006. Islamic Republic News Agency, "Iran Will Reject Illegal, Faulty Decisions: President," *GlobalSecurity.org*, 10 May 2006 [Online]; available at: http://www.globalsecurity.org/wmd/library/news/iran/2006/iran-060510-irna02.htm; Internet, accessed 15 May 2006.

133. "Letter by Iran's Ahmadinejad to U.S. President Bush." Mahmoud Ahmadinejad, "Ahmadinejad's Letter to Americans," *CNN.com*, 29 November 2006 [Online]; available at: http://edition.cnn.com/2006/WORLD/meast/11/29/ahmadinejad.letter/; accessed 1 April 2008.

134. Alessandra Rizzo, "Iran's President Sends Pope Letter," *Associated Press*, 28 December 2006 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=9656; Internet, accessed 7 January 2007. Associated Press, "Ahmadinejad Sends Sarkozy 'Acrimonious Letter'," *The Jerusalem Post*, 16 November 2007 [Online]; available at: http://www.jpost.com/servlet/Satellite?cid=1195127523583&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 16 November 2007. Again, it is interesting to note that there have been no reports found (at least in open source media) of invitations issued specifically to either of the most recent British Prime Ministers or to the President of Russia.

135. "Iranian President Mahmoud Ahmadinejad Recently Forwarded a Letter to the German Chancellor Angela Merkel," *Fars News Agency*, 28 August 2006 [Online]; available at: http://english.farsnews.com/newstext.php?nn=8506060558; Internet, accessed on 10 April 2008. "Text of Ahmadinejad Letter to Merkel," *Jihadwatch.org*, August 2006 [Online]; available at: http://www.jihadwatch.org/archives/2006_08.php; Internet, accessed on 10 April 2008.

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140. Elaine Sciolino and William J. Broad, "Iran Quietly Learns of Penalties in a Nuclear Incentives Deal," *The New York Times*, 15 June 2006 [Online]; available at: http://www.nytimes.com and http://www.iranfocus.com/en/index.php?option=com_content&task=view&id=7607; Internet, accessed 16 June 2006. Global Security Newswire, "EU Weighs Reactor Offer for Iran," *National Journal Group*, 17 May 2006 [Online]; available at: http://www.nti.org; Internet, accessed 17 May 2006. Gallington, "Nuclear Brinkmanship." Timmerman, "Slippery Slope in Iran."

141. Presentation was supposedly carried out in this manner "for two reasons: to prevent Iran from rejecting the offer out of hand and to maintain the fragile unity of the six nations that authored it" according to the *New York Times* Sciolino and Broad article (see Sciolino & Broad, "Iran Quietly Learns of Penalties in a Nuclear Incentives Deal"). Since Iran had been extremely vocal about rejecting the offer before it was even presented, and since the explanation as to how such a presentation would "maintain the fragile unity" of the nations involved, the reasoning remains unclear.

142. Michael Slackman, "Iran Says it will Ignore U.N. Deadline on Uranium Program," *The New York Times*, 7 August 2006 [Online]; available at: http://www.nytimes.com; Internet, accessed 7 August 2006. Richard Beeston, "Defiant Iran Threatens to Use 'Oil Weapon' Against Sanctions," *The Times*, 7 August 2006 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=8178; accessed 7 August 2006.

143. Poole, "Ahmadinejad's Apocalyptic Faith." Lewis, "August 22: Does Iran Have Something in Store?" "Focus: The Nuclear Fanatic," *The Sunday Times*, 20 August 2006 [Online]; available at: http://www.iranfocus.com/modules/news/article.php?storyid=8297. There seems to be a difference of opinion over whether this tradition as specified by Lewis is important within the Shi'a belief system (see DEBKAfile, "Iran's Military Exercise and Apocalyptic Plans for Israel and World," *DEBKAfile*, 20 August 2006 [Online]; available from http://www.debka.org/article.php?aid=1203 as compared to Lewis, "August 22: Does Iran Have Something in Store?" But, if Furnish, Amanat, and Cook are right, apocalyptic traditions are increasingly similar and based more on popular apocalyptic literature than on historic scriptural interpretation.

144. Apparently he meant it would change Israel's destiny, but he could have meant the Muslim world's. See Micah D. Halpern, "Terror Threat for 8/22: Back to the Future," *Israel Insider*, 16 August 2006 [Online]; available at: http://web.israelinsider.com/Views/9193.htm; Internet, accessed 16 August 2006.

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147. Yaakov Katz, "Shattered Sources," *The Jerusalem Post*, 7 July 2006 [Online]; available at: http://www.jpost.com/servlet/Satellite?cid=1150885937443&pagename=JPost%2FJPArticle%2FShowFull; Internet, accessed 8 July 2006.

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The Middle East in 2040: A Forecast of Drivers of Stability

Dr. Thomas Ferleman and Dr. Dennis Walters

Part I: Introduction

Awash in dictators, theocrats, and tribal demigods, the Middle East remains a region void of legitimacy. Conflicted by limited natural resources and burgeoning social demands, it is now faced with the consequences of nuclear energy. Yet, the values of stability are remote when mistrust, violence, and intolerance dominate the landscape. Until recently, historical patterns helped keep the ramifications of instability within the confines of the Middle East; distance and disengagement no longer provide the mechanisms for relating to this troubled region. Short-sighted western engagement and an insatiable demand for oil has brought the region's anger to the doorsteps of most capitals.

Attempts to improve stability in the region have been unsuccessful largely due to a poor understanding of the drivers of stability. This lack of understanding has resulted in well-intended interventions that ultimately only bring chaos. There was great hope that the U.S. invasion of Iraq would be the necessary shock to the region needed to spur democratic reform. Although there was broad opposition to the war, many liberal Muslims saw the post-Saddam trends as positive. Unfortunately, most of the momentum for democratic change dissipated as violent resistance to the coalition authority in Sunni areas of Iraq developed into a civil war (Rabasa, Benard et al. 2004, 56) and has now likely progressed into anarchy. The collective impact of the U.S. invasion will be felt in the region for a very long time. Many in the Arab world likened the Iraq war to the Arab defeat in 1967 in terms of the effect on the Arab psyche. The change in U.S. policy in early 2007 will unlikely be sufficient to correct the course, and could very well lead to more problems in the long term (Walters 2007).

Discussions on the future of the Middle East invariably end up centering on Al Qaeda and their acquisition of weapons of mass destruction (WMD). While these are the most dangerous aspects of the region, they are not the drivers of instability but symptoms of an unstable region. Understanding the variables that contribute to stability and being able to predict how these variables will change over time will greatly improve the chances for a stable Middle East and help reduce the threats posed by WMD and Al Qaeda.

It is our intent to take the mystery out of stability, and to illustrate for U.S. policy makers intervention points that will help to stabilize the region. To do this, we offer two versions of the future for the region. The first, or base case, illustrates how the Middle East will look given current trends *without intervention*. The second scenario examines how the future will look if efforts are undertaken to lower just one social variable; in this case, we examine the stabilizing consequences of lowering infant mortality in the region.

Part II: Current Assessment and Area of Forecast Interests

Current Assessment

To begin an analysis of the future it is important to understand current conditions. While none of the information presented in this section should appear as new to policy makers, we offer it simply as a point of departure.

The Israeli-Palestinian conflict continues to cast a long shadow over political discourse in the Arab world (Rabasa, Benard et al. 2004, 71). The Israeli shadow is not limited to the Palestinian problem. Lebanese Hezbollah has sworn to destroy Israel, and they kidnapped two Israeli soldiers in 2006 to speed things along. This of course resulted in the Israeli invasion of Lebanon and a limited war over the summer of 2006, inflaming already existing hatred towards the Israeli state.

Other areas outside of the Israeli shadow fair little better. Sudan is on the brink of chaos and has opened dialog with Iranian President Ahmadinejad (STRATFOR 2007). Iran itself is threatening to continue its nuclear pursuits, and if some reports are to be believed, is equipping terrorists in Iraq. Afghanistan, a former success story in the war, is sliding back towards violence as evidence mounts of Al Qaeda and the Taliban regrouping on the Afghanistan-Pakistan border.

The area most familiar to American is of course Iraq. Even with the large troop increases of early 2007, the situation in Iraq almost defies classification. It has exceeded the overly simple definition of a civil war and is now fast approaching outright anarchy.

Other less familiar areas are also spinning out of control. The Yemeni desert is completely out of control and even threatens the security of the House of Saud (Abdullah 2005). Syria appears to be stable, but it is almost certain that Syrians assassinated the former Lebanese Prime Minister Rafik al-Hariri, though whether with or without the Syrian governments knowledge is still unknown. What is known is Syria continues to support Hezbollah. Damascus is working to expand Hezbollah's political prowess forcefully while ensuring Syrian allies are safeguarded from an international tribunal that would potentially implicate the Syrian regime in the assassination (STRATFOR 2007).

Aside from violent conflict, the region is plagued by environmental and resource problems. Irreplaceable water tables falling across the region will only contribute to violence as tribes fight over limited supply (Yaphe 2002, 9). Low water tables and an arid climate contribute to a huge and growing agricultural import-export deficit; the region can not feed itself. The status quo is unsustainable.

Area of Forecast Interests

For the purposes of this study the Middle East includes sixteen countries:

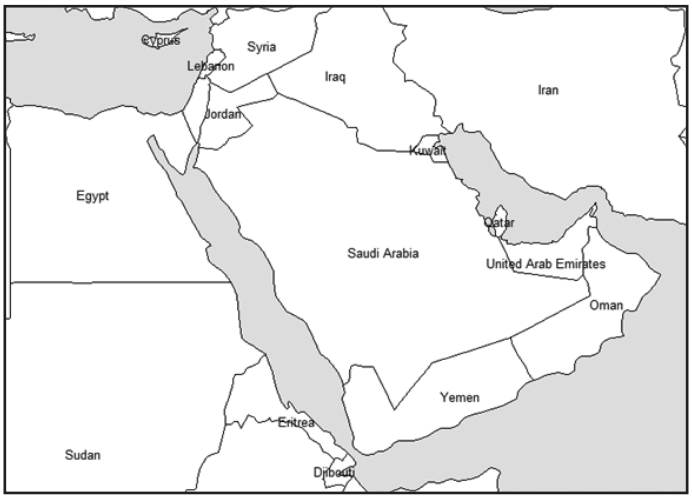


Figure 1. Area of Forecast Interest

Geographically, the area has numerous seaports and extensive coastlines. In almost any other region, this much coastline would contribute to a budding economy, but not in the Middle East. A combination of limited natural resources and political instability has not allowed coastal access to really contribute to the region's development. Aside from oil, the region has no notable exports other than Afghanistan's cash crop, the poppy.

The governments of the countries comprising the region have changed little over the years. Except for the 1979 Islamic revolution in Iran and a military coup in Sudan ten years later, leaders have remained in power for relatively long periods of time, thanks to equal measures of coercion and intimidation. However, this does not suggest a measure of stability; rather, it is simply an indication of how repressive the governments have been. By controlling dissent and consolidating power, most rulers in the region have been in place for a generation—Syrian President al-Asad just assumed power from his father who ruled from 1971 until his death, Jordan has been ruled by the Hussein family since 1952, the Saud family ruled Saudi Arabia for much of the 20th century and continues to rule, and of course, Saddam Hussein ruled Iraq from 1968 until his ouster and execution. Despite the apparent political stability, there has been almost no economic growth in the entire region (Yaphe 2002, xi), and the majority of the population has yet to witness a productive and viable democratic process.

External efforts at regime change have had mixed results. The war in Iraq and its aftermath can be regarded as the most potentially significant event in the U.S. relationship with the countries of the Middle East in the past half-century. For the first time since the withdrawal of the European colonial powers, a Western-led coalition assumed responsibility for the governance and political reconstruction of a Muslim country (Rabasa, Benard et al. 2004). As has already been mentioned, this is leaving a dark stain on the Muslim psyche that will continue to hinder U.S. relations with the region for a very long time.

A significant amount of research points to the beginnings of a clash of civilizations of one form or another (Barber 1996; Huntington 199; Lewis 2002), yet public opinion polls say the problem is more basic and related to economics and political factors (Regan 2007). Regardless of the side of the argument chosen, it is obvious the future stability of the region is very much in question.

Specific Research Area

Future Middle Eastern stability is the focus of this study. To estimate stability we used the Political Stability Taskforce model from the Center for Global Policy at George Mason University (Goldstone 2005) and data from the International Futures (IF) model developed by Barry Hughes at the University of Denver. Formulations were estimated for each variable of stability using up to five independent variables that exist in the IF model (Hughes & Hillebrand, 2006): democracy, infant mortality relative to the global average, trade openness as indicated by exports plus imports as a percentage of gross domestic product (GDP), GDP per capita at purchasing power parity, and the average number of years of education of the population at least 25 years old. Figure 2 depicts each of the variables that

contribute to overall stability.

Figure 2. Drivers of Stability

While these drivers may appear overly simple, they are quite comprehensive in their coverage. Relatively simple models, involving just a handful of variables and no complex interactions, accurately classify 80% or more of the instability onsets and stable countries in the historical data. According to the Polity IV Country Report of 2003 (Marshall and Jaggers 2003):

> **Relatively simple models can identify the factors associated with a broad range of political violence and instability events around the world.**

The specific research questions we asked were:

1. *Which events are likely to affect stability either positively or otherwise from the baseline scenario?*
2. *How strong and in which direction will these events bend the baseline scenario?*
3. *Which intervention points provide the best possibility for improving long term stability in the Middle East?*

Part III: Current Trends—the Base Case

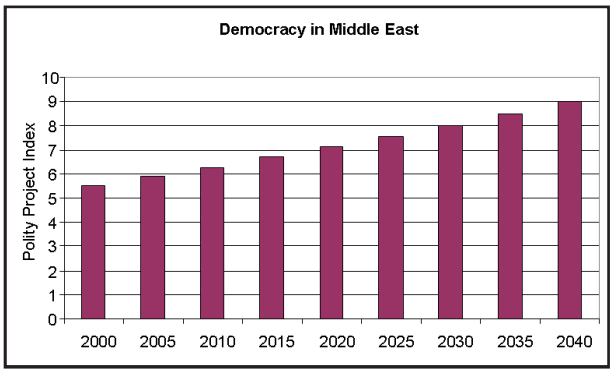
In developing the base case scenario we projected the variables shown in figure 2 out three decades to the year 2040. What follows is a detailed discussion of how each of these variables will play out over time, given no outside intervention.

Democracy

Using data from the Polity IV Project at the Center for International Development and Conflict Management (CIDCM), University of Maryland, we determined the level of democracy-vs.-autocracy both in a time series and in the year 2040. For the purpose of this study democracy is defined as:

1. The presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders
2. The existence of institutionalized constraints on the exercise of power by the executive
3. The guarantee of civil liberties to all citizens in their daily lives and in acts of political participation

Albeit in incremental degrees of progress, democracy is on the move in the Middle East. By 2040, Lebanon, Yemen, Iran, and Jordan are expected to be the most democratic nations in the Middle East. It is our suggestion that non-violent political competition will exist in these countries. We can expect to witness a measure of voluntary elections and a degree of constraint placed upon the governing leadership. As a manifestation of democracy in these countries, we can expect to see a defined rule of law, checks and balances, and some level of freedom of the press.



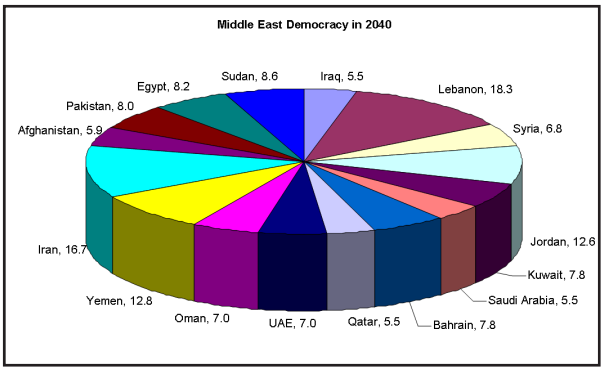


Figure 3. Measures of Democracy in the Middle East

However, while the progress towards democracy is encouraging, the regions overall move will be well below Western standards. Even by 2040, the region will not achieve half of the level of democratization that the Organization for Economic Co-operation and Development (OECD) nations have achieved today. It is our suggestion that one of the most significant inhibitors of democratic progress in the Middle East will be related to freedom.

Freedom

In a world that is increasingly democratic, regimes that resist the trend produce dysfunctional societies—as in the Arab world. There, people sense the deprivation of liberty more strongly than ever before because they know the alternatives; they can see them on CNN, BBC, and Al Jazeera (Zakaria

2003, 18). Our analysis reviewed changes in freedom as defined by the Freedom House measures used in the IF model. In this case, the variable *freedom* measures the opportunity to act spontaneously in a variety of fields outside the control of the government and other centers of potential domination. Freedom House defines these opportunities based on two rights:

- Political Rights: The right of people to participate freely in the political process; the right to vote freely in legitimate elections, compete for public office, join political parties and organizations, and elect representatives who have a decisive impact on policies and are accountable to the electorate
- Civil Liberties: The right to express beliefs, associational and organizational rights, rule of law, and personal autonomy without interference from the state

While initial observations suggest that the Freedom House measures are relatively similar to those of the Polity IV project, a distinct difference exists between how they portray the role of women. We believe that the role and rights of women will continue to inhibit the most promising democratic countries in the Arab and Persian worlds. The rights of women are almost identical across the region. Yemen is only slightly more responsive to the rights of women than Afghanistan, the worst offender; while Lebanon, Iran, and Jordan provide for equal participation in government, women continue to face discrimination in legal and social issues. In Iran, a woman cannot obtain a passport without the permission of a male relative or her husband, and women do not enjoy equal rights under Sharia statutes governing divorce, inheritance, and child custody. A woman's testimony in court is given only half the weight of a man's. Women must conform to strict dress codes and are segregated from men in most public places (anonymous 2007). Contrary to the progress some countries will make, as limited as it might be, Sudan, Saudi Arabia, and Syria will see much less advancement in both democratization and freedom.

Infant Mortality

The next variable factoring into stability is infant mortality. This variable is the ratio of infant deaths under one year old per thousand births. Infant mortality rates above the international median for a given year are associated with a high risk of state failure. Infant mortality is indicative of the quality of life in a society. It tends to be lower in countries with high GDP per capita, but also is relatively low in some poorer countries whose governments devote substantial public resources to health, education, and welfare services. As a measure of stability, infant mortality is a signal of poor governance. Countries that are unable to decrease infant mortality through, either expanding clinical access, offering neo/post-natal care, clean water, etc. will face internal conflict and strife. For those countries experiencing a positive increase in other areas such as self-expression and increasing democratization, a high infant mortality rate will be expressed widely across the populace (D. Esty, Goldstone et al. 1998).

By and large, we can expect the infant mortality rate to decrease across the Middle East. However, when compared to the OECD countries, by 2040 the region will still face an unfortunately high infant mortality rate. Of particular concern are Afghanistan, Pakistan, Sudan, Yemen, and Iraq, whose infant mortality rates will remain much higher than the remainder of the region. It should also be noted that the overall infant mortality rate appears to divide into three segments. The five countries noted will have the highest rate of deaths, followed by a second tier consisting of Syria, Iran, and Egypt, followed by the Emirate nations and Jordan.

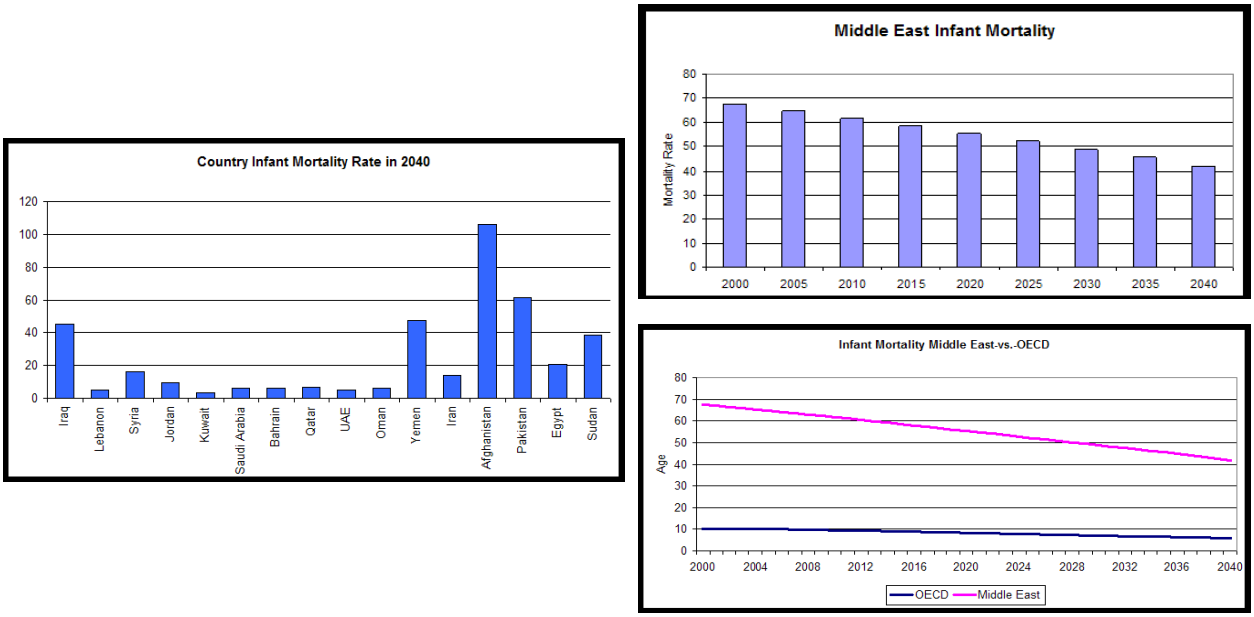


Figure 4. Measures of Infant Mortality in the Middle East

Trade Openness

Trade and the balance of commerce serve as an effective measure of conflict. Countries with effective trade relations and productive commerce often experience financial prosperity and rarely engage in war. While disputes may exist, it is uncommon for economically integrated societies to engage in open warfare. Contrariwise, those countries with a resistance to trade often lack sufficient resources to maintain a developed and diversified populace. In the absence of commerce, a country may lack innovations commensurate with population consumption. Such conditions will often provoke conflict with neighboring countries and foster regional instability.

While in and of itself a trade imbalance does not directly correlate to instability, when the trade imbalance is a result of financial pressures fueled by resource constraints, it can serve as a barometer for instability. Likewise, in the case of the Middle East, oil serves as the near-exclusive export for most countries in the region. While, it is often said that Western nations are too reliant on fossil fuels, it is the Middle East that is nearly exclusively reliant on the export of such fuels. Hypothetically speaking, if the United States stopped importing oil tomorrow, the Middle East would face a catastrophic collapse of society. Given this consideration, it is noteworthy to recognize that by 2040 Middle Eastern imports of manufacturing and services will be twice as much as their exports of fossil fuels. While it is difficult to surmise the consequence of this imbalance, it does suggest that the region could lack the export capacity to meet import demands. Likewise, as the region fluctuates between trade deficits, we can expect shifts in trade openness. This potential for disruption will likely impact Iran, Saudi Arabia, Kuwait, and Egypt more than other countries, as they will fluctuate economically more than other countries of the region.

Unlike other areas, trade openness does not follow a steady move in one direction, as figures 5 and 6 show. Trade openness will continue to increase over the near term as world demand for oil ensures steady exports from the Middle East. The reciprocating imports to feed and cloth the population can also be expected to rise during this period. After 2010 however, there will be a marked downturn

in openness. Alternative fuels such as hydrogen and solar power, as well as new technology in nano science will move demand away from oil even though abundant oil reserves *remain in the ground* (Canton 2006, 38). Even if this hypothesis is late in coming, the anticipation of a drop in oil demand will trigger a reduction in trade openness. This reaction is in keeping with the economic theory that the more integrated a country is in world markets the more they will be subject to sudden stops and starts (Anonymous 2000).

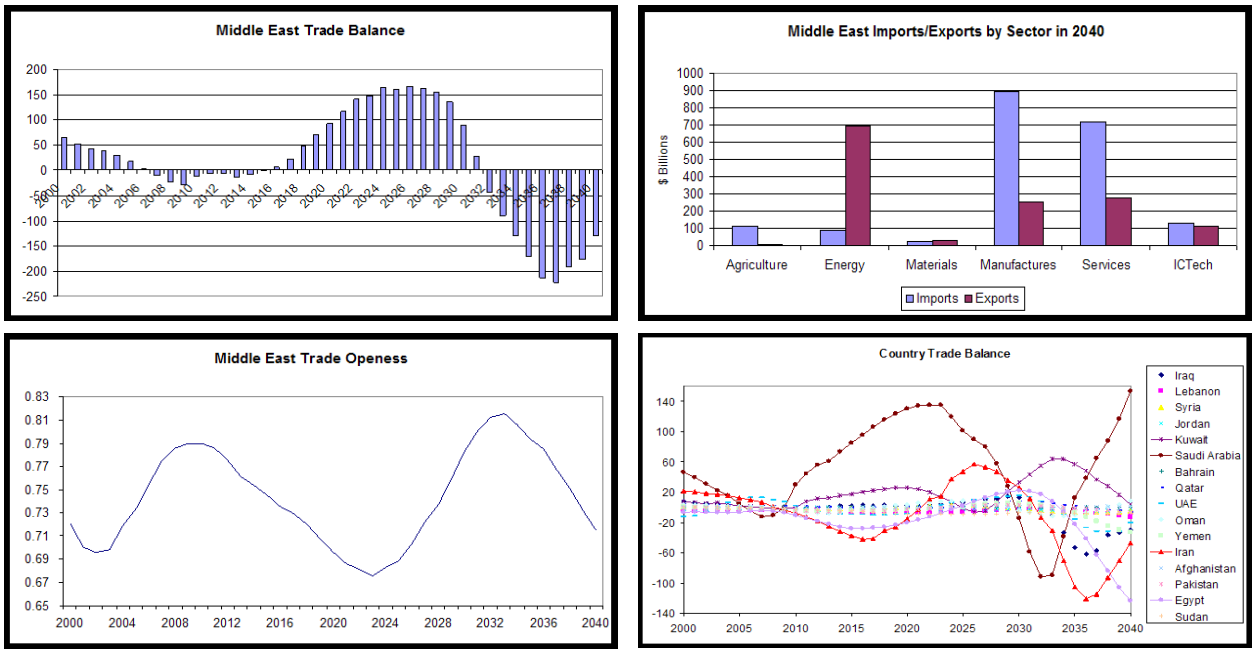


Figure 5. Measures of Trade in the Middle East

As the shock subsides from the shift to alternative fuels, the Middle East will have no choice but to return to greater trade with the world, as the region does not and will not have the resources necessary to feed its citizens as shown in the figure 5. Should the countries of the Middle East be unwilling to enter into open and productive trade relations with other regions, the increasing internal imbalance between agricultural production and demand will raise the risk of internal conflict.

Gross Domestic Product

Closely related to trade is the region's GDP. Impacting nearly every part of society, GPD is the market value of all goods and services sold in a country.

Between 2007 and 2040, the GDP will almost double for the entire Middle East. However, a closer look at the individual countries shows that potential trouble spots lag far behind the regional average.

As determined by GDP per capita at purchasing parity, the growth for these countries is so slight as to be unnoticeable except over extended periods. Afghanistan, the slowest of the group, will not have raised its GDP one percent in 30 years, effectively remaining in the state it is today. The other countries fair little better, with Sudan the big winner coming in with a whopping three percent rise in GDP. Once again, we can expect Afghanistan, Pakistan, Yemen, Sudan, and Syria to witness the least progress.

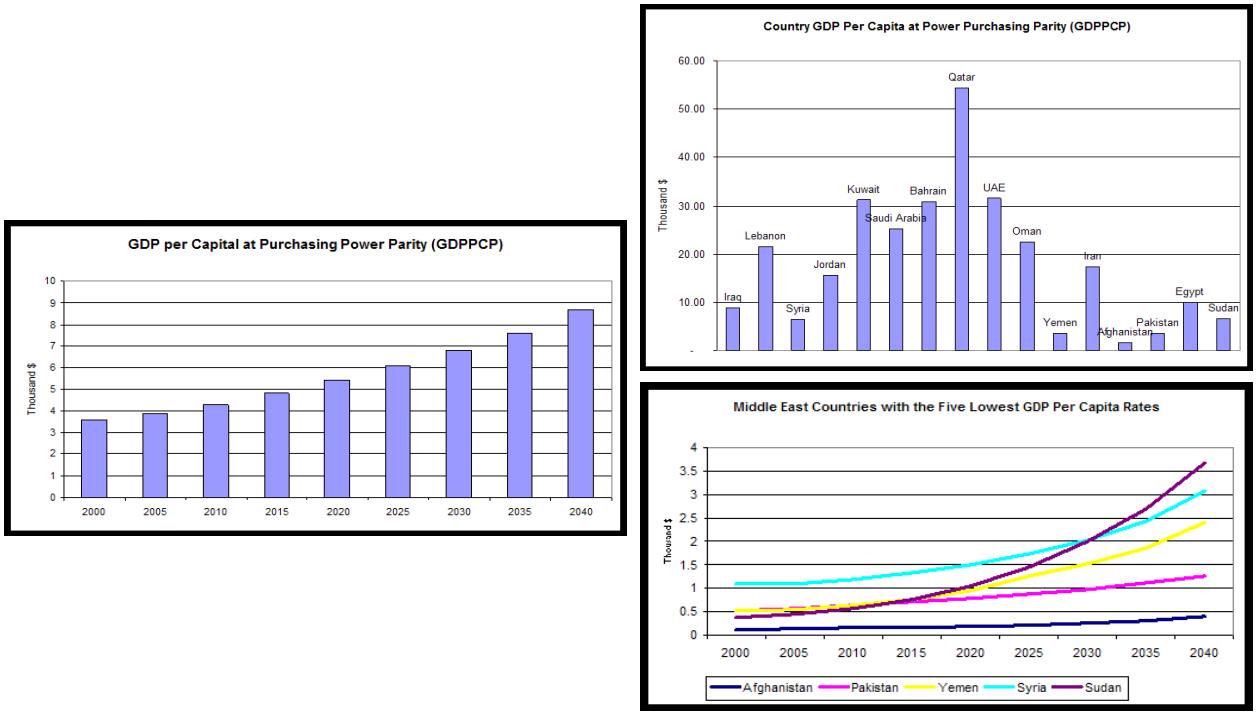


Figure 6. Measures of Gross Domestic Product in the Middle East

Education

The final area of examination in the base case is education. Examining education last in the base case is purposely done in order to underscore its importance in developing countries. Education is foundational in the development of human capital, which itself leads to greater economic growth (Cypher and Dietz 2004).

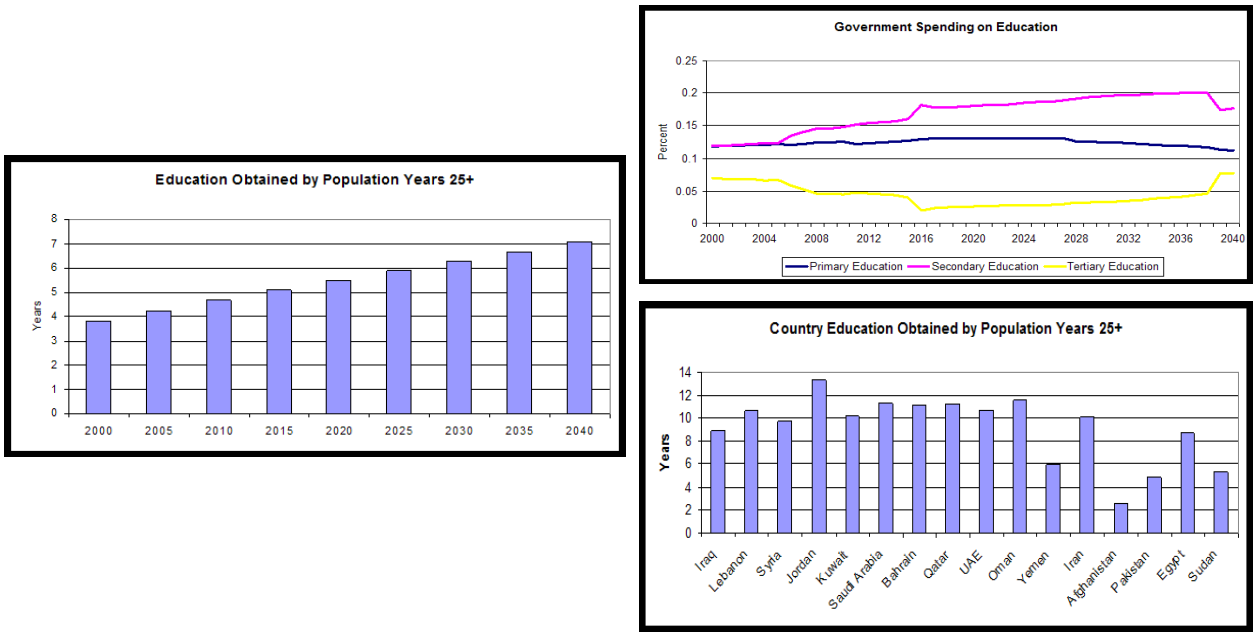


Figure 7. Measures of Population and Education in the Middle East

Many economists argue that primary commodity exports are the only way that countries in the early stages of development can generate the foreign exchange necessary to pay for essential imports and to service external debt (eventually leading to a growth in GDP). However, many resource-abundant countries never manage to make take the steps necessary to expand exports or to even make use of the resources they have and consequently never fully develop (Auty 2001, 6). One of the main reasons behind this lack of effort is the lack of educated government officials necessary to guide these countries. In the case of the Middle East, the only known resource is oil and poppies. The first is on the way out, and the second is not an acceptable export. Given these simple facts, education is doubly important in the Middle East, and once again, there is a steady rise in the level of education throughout the projected period.

However, a closer look shows again that certain countries lag behind the region in education. In addition, government spending on education is grossly inadequate as figure 7 shows.

Summary of Base Case Forecast

The base case data for the Middle East shows an overall upward trend in each of the variables that influence stability. A number of countries are challenged by measures of instability and will likely remain within this posture over the next 30 years. It would not take much of a catalyst to push any one of these countries over the edge into chaos, which will invariably spill over to other areas of the world.

The primary reason for any spill over in the Middle East is of course demand for fossil fuels. This demand has helped bring what little economic development there is into the region, but this source is drying up. Oil will soon begin to loose its importance in world economics as governments move to more environmentally sound fuels. At least some of the Middle Eastern leaders recognize that the demand for oil might evaporate while supply is still plentiful (Canton 2006). The question remains as to whether these leaders will move their nations towards other areas of export. Even if they choose to do so, the lack of natural resources will complicate an already difficult task. In addition, the absence of investment in education will further restrict development of the region both economically and socially.

These restrictions will in turn contribute to extending a trend towards radicalism that began years ago. Repressive political conditions and a stagnant economy fed a resurgence of religious and ethnic nationalism in the Middle East in the early 90's (Yaphe 2002, 9). The baseline forecast shows marginal improvement in both political and economic conditions, so it is almost certain that radicalism will continue to be prevalent. Add to this a population that will almost double in the next 30 years and remain under educated, and the conditions will be ripe for even more violence as the largely unemployed future generations turn to fundamentalist organizations as vehicles of change.

While some may be tempted to point towards the overall positive trend line in democracy, trade, and other areas, this unequal improvement may actually contribute to instability. The dichotomy between the elite and the masses will be expanded as the elite continue to draw benefits from the slight improvements in the region while ignoring the rural, uneducated masses (Didsbury 2003, 59). While many of these masses are uneducated, improvements in technology will render literacy unimportant in communications (Naisbitt 2007), and the majority will come to realize that the world is continuing to leave them behind. This large group of people will provide fertile recruiting for extremists, who will

make use of the chaotic and uncontrolled territories of Sudan, Afghanistan, Pakistan, and Yemen to train and equip future insurgents to do battle with globalization and the West.

Syria remains a particular concern. While in many ways we can expect Afghanistan, Pakistan, Sudan, and Yemen to remain troubled countries, Syria is a bit of a different issue. Syria is an ordered society controlled by a strong central government, whereas the other countries are relatively lawless. Additionally, Syria has a developed military with the ability to project power beyond its borders. This is especially troublesome given their previous occupation of and continued interest in Lebanon and their support for Hezbollah. Should events be allowed to unfold in the Middle East along the current trend lines, it is almost certain to lead to greater and more violent instability.

Part IV: Al Qaeda, the Wild Card of WMD, and Policy Options

The Special Case of Al Qaeda

We include a discussion on the future of Al Qaeda to underscore the importance of improving stability in the region. Mass movements such as Al Qaeda feed on social imbalance that often fosters instability. Improving conditions in the region will also help lessen the threat from Al Qaeda.

There will undoubtedly be some argument that Al Qaeda does not warrant inclusion in a study of the future. These same people would point out that Al Qaeda has been marginalized and subjugated to the badlands of the Middle East. These optimists will say that bin Laden is no longer calling the shots and is an ineffective leader hiding somewhere in Waziristan (VOA 2005). While he may not be an effective tactical or operational leader at the moment, bin Laden is serving a much more important strategic roll as the symbol of a movement. As recently as six months ago, fighters in the tribal region of Pakistan distributed leaflets in bin Laden's name calling for the assassination of the Pakistani president (Anonymous 2006). Whether he even knows about the leaflets or not is far eclipsed by the fact that his name is being used to identify the movement he created. This tells us much about the future of Al Qaeda, if we can understand its significance.

Like it or not, Al Qaeda is a religious movement. While the religion did not directly give rise to Al Qaeda, it does provide the foundation for its continuance. More importantly, it provides a potential bridge for future evolutions of the movement. To move from a religion to a nation takes a single step, historically and psychologically. Group identity was seen to rise from the tribe through religion and culminate with the nation (Issacs 1975, 171). The nation state was until recently seen as the final evolution of belonging. Until the advent of globalization, belonging to a nation state was the most universally legitimate value in defining a group of people (Anderson 1991, 3). However, in some areas of the world, such as the Middle East, globalization serves an altogether different purpose, expanding and exposing the wide gaps between rich, poor, rural, and urban. The differences highlighted by globalization have also ushered in a return to the religiously defined cultural group as the preferred choice in many areas of the Middle East. This logic defies understanding by Western secular standards, as we seek progress through development and look for answers in many places, including but certainly not limited to religion.

It is very hard for us to accept that religion can motivate people to do such horrific deeds, but this isn't the first time we've been exposed to this type of behavior. The Iranian revolution brought faith out of the shadows and demonstrated that it could appeal to a huge constituency of modern society

(Armstrong 2001, 379). Unfortunately we didn't learn or even adapt well from our experiences with Iran, except perhaps to declare them a state sponsor of terrorism. These same conditions exist today in the Middle East and allow Al Qaeda to develop and prosper. More importantly, these conditions will actually worsen in the four problem countries as shown earlier in the base case. Quite simply, Al Qaeda offers hope in hopeless places. One of the most potent attractions of a mass movement, and Al Qaeda is most certainly a mass movement, is its offering of a substitute for individual hope. This attraction is particularly effective in a society imbued with the idea of progress. For the conception of progress, "tomorrow" looms large, and the frustration resulting from having nothing to look forward to is the more poignant.

Mass movements are generally accused of doping their followers with hope of the future while cheating them of the enjoyment of the present. Yet to the frustrated, the present is irremediably spoiled. Comfort and pleasures cannot make it whole (Hoffer 1951, 15). This is especially true where charismatic clerics proclaim the culture of the west is sinful in the eyes of Allah and should be not only shunned but destroyed.

The message of hope is proving to be irresistible to a wide range of ethnic groups *outside* of the Middle East. In Europe, the demographics of those being arrested (for terrorism) are so diverse that many counterterrorism officials and analysts say they have given up trying to predict what sorts of people are most likely to become terrorists. Age, sex, ethnicity, education, and economic status have become more and more irrelevant. There are numerous examples of this appeal. In Belgium, a blond, white, Catholic woman converted to Islam, traveled to Iraq, and blew herself up in November 2005. Other examples include three of the suspects arrested in last summer's alleged transatlantic airline hijacking plot. All three were religious converts who grew up in north London's affluent suburbs. One was the well-to-do English son of a Conservative Party activist; he worked in a bar and loved the movie "Team America." Edwin Bakker, a researcher at the Clingendael Institute in The Hague, examined almost twenty variables concerning these particular suspects' social and economic backgrounds. In general, he determined that no reliable profile existed—their traits were merely an accurate reflection of the overall Muslim immigrant population in Europe. There is no standard jihadi terrorist in Europe, the study concluded (Whitlock 2007). What they all share is a belief that militant Islam offers hope for a better tomorrow. This hope cuts across ethnic boundaries. What is even more troubling is that Al Qaeda and other groups are taking this message online, ensuring it reaches millions of people (Pelley 2007).

Understanding how mass movements operate it is possible to say with some certainty that Al Qaeda will continue to propagate its message, recruit, and oppose and attack the West as long as conditions remain that fuel the need for such movements. Our base case shows us that these conditions will remain in many areas of the Middle East, most notably Afghanistan, Pakistan, Syria, and Sudan. Any of these states offer room to hide and to train and equip future adherents to the Al Qaeda message, and it can be expected that as one area is closed to them Al Qaeda will find another.

As with the future of the region, there exist alternatives when discussing the future of Al Qaeda. The first choice is to follow the current U.S. policy of denying them safe havens, disrupting their networks, and defeating their organization. This policy will only have marginal effect and will continue to be costly. Continuing to follow current policy, given the projected future of instability in the region, will only extend and quite possibly increase the levels of violence.

A second alternative is to take away the conditions that make joining the movement appealing. In the closing section of this study we offer a suggestion on improving stability in the region that will simultaneously improve stability and erode the underlying conditions that make movements such as Al Qaeda possible. It is imperative that policy makers understand, however, that those efforts to improve regional stability will also require a different approach when dealing with Al Qaeda. When people are ripe for a mass movement such as al Qaeda they are usually ripe for any effective movement, and not solely for one with a particular doctrine or program (Hoffer 1951, 16). Therefore Western policy makers must be prepared to offer future Al Qaeda members a choice; which group would they like to belong to: a radical fundamentalist group or a group devoted to promoting peace, cross-cultural understanding, and regional development? Incorporating the youth of the Middle East into the change process will help to develop more pluralistic thinking while also eroding the support base Al Qaeda has to draw upon. Values can change, and therein lies the seed of change that must be planted and nurtured. Secular social trends have only a glacial effect on cultural norms, but that, through the socialization process, the experience of prevailing conditions during the formative years of childhood and early adolescence leave a lasting imprint on people; the religious values held in later life are largely shaped by one's formative experiences. Would we rather these values be fundamentalist-based or more plural? Certain decisive historical events and common experiences can stamp their imprint on a generation, shaping how they perceive and interact with the world around them (Norris and Inglehart 2004, 76). Would it not be preferable for this decisive event to be the opening of a major hospital, university, or cultural center in Sudan and not the genocide that is the current norm?

How Al Qaeda would respond to such efforts would depend on how and if they are included in the process. The ideology behind Al Qaeda will not go away, even as we continue to hunt and capture those responsible for 9/11. However, if the conditions that fuel there actions are improved through greater regional stability, they will find violence counterproductive to their aims. Once the Al Qaeda leadership realizes this, they can be expected to morph into a quasi-political organization along the same lines as Hamas, Hezbollah, or even Sinn Fein. Recognizing any of these organizations as legitimate political organizations goes against current U.S. policy. However, not recognizing them will force them back underground and could lead to future problems. Whatever the decision, the United States should expect some form of political wing of Al Qaeda to emerge as a response to improving social conditions in the Middle East.

Weapons of Mass Destruction

In decision theory and futures research, "wildcards" refer to low-probability, high-impact events (Petersen 1999). There can be no greater wildcard in the future of the Middle East than WMD. Should a nation state or non-state actor acquire and use WMD against the United States, whether nuclear, biological or chemical, all ongoing efforts at stability could and probably would come to a crashing halt. We present a short discussion here for two reasons: first, to remind decision makers that it is deceptively simple to acquire mass killing tools and to employ them on soft targets such as the American heartland; second and more importantly, to emphasize that policy to improve stability must address all aspects of the problem. Policies that only pressure or hold nation states accountable do nothing to the non-state terrorist cell following a violent and infectious ideology of a mass movement.

To find examples of weapons technology and its availability look no further than the United States Patent and Trademark Office. U.S. Patent 4841864 was filed in 1988 by a U.S. citizen for explosively

formed penetrators, or EFPs for short. There are several dozen other similar patents on record dealing with EFPs. The EFP is significant for this discussion because it is the weapon responsible for the most American casualties in Iraq, and it represents an improvement in weapons technology at the lowest level. Up until recently, it was thought the technology to build such weapons was only resident in places such as the United States, Russia, China, and of course Iran. Now there are instructions to build them readily available on the Internet, and these instructions are precise and allow for instantaneous proliferation of this knowledge. Of course a radiological, chemical, or biological weapon is much more difficult to construct than an EFP, but if we consider the exponential nature of technological development and communication it is only a matter of time before it is feasible.

The hardest part of constructing a WMD is acquiring the raw material, and this is not as difficult as first thought. Inside the United States and elsewhere there is plenty of weapons-grade fissile material available, and more being produced all the time. Surely a terrorist can buy or steal enough for a single garage-made device (Langewiesche 2006). This scenario is much more likely than stealing an existing bomb or buying one of the suitcase nukes that may or may not exist. It is largely accepted in intelligence circles that, should terrorists desire to explode a bomb in the United States, they will acquire the materials once they are already *inside* the country. A radiological dispersal device or dirty bomb is the most likely option for a terrorist seeking a weapon of mass destruction, and we have already seen evidence of their efforts from Jose Padilla (Zimmerman and Loeb 2004).

The implications for the future are not promising. As long as the motivation to confront the West exists, the extremists will continue attempting to acquire such weapons. There is certainly disagreement on this assumption. Many smart people point to a number of good reasons why this will not happen. The first of these is our success at disrupting their attempts. The United States caught Padilla, and the British have had several similar successes. At the same time as these arrests, however, Al Qaeda succeeded in launching devastating conventional attacks in Egypt, Turkey, Tunisia, Indonesia, Jordan, Spain, the United Kingdom, Pakistan, Afghanistan, and Iraq. Thus, while Al Qaeda has suffered some setbacks in its WMD efforts, these disruptions alone do not appear sufficient to have prevented Al Qaeda from conducting a WMD attack, given its other successful attacks.

Many of the traditional reasons why terrorist groups do not attempt WMD attacks do not exist for Al Qaeda. The organization has clearly demonstrated its willingness to engage in indiscriminate killing on a massive scale without fear of losing the support of its followers. Al-Qaeda has also shown it is willing to take on the technical challenges involved and has had some successes in developing lethal materials, including cyanide, anthrax, and other devices. Unfortunately, this combination of continuing interest, growing capability and demonstrated patience may one day pay off for Al Qaeda or any of its splinter groups (Quillen 2007). The same conditions that help to keep Al Qaeda a viable movement will also ultimately ensure they will continue to pursue bigger and more lethal methods of violence.

A Better Future through Reduced Infant Mortality

In the opening section of this study we identified a number of drivers that influence stability. While it is difficult to rapidly improve a country or region's GDP, or their levels of democracy, or many other areas that will improve stability, lowering the infant death rate might offer a policy alternative. Infant mortality does not stand out in the way gross domestic product or improved levels of democracy might,

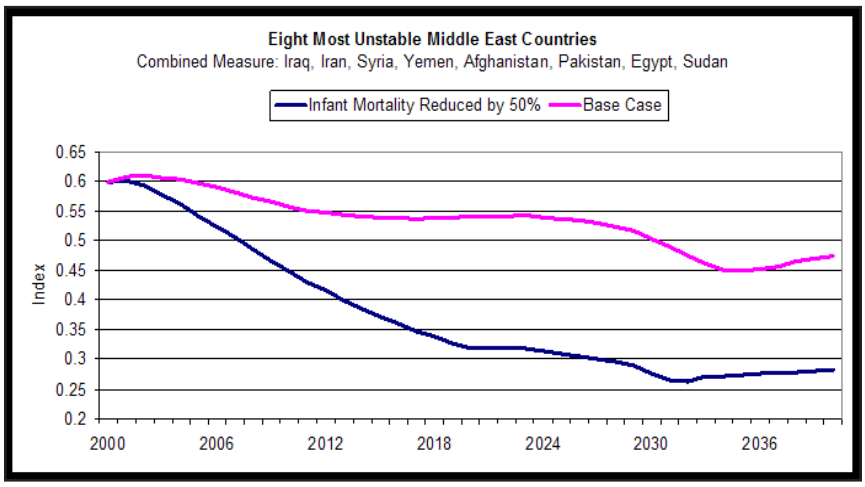


Figure 8. Impact of Reduced Infant Mortality on the Eight Most Unstable Countries in the Middle East

and it certainly seems less satisfying than building a strong military presence in the region. But it is a large contributor to regional stability nonetheless, and improving the welfare of children is not usually a continuous area in policy intervention. Sadly, the plight of children in the Middle East is indeed a disaster all its own, and correcting it will serve many purposes other than stability.

In figure 9, we analyzed how a 50% reduction in the infant mortality would affect stability and then compared the output with the base case. The result shows a dramatic increase in stability for even the most unstable countries. With a 60% spread between the base case and the reduced infant mortality scenario by 2040, it is apparent that the return on investment is quite high. Contrasting this option with other perceived methods of improving stability, such as increased military spending, strengthens the argument for this scenario.

Consider that if Syria reduced infant mortality by 50%, it would increase stability by 60%, yet if they increased military spending it would have almost no impact on stability. By 2040, the result from additional defense spending would be only a marginal 6% increase in stability. Extending this example by increasing spending on nuclear weapons by 50%, with the presumption that the previous increase

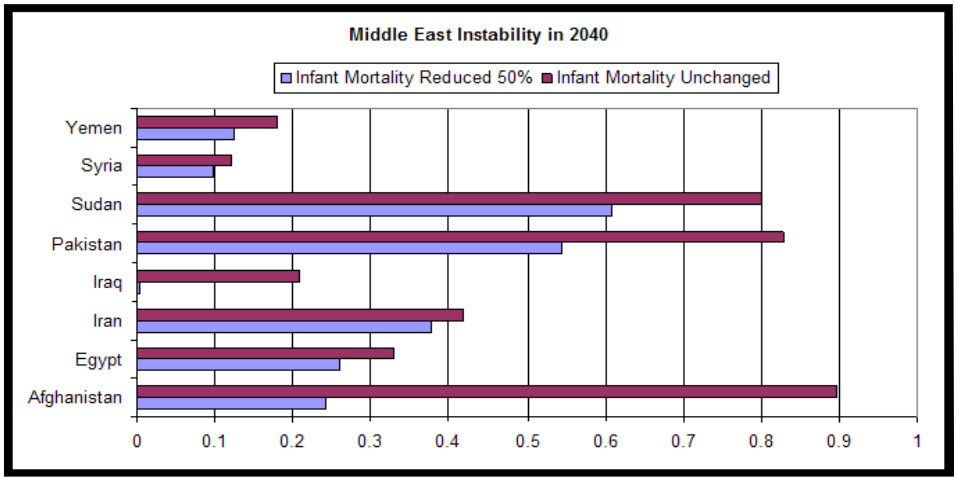


Figure 9. Impact of Reduced Infant Mortality of Stability in the Middle East

in military spending would be allocated to the acquisition of these weapons, we concluded that this too would only produce a 7% increase in stability by 2040.

In order to further study our analysis, we ran the same calculations for Iran, Pakistan, Egypt, and Iraq, and in each case we found no significant increase in stability through the acquisition of nuclear weapons.

Additionally, we found that investments in reducing infant mortality can also generate secondary impacts relevant to economic development. As noted below, GDP Per Capita, Imports, and even Exports increase as infant mortality decreases. While these changes are relatively limited and there are no double corollary drivers impacting such progress, we cannot ignore the economic impact of investing in reducing infant mortality.

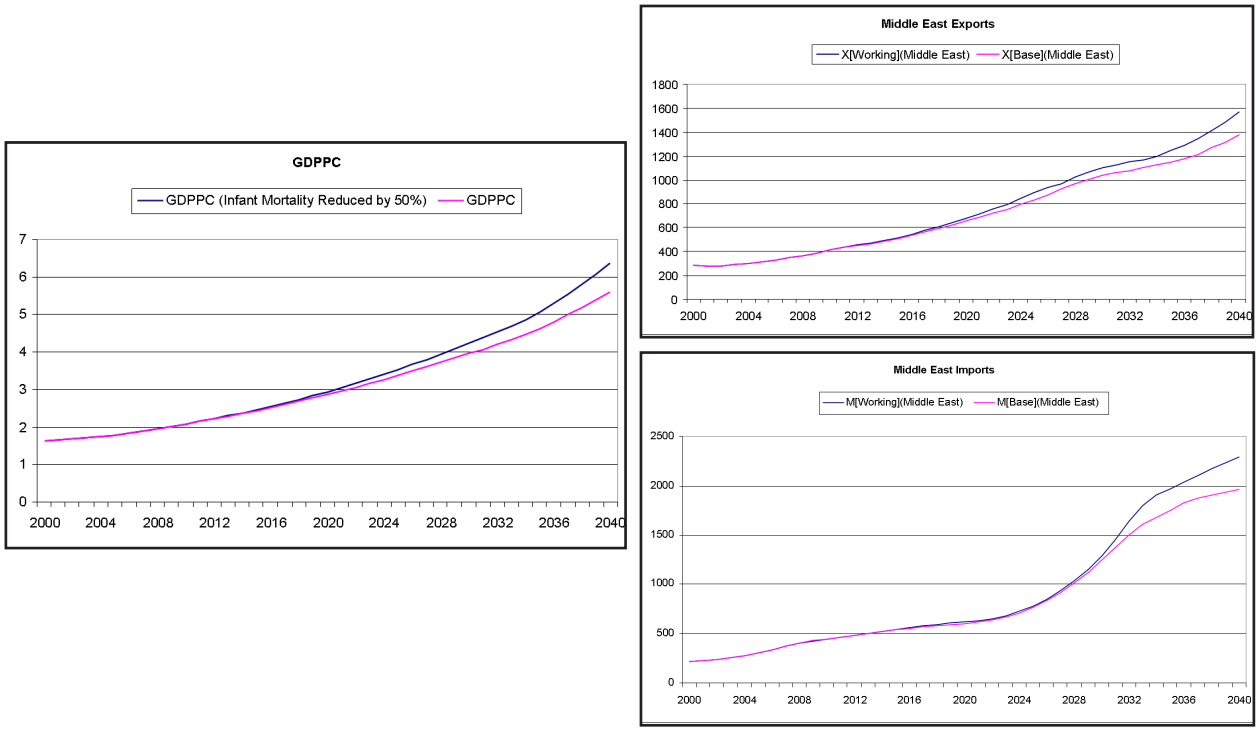


Figure 10. Impact of Reduced Infant Mortality on GDP and Trade

Based on the above analysis, we conclude that investments in reducing infant mortality would make significant inroads in building long-term stability across the region. Furthermore, it is fair to postulate that these actions would reduce the conditions that promote radical ideologies, including fundamentalist Islam and sectarian conflict, since, as we have seen in the previous two sections, mass movements depend on poor economic and environmental conditions to propagate their ideology.

Part V: Conclusion

We have offered two versions of the future in the Middle East. Our base case analysis illustrates that the Middle East will remain a region divided against it self. While elements of democracy and freedom will exist, their form-and-function will have little resemblance to that of Western democracies. The balance between productivity and the human quality of life will be uneven. Some segments of

society will be exceedingly wealthy, powerful, and dominant, while others will be ruled-over and disenfranchised.

A surprising finding in the base case is that countries portrayed as the greatest threat to the United States actually show some of the most promise. Iran and Lebanon both do well in many of the categories of stability. This bright spot is offset by the perpetuation of conditions that helped bring about Al Qaeda. These conditions of low GDP, education, exports and others ensure that Al Qaeda will have many real disparities to embellish as it looks for new recruits. Afghanistan, Syria, Sudan, Pakistan, and Yemen will all remain on the brink of chaos due to these problems. These countries will be unable to control their own territories and will be ripe for mass movements to develop and prosper. These mass movements will draw much of their ideology from Al Qaeda, even if Al Qaeda is destroyed and all its leaders captured. These mass movements will continue to feel threatened by globalization and will continue to hold the United States responsible for the economic woes of the region. They will continue to pursue asymmetric methods of violence, including the acquisition and use of weapons of mass destruction.

Increased military spending in the region, even among Western-friendly nations, will not improve stability. While stronger militaries among allies in the region do help governments to project power, they do not provide the influence necessary for positive change. While we do not advocate disarmament, we do see that influence necessary for positive change can not always be obtained from overt expressions of power. A better balance in spending and assistance will help to ensure hope, provide for the common needs of the population, and consequently improve stability.

This type of balance leads to our second version of the future in the Middle East. Of the numerous variables that influence stability, the infant mortality rate offers low-hanging fruit to the United States and others interested in fostering stability. Lowering the infant death rate will improve all other areas of stability. More importantly. this type of policy intervention does not appear as much of an overt threat to nations as many other types of assistance. As the other variables improve with the reduction in mortality, there will be a corresponding reduction in the conditions that foster radicalism.

In conclusion, we argue that stability in the Middle East can only truly be achieved through the provision of basic human needs. Massive military force or the acquisition of nuclear weapons might provide perceptions of power and security, but any stability will only be transitory. There are a number of intervention points that can be effective, and we offer infant mortality as an easy and hopefully non-confrontational access point for U.S. foreign policy.

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CHAPTER THREE

Future Informational Challenges and Thoughts for the Future

As today, in the future, phenomenal changes and advancements in information technology age will continue to exponentially raise the level of complexity within the informational domain, and will remain an essential component within all domains: virtual, cognitive, and physical. These advances and breakthroughs have already improved—but also complicated—the way we communicate our information and influence others via messages and themes. They have required us to develop new processes and methods for the collection, protection, processing, analysis, and understanding of mega-information and for decision making. The unprecedented "connectivity" provided by the global grid brings mountains of information along with significant threats. The information superhighway and cyberspace have brought our enemies and our friends not only to our shores but to our government, our businesses, and our homes. We are deluged with mega volumes of domestic and global information and this includes those who either want to help us or harm us.

In the first essay, "The Limits of Information," Jonathan E. Czarnecki illustrates the information-uncertainty paradox using recent operations and provides a visual means of depicting the problem. He discusses the national security implications, and provides both technical and, more importantly, behavioral ways to adjust to this new reality. He describes the conventional method of envisioning information as a pyramid ascending from data to wisdom. However, he asserts that recent research in physics, mathematics, and information theory indicates that the conventional view may be wrong. Instead, there is strong evidence that data and meaning, which make up the joint military doctrinal definition of information, are different, but are correlated and subject to Heisenberg uncertainty. In short a paradox exists in which information and uncertainty are intrinsically intertwined; the more data one gets, the more uncertainty one has about its meaning.

The author further asserts that, for national security purposes, this new approach to information requires a reformation in the strategic, operational, and tactical views, especially in the realms of command and control and intelligence. Every national security challenge in recent years has involved a breakdown in command and control and/or intelligence systems. This is no accident. It is a reflection of the collision of incredible information technology advances with the limits of the human ability to comprehend the product of that technology. The collision cannot be avoided.

In his essay, "Leveraging Information as an Element of National Power," Professor Dennis Murphy notes that information as power is wielded in a complex environment consisting of the physical, information, and cognitive domains. His assessment is that the United States, while a military superpower, is not an information superpower. In this world, he believes, the U.S. military should no longer base strategy on an expectation of information superiority. In fact, it can only expect to achieve

information dominance for a limited period of time in a very localized area. He stresses that the United States should, however, be expected to effectively *manage* this information environment. He concludes by noting that we live in a very complex information environment where new approaches must be considered, which is the challenge that faces Information Operations professionals.

In the third essay, "The Sword and the Network," Tim Rosenberg follows up from his previous essay published in the *2006 Proteus Workshop Digest*. He expertly describes how to bring Computer Network Attack (CNA) and Computer Network Defense (CND) into a martial training and operational setting. Furthermore, once the martial CNA/CND foundation is complete, the traditional aspects of Body, Mind, Spirit (BMS) training will be added into the CNA/CND space for complete integration. His work presents the first concepts of a combined warrior training program.

Rosenberg further describes the results of several White Wolf Security sessions that have sought to address some of the basic, fundamental questions and issues around an integrated training program. The original idea of body, mind, spirit, and technology has been distilled down to body, technology, and citta (mind/heart/spirit). In the winter of 2007, a combined cyber/physical tactical mission was demonstrated. Since then, the demonstration has been repeated several times for a wide variety of audiences. Likewise, cyber attack and defend exercises have been designed to put the teams through protracted digital attack scenarios, causing stress to the technology, the body and the spirit. These exercises, while digital in focus, are designed around technologies that demonstrate the convergence of the cyber and the physical realms.

He concludes by highlighting White Wolf Security's development of tools and training that emphasize the connectedness of things across their respective domains, instead of treating them as stove-piped individual topics. He presents a combined cyber/physical attack scenario as well as the findings of a year spent in identifying methods, tools, and technologies that can be immediately deployed to teach and operate in a combined environment.

The Limits of Information

Dr. Jonathan E. Czarnecki

"There are more things in heaven and earth, Horatio,
than are dreamt of in your philosophy."
—Hamlet, Act I, v. 166-167

Introduction

The silver bullet for the modern military is information. More information means more situational and even knowledge awareness.[1] More information lifts the fog of war.[2] More information enables agility, and thus adaptiveness to rapidly changing situations.[3] More information improves the intelligence picture, thus limiting the potential for error.[4] Information appears to be the 21st century equivalent to shovels for civil defense in the 20th century; with enough information anything is possible.[5]

What is information, however? What makes it special? How does information really influence military operations and doctrine? Is it a silver bullet or a poison pen? The answers to these questions are the subject of this essay. It will argue that information is a poorly understood concept, with a great deal of controversy with respect to what it means. The essay will argue that even with a consensual definition of information, it is not at all clear that more information is better. This is due to the unique confluence of two different streams of thought in modern science—information theory and quantum physics—catalyzed by cognitive science and psychology. The paper will present evidence on how more information actually contributes to the breakdown of military operations, specifically in the Command and Control and Intelligence realms. These breakdowns reflect the inevitable and unavoidable collision between information technology advances and the limits of human and organizational comprehension and processing. To emphasize this point, the collision *cannot* be avoided or evaded in the natural world.

The essay makes this point by providing an Information Content-Meaning Matrix that graphically summarizes the unbridgeable distance between human leadership desires and human individual and organizational capabilities. Finally, the paper presents some observations on non-technological, individual, and organizational behaviors that can assist the military in adjusting to the newly emergent realities of the limits of information.

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1. David S. Alberts, John J. Garstka, Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*; Washington, D.C.: C4ISR Cooperative Research Program (CCRP), 1999, pp. 29-32.
2. William Owens and Ed Offley, *Lifting the Fog of War*; Baltimore, Maryland: Johns Hopkins Press, 2001.
3. Simon Reay Atkinson and James Moffat, *The Agile Organization: From Informal Networks to Complex Effects and Agility*; Washington, D.C.: C4ISR Cooperative Research Program (CCRP), 2005.
4. Gregory F. Treverton, *Reshaping National Intelligence for an Age of Information*; London: Cambridge University Press, 2001.
5. The phrase, from a Director of Civil Defense late in the Cold War was "With enough shovels we can be safe." From B. Bruce-Briggs, *Shield of Faith*; New York: Simon & Schuster, 1988, page 421.

What is Information and why do we want more?

Information typically is depicted in terms of a pyramid as in figure 1, leading from data to wisdom.[6] Arquilla and Ronfeldt suggest that the pyramid is too simplistic and recommend a conceptualization of information as means, message, and material.[7] United States joint doctrine defines information as data plus meaning.[8] In fact, there is great confusion and controversy within the scientific community over just what information is and what information's role is in understanding reality.[9] The significant problem with information is that everyone has assumed that everyone understands what information is when the concept itself is far more complex than everyone imagined.

If the foundational concept for transforming the way one conducts oneself in the world and for transforming the organizations, equipment, and reality to assist in that conduct is controversial, then efforts to accomplish such a transformation are bound for controversy as well.

The problem of conceptualization for information is one aspect of the mystery; the second and equally compelling is the constant, enduring, and encompassing pursuit of information by all living systems. The nature of this pursuit is well documented in James Grier Miller's research compendium on information and life, aptly titled *Living Systems Theory*.[10] In this pioneering work, Miller and associates present a theory and model arguing that all life, from cellular to global, seeks and processes information, mass, and energy as the means to continue existence. Of course the problem with this concept revolves about the definition of information. Miller adopts the technical definition of information as data, measurable in bits, described in formal mathematical detail by Claude Shannon.[11] He separates meaning from the definition of information as a thing apart. Miller recognizes the difficulties in doing so, but uses the split definition to account for the subjectivity of the term meaning, and to utilize the so-called objectivity of data. Thus defined, information for Miller is, "the negative of uncertainty."[12] All life processes data to maintain itself and adapt to circumstances; this is done presumably to ensure continuation of the entity. In his preliminary discussion of his general theory of living systems, Miller notes the

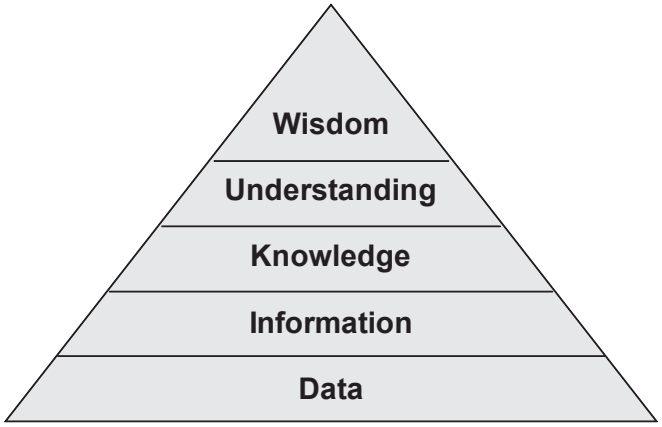

Figure 1. Information Pyramid Archetype

6. John Arquilla and David Ronfeldt, "Information, Power, and Grand Strategy: In Athena's Camp – Section 1," in Arquilla and Ronfeldt (editors), *In Athena's Camp: Preparing for Conflict in the Information Age*; Santa Monica, California: RAND Publishing, 1997, page 146.
7. Ibid., page 152.
8. Joint Publication 1-02, *Dictionary of Military and Associated Terms*; Washington, D.C.: Joint Chiefs of Staff, 2001 (amended in 2007), page 258.
9. Hans Christian Von Bayer, *Information: The New Language of Science*, Cambridge, Massachusetts: Harvard University Press, 2005, Chapters 2 and 3.
10. James G. Miller, *Living Systems Theory*; Boulder, Colorado: University of Colorado Press, 1996 (Reprint of 1978 edition.)
11. Claude E. Shannon, "A mathematical theory of communications," *Bell Systems Technical Journal*, no. 27, pp. 379-423 and 623-656, 1948.
12. Miller, *Living Systems Theory*, page 12.

strong relationship between information and energy; the measure for Shannon information is the same as the negative measure for entropy, a concept of thermodynamics captured in the Second Law: thermodynamic (energy) degradation tends to be irrevocable over time.[13]

The relationship of energy and information through entropy presents a paradox; if information follows energy and irrevocably degrades over time, how do living systems use it to create life, that is, order from disorder? Ilya Prigogine, a Nobel laureate physicist, provides a resolution to the quandary: in *open* systems, those that can import mass, energy, and information from exogenous environments and transform them as required, negative entropy, or negentropy, can develop and exist.[14] However, one must note that open systems only exist in a region or locality of space-time; the universe and reality as humans understand it is a closed system in the large. Thus, for life to exist in its pursuit of information (in the narrow sense of data), it must metaphorically borrow from Peter to pay Paul. The corollary to this observation is of importance to individuals, groups, and organizations that are living systems: the more open the system, the more "life" or order potentially can be generated. The reverse also holds.

What about the subjective concept of "meaning?" Can meaning merely be dismissed as immeasurable so that scientists can focus on that which can be measured—data? The answer from physics and mathematics, though still controversial, is a resounding no. The reason that meaning cannot simply be dismissed a subjective concept is the revelation from quantum physics that humans exists in a "participatory universe"; that is, everything is subjective and dependent on the observer(s).[15] The subjective nature of reality is a direct extension of the Standard Model of Physics per the so-named Copenhagen Interpretation.[16] The Standard Model is a compromise between relativitistic physics and quantum physics; the former well describes and explains the macro-world while the latter well describes and explains the micro-world. Relativitistic physics, the father of which was Albert Einstein, addresses issues of space and time from a relational (hence the term, relativity) perspective—there is no absolute space or time; in fact, space and time are inextricably *related*. Relativity theory and models are deterministic, however; that is, there are unique solutions for identified problems—there is certainty. Quantum physics, on the other hand, notes that on the micro-level, the size of atomic and sub-atomic phenomena, strange things occur that relativity theory cannot explain. Reality no longer appears deterministic, but *probabilistic* and uncertain; events in the sub-atomic world are explained by sophisticated statistical relationships that always have a degree of uncertainty. In fact, precisely measuring one aspect (like position) of a phenomenon increases the imprecision of measuring another aspect (like velocity). The Standard Model of Physics provides a mathematical "band-aid" to resolve the differences in both worlds. However, such band-aids are costly in the assumptions they require of

13. Ibid, page 13. Among others, Ludwig Boltzmann, a noted Austrian physicist also observed this relationship at the turn of the 20th century. In fact, the constant that he defined (and named after himself), *k*, can be used for either information or energy.
14. Ilya Prigogine, *Thermodynamics of Irreversible Processes, Second Edition*, New York: John Wiley and Sons, 1961. Erwin Schroedinger, another Nobel laureate physicist from Austria, first observed the possibility of negative entropy in open living systems in his book, *What is Life? Mind and Matters*, London: Cambridge University Press, 1987 (reprint), Chapter 6.
15. John Wheeler, a noted American quantum physicist, is the person who coined the term, participatory universe, in his book *Geons, Black Holes, and Quantum Foam: A Life in Physics*, New York: W.W. Norton & Co., 1998.
16. There are several interpretations of the Standard Model, but the most prevalent and accepted is the Copenhagen, named after the Physics school headed by Niels Bohr and Werner Heisenberg. For a good and understandable discussion, read Charles Seife, *Decoding the Universe: how the New Science of Information is Explaining Everything in the Cosmos, from Our Brains to Black Holes*, New York: Viking Press, 2006, pp. 254-257.

researchers. The Copenhagen Interpretation requires one to assume that observers "cause" the change in quantum or micro-world phenomena, collapsing waves into particles or visa versa, increasing uncertainty in one place while decreasing it in others.

Until recently, Copenhagen was the only interpretation that fully explained the disparity in the two theories. An alternative interpretation, the Many Worlds, or Everett Interpretation, has emerged to contest the Copenhagen idea. The problem with the Copenhagen interpretation is that it requires the wave or photon to be intelligent, to know when it is observed and act accordingly. There is no known scientific evidence supporting such a feat, thus the term, assumption. The Many Worlds Interpretation places the intelligence for accounting wave-particle duality in the hands of the observer; when observing a particle or wave, the universe "splits"; down one path goes the wave observation, down the other goes the particle observation. It is the observer who determines the split, and the split retains the probabilistic and uncertain natures that are observed.[17] The observer does this through obtaining information from the situation; the critical measure is information—not just the data that Miller, Shannon, and other information researchers of that generation considered, but information that includes content, includes meaning. Herein, of course, is the problem with the Many Worlds Interpretation: how does one measure information? This is a subject of ongoing research and quite a bit of controversy. One potential direction leads to the development of the concept of quantum information that encodes meaning into the data; however, the pursuit of that idea is beyond this paper's purposes. Nonetheless, information as a quantum phenomenon, as a legitimate object of scientific research, appears to be here to stay. Siefe reports physicist David Deutsch saying, "the structure of the multiverse is determined by information flow."[18]

TABLE 1

RECENT NATIONAL SECURITY CHALLENGES (Since 1990)

CHALLENGE	REASON for Challenge (failure)*
Iraq Civil War (2005)	C&C
Iraq Insurgency (2003)	C&C
Iraq Post Hostilities (2003)	C&C
Iraq Causus Bellum	C&C
Afghan ANACONDA (2002)	C&C
Afghan Tora Bora (2001)	C&C
9/11 (2001)	C&C
Cole (2000)	Intel
Kosovo (1999)	C&C
Embassy Bombings (1998)	Intel
Khobar Towers (1996)	Intel
OK City (1996)	BOB
Balkans (1992-1995)	C&C
Haiti (1995)	C&C
Somalia (1993)	C&C
WTC 1993	Intel
Iraq Invasion of Kuwait (1990-91)	Intel

* Intel – intelligence failure to observe

C&C – Command and control failure to orient, decide, and act

This section has traveled into the far reaches of modern scientific endeavor as it applies to information. Information seems to be both data and meaning. Information is essential for life, and all life processes information to exist. Hans Christian Von Bayer, an information physicist, writes, "Information is the transfer of form from one medium to another…; we can tentatively define information as the *communication of relationships* (italics in original)."[19] The Department of Defense definition of

17. Ibid. pp. 257-262.
18. Ibid., Page 261.
19. Von Bayer, *Information*, page 25.

information, as data plus meaning, seems to be valid. However, there are attributes of the concept that one must include in any utilization of it: information appears probabilistic; it appears to follow Heisenberg Uncertainty in that the more information obtained, the less certainty about its meaning; it appears to both enable and disable order or life, depending on the openness of the system in which it exists; it appears to follow natural law, and thus have a tendency towards degradation or disorder; and finally, information appears to be subjective, that is unique to the observer to at least a certain degree. These attributes have critical impacts on the use of information as intelligence and information in the battlespace because different types of living systems have different limits in terms of the amount and speed with which they process information. More information only *sometimes* is better than less information.

Evidence of a Problem

Alvin Toffler, the futurist, usually is credited with identifying the critical importance of information for the present and future through his book, *The Third Wave*. In the book, Toffler names the new age in which humans find themselves as "The Information Age." Information, by any measure (bits, pages, images), is increasing on the familiar non-linear "S" curve, with no appearance of the flattening associated with the end of an age. *The Third Wave* was published first in 1984, well before the Internet explosion. Including the Internet increases the positive slope of the curve showing increasing information to the point that the slope virtually is vertical. In this essay, the time of the Internet explosion, identified in a variety of sources as extending from the mid-1980s thru the mid-1990s, will be used as the beginning of an increasing information challenge for the military and the intelligence community. That challenge is the ability to accurately and timely "observe, orient, decide, and act" on the information provided to them; too much information has slowed their Boyd decision cycles.[20] Using 1990 as a convenient start date illustrating the beginning of the Internet explosion of information, Table 1 shows the problem in national security crises.

With the exception of the Oklahoma City bombing, a "Bolt out of the Blue" (BOB) attack, the general trend is towards more Command and Control failures despite the vastly increased fidelity, bandwidth, and number of channels of information available to decision makers at all levels. What is happening is no accident. It is directly a consequence of *more and better* information available within a relatively constant timeframe, the time to make decisions and act. The failures are due to the phenomenon of information overload.

James Grier Miller again is the best one-stop source on describing the phenomenon.[21] Using his constrained definition of information (bits), he collected the results of cognitive science/psychological and neurological research on the information input/output rates of individuals, groups, and organizations (among others). All show the same phenomenon: at first, as input rises, output rises even more; then there is a short flat period, followed by a sharp decline in which more input results in *less* output ending with a distinct finish where more input has no corresponding output—the system has ceased operating. The differences among the targets of the research are due to information processing rates: smaller entities (individuals) process information faster than larger ones (groups, organizations); but larger entities can process far more information. In complex environments, these differences are

20. USAF Colonel John Boyd (dec.) originated the "O-O-D-A" cycle, which can be found in his class presentation, "A Discourse on Winning and Losing," in the first part, "Patterns of Conflict," slide 131. Unpublished presentation, August, 1987.
21. Miller, *Living Systems,* Chapter 5 encompasses all the discussion that follows this note.

vital to survival of the living system: in less complex situations, individuals best adapt; in more complex situations, groups and organizations perform better.

All the living systems peak out in their ability to process information; the point at which they do is information overload. No longer do the systems efficiently or effectively process information; in fact, more information apparently inhibits their ability to adapt, to cope, to survive. The United States military has empirical battlespace research demonstrating information overload.

During the late 1960s and mid-1970s, the U.S. Army undertook research investigating the reasons why some infantry battalions were more effective in combat than others. The research used a more sophisticated version of the Boyd Decision Cycle, Edgar Schein's seven-step Adaptive-Coping Model, into which researchers feed observational and survey data from both units in the field and "virtual" units in command post exercises. The results from the two sets were nearly identical: what distinguished the more successful battalions from the less successful ones was how well the battalion battle staffs handled information overload within the staff. Battalions encountered information overload at the moment of contact with the enemy; thus, time compression made the "handling" or management of the information overload critical. Not only did the battalions have an enormous amount of data to process, given the organization's limit on how fast it could process the data, but they also had to contend with the uncertainties associated with the meaning of the voluminous data. [22] Those battle staffs that were efficient in distributing the overload among the staff were the most effective in the battlespace.

Martin Van Creveld has made a similar point in his classic analysis, *Command in War*. He asserts that the primary purpose of commanders and staff is to reduce the uncertainties of the battlespace for their side. However, he notes that increasing information does not reduce the uncertainties, it increases them. Using data from the American experience in Vietnam, Van Creveld noted a kind of positive feedback loop occurring in which more information begat the need for more capabilities to process the information which begat the need for more information, and on and on. This loop increased centralization, specialization, and complexity in the organizational and operating environment to the point, literally, of command paralysis. Senior military commanders in Vietnam had unprecedented information on what was happening on the battlefield, but *did not understand what was going on*, and consequently did not act promptly to take advantage of the information.[23]

This organizational behavioral pathology, especially acute among the U.S. military, has not gone away; it has increased. In 1978, exercise NIFTY NUGGET experienced command information (message) delays in which the most critical (FLASH) messages failed to meet their transmission-reception time standard while low critical messages (IMMEDIATE and PRIORITY) did meet their standards. In 2002, using the best electronic and human intelligence in the world, with the best communications systems in the world, the most elite U.S. military forces managed to land *three* MH-47 Chinook troop helicopters on top of an enemy fortified position during Operation ANACONDA in Afghanistan over the space of several hours, *even though the command knew the existence of the fortified position!*

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22. Joseph Olmstead, the chief Army researcher for the FORGE research, has condensed the findings in his Institute for Defense Analyses monograph, *Battle Staff Integration,* Washington: IDA, 1992. Edgar Schein's model is found in his classic book, *Organizational Psychology*, Englewood Cliffs, New Jersey: Prentice-Hall, 1979. Major Mike McGee summarizes Olmstead's research in Army battle staff terminology in his monograph, "Battle Staff Integration," EXCELNET paper, 1985.
23. Martin Van Creveld, *Command in War*; Cambridge, Massachusetts: Harvard University Press, 1985, Chapter 7.

A Visual Understanding of What is Happening

United States military and intelligence forces are crippling themselves through a mistaken idea that more information is better. It is not and can never be. That is the lesson of conceiving information as a quantum phenomenon that follows natural law. All other things equal, in a complex battlespace, more information will lead to decision paralysis, and to system defeat. Increasing the amount of data flowing to command and control elements only accelerates a process that leads to paralysis and defeat. The modern complex battlespace (and its future relation) always incurs information overload at or before contact, not after. Senior command and control entities desperately want certainty for their actions; they believe they can get it through "Third Wave" information technology improvements. They are seeking an illusory goal, and their search is leading the forces they command into anxiety, ignorance, and defeat. Figure 2 illustrates these statements.

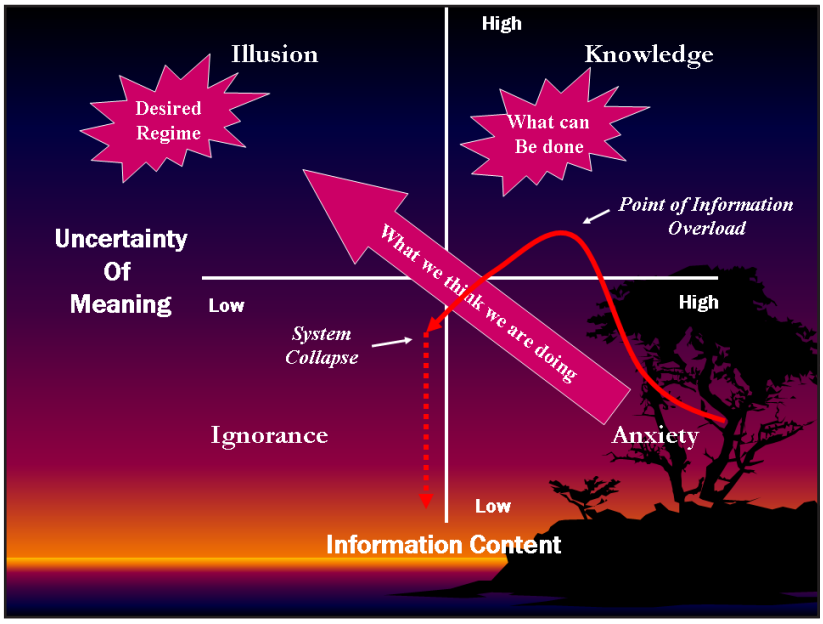

Figure 2. Increasing amounts of information accelerate the rate of system collapse

By increasing the information technology (bandwidth and channels), commanders believe they are increasing information content and reducing uncertainty. Indeed, for a while that is what occurs, until the point of information overload. At that time, information content declines, and uncertainty can increase to the point that the system collapses—the battle staff or strategic staff no longer functions according to its purpose.

What Can Be Done

There are ways to delay information overload, to handle it, and to deal with the uncertainty associated with increased information and complexity. These ways or methods require unconventional organizational behavior that truly can be called transformational.

First, all interested parties must become familiar with the concepts of the new sciences. Complexity only is one of these. Far more intrusive on defense and intelligence organizational behaviors are the concepts associated with quantum realities and probability. Familiarity does not mean that all the parties must become quantum physicists, but rather that they must learn, understand, and act upon the real-life implications of quantum behavior: ideas like entanglement, superposition, "spooky action at a distance," and coherence/de-coherence. Humans can no longer consider the world in classical physics terms; they have increased their impact on reality—particularly with respect to information—such that formerly micro-reality phenomena are appearing in the macro-world they experience.

Second, Miller points out several methods to deal with information overload; PROTEUS has identified one such insight: Bedfellows. The idea is formally called using "multiple channels."[24] The Army research indicated that those battle staffs that distributed the information overload internally and horizontally worked better and more effectively than those that did not. The commander and staff *shared* their information and pain so that problems and possible solutions could emerge from anywhere; in effect, while the staff as an organization processed incoming information at its slow speed, the internal processing speeded up by using faster, collaborative individual processing. Relying on powerful human perceptual skills, adequately checked by fellow staff, is another means. These skills are recognition, interpretation, and expectation.[25]

While these skills are powerful, they can also mislead; "groupthink" is one organizational behavior that illustrates this. A final method, based on several decades of research, is the aggressive and abusive use of power by those who are in authority to force information from those who are subservient.[26] Without checks from command, peers, or subordinates, people in a position of ambiguous power will easily turn to evil; the experience of Abu Ghraib is a classic illustration of this phenomenon. Again, if the information concerning the power is shared, there is much less chance of such an occurrence.

Third, military and intelligence leaders can recognize that teamwork, enhanced through cohesion and superb leadership, is at least equally as important as fast information technologies. To this end, collaborative efforts building on the results of thoroughly common-trained commanders and staff who respect and trust each other to the point of implicit-ness are an absolute requirement to effectively counteract the effects of information uncertainty and overload. One might observe that the data part of information is amenable to technological solution because of its quantitative aspects; however, the meaning part of information is qualitative and subject to inherent ambiguity. The only way to overcome that ambiguity is to ensure as much as possible that different people on the team/staff perceive their realities/situations in the same way so that they will adapt without having to explicitly communicate—thus bringing to bear all the problems of uncertainty, slowness, and paralysis.[27] There is empirical evidence to demonstrate the advantages of this. T.N. Dupuy, a military analyst, investigated why the German armed forces were so difficult to defeat during World War Two. He found that the German armed forces decentralized command authority and responsibility, basing that decentralization on the common training and education all their leaders received. This decentralization, coupled with the use of Command Intent (the "what" to be achieved), enabled the Germans to attain superior operational speeds: their decision cycles were faster than their opponents. What was equally important was that they were also able to inhibit their opponents' own cycles. Dupuy argued convincingly that this truly was the German "genius for war."[28]

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24. Miller, *Living Systems*, Chapter 5.
25. From Karl Albrecht, *Brainpower*; Englewood Cliffs, New Jersey: Prentice-Hall, 1980.
26. The classic experiement is the Stanford Prison Experiment (SPE), conducted by Phillip Zimbardo in 1972. Zimbardo has recently published a confessional memoir on this controversial and dramatic experiment, *The Lucifer Effect: How Good People Turn Evil*; New York: Random House, 2007.
27. Referring again to Boyd's "Patterns of Conflict" part of "A Discourse on Winning and Losing," what one tries to achieve is to make one's own decision cycle as fast as possible (Boyd's first Rule or Law), and to slow down as much as possible one's opponents (the second Rule or Law.)
28. T.N. Dupuy, *A Genius for War*; Englewood Cliffs, New Jersey: Prentice-Hall, 1977. This author has personally observed a modern-day inheritance of this: during the Cold War, the U.S. Army standard for issuing Operations Orders at the battalion level to subordinates was six hours. The German Bundeswehr routinely did theirs in two.

Fourth and finally, interested parties must remember the necessary conditions for information to constructively flow and create order in the first place: open systems. That is the pre-condition for sharing information among each other. Those who would use information as a means for power and prestige, those who would insulate their organizations from information-sharing for organizational psychologically neurotic or psychotic reasons doom their organizations and responsible entities to a Sisyphean fate that ends only in systems collapse. Because information follows natural law, it cannot be any other way. Open systems enable new order, life, and successful operations; closed systems kill them. What does this mean for U.S. intelligence and military actions? The future, and the answer to the question, is upon them.

Leveraging Information as an Element of National Power

Professor Dennis M. Murphy

"How can a man in a cave out-communicate the world's leading communication society?"

—Richard Holbrooke

The answer to Ambassador Holbrooke's question lies in understanding today's information environment. Interestingly, one needs to go back to the Reagan administration to find the most succinct and pointed mention of information as an element of power in formal government documents. Subsequent national security documents have alluded to different aspects of information, but without a specific strategy or definition. Still, it is generally accepted in the United States government today that information is an element of national power along with diplomatic, military, and economic power…and that information is woven through the other elements, since their activities will have an informational impact. Given this dearth of official documentation, Drs. Dan Kuehl and Bob Nielson proffered the following definition of the information element: "use of information content and technology as strategic instruments to shape fundamental political, economic, military, and cultural forces on a long-term basis to affect the global behavior of governments, supra-governmental organizations, and societies to support national security." Information as power is wielded in a complex environment consisting of the physical, information, and cognitive domains.

In a speech to a U.S. Army War College class in March 2006, then Secretary of Defense Donald Rumsfeld said:

> *If I were grading, I would say we probably deserve a D or a D-plus as a country as to how well we're doing in the battle of ideas that's taking place in the world today. And I'm not going to suggest that it's easy, but we have not found the formula as a country.*

A rather remarkable statement considering that the National Strategy for Combating Terrorism identified "extremist ideology" as (in Clausewitzian terms) the center of gravity of what is likely a generational struggle. But to understand the dilemma facing the United States and its allies, one must consider today's information environment. That environment enables non-traditional players who often use cheap, ubiquitous communications means to transmit their messages with immediacy and with world-wide coverage and impact. These actors, often uninhibited by the need to be truthful, are also devoid of a bureaucracy that demands clearance and approval of public statements. And so, the United States finds itself responding to adversaries' messages rather than proactively and effectively telling our own story. A start point for discussion must recognize that this environment will not change to favor nation-states. Some illustrative examples make that point.

> First and most obvious to us is the fact that terrorist groups are networked. Sunni extremist groups use multiple websites to solicit donations. Terrorists recruit, conduct

> knowledge management (e.g. the "Encyclopedia of Jihad"), and conduct perception management and disruptive attacks on the web. The uses of information technology (IT) will become increasingly sophisticated, and greater emphasis will be placed on the use of IT for both disruptive and destructive attacks.

But consider for a moment the power and ubiquity of the cell phone. There are numerous examples of cell phone SMS (text) messaging shaping political campaigns and mobilizing and revolutionizing politics. It is used both to call people to popular protests as well as by governments to provide misinformation in order to quell such protests. Text messaging is the medium of choice in overseas countries. It bypasses mass media and mobilizes an already persuaded populace as a means of lightweight engagement. An example includes the popular uprising in Spain after the subway bombings, where text messaging rose 40% above normal within two days of the attacks. Cell phones currently contain the technology to text and to provide news, video, sound, voice, radio, and internet. Mobile is pervasive in the third world. Some 97% of Tanzanians have access to mobile phones. Mobile coverage exists throughout Uganda. There are 100 million handsets in sub-Saharan Africa. Radio is the only media device more prevalent than mobile. Small laptops add to the mobile tech phenomena. One hundred dollar laptops currently in development are nearly indestructible.

> Our children and grandchildren will likely straddle two worlds: the real world and the virtual world of "web 3.0" reflective of the internet world of 2nd Life and others. 2nd Life is attractive as an opportunity to socialize where there is no need to compete, and it can be exploited as a tool for learning. Web 3.0 is generally about being inside a 3D world that is low cost and emotive. Multinational corporations see a movement toward a 3D internet world (which already exists) where they will develop and execute business plans. Terrorist groups find opportunities to both train and conduct business in the same "world."

Today's mainstream media is not your father's mainstream media. Where newspapers once competed for knowledge as a scarce resource, today the scarce resource is the reader's (or listeners in the case of broadcast media) attention. Perhaps that is why increasing numbers of young adults turn to Jon Stewart's "The Daily Show" for their news. And, in a strange twist, mainstream media now turns increasingly to bloggers for their stories and the most respected bloggers require multiple sources to verify accuracy. At the same time, the mainstream media, acting as the watchdog of government, is the first to cry "foul" when the United States attempts to wield information as power. It seems it only takes mention of that emotive term "propaganda" and its perceived clash with the democratic ideals of a free press to cause political leaders to cringe, huddle, and surrender that battlefield.

So it is apparent that the United States, while a military superpower, is not an information superpower. In this world, the U.S. military can no longer expect to have a strategy dependent on information superiority. In fact, it can only expect to achieve information dominance for a limited period of time in a very localized area. The United States should, however, be expected to effectively *manage* this information environment. We live in a very complex information environment where new approaches must be considered. This is the challenge that faces Information Operations professionals.

The Sword and the Network

One Year Later in Blending Body, Mind, and Technology

Mr. Tim Rosenberg

Introduction

In August of 2006, I presented the first paper entitled "The Sword and the Network: Combining Body, Mind, Spirit, and Technology." In that paper I discussed the benefits of creating a combined training program that integrated the mindfulness of eastern philosophy together with the honor code of traditional warrior training and the bleeding edge of technology war fighting. I delivered that paper to Proteus USA. After my talk, several members (some quietly and other not so) called my ideas into question. The overall comment can be summed up as, "That's a nice theory, but what can you do with it, and can you make it actually work?"

Over the next year, I assembled a diverse team of individuals to see what we could reduce to practice. Our initial meeting was held in January of 2007 and consisted of the following individuals:

- David M. Frees, Esq.
- Paul Byron Pattak
- Dr. Elizabeth Stanley
- Joe DeCree, Major, USA, Retired
- Dwight Hobbs
- Lisa Kernic, D.O.
- Dr. Erik Naylor
- Roger Rosenberg, Colonel, USAF, Retired
- Tim Rosenberg, J.D.
- Paul Currie

The group represented skills and experience drawn from combat operations, law, neuro-linguistic programming, neuroscience, medicine, critical infrastructure protection, computer security, national security policy, and meditation. By the end of our session, we had an overarching model for proceeding. What follows is the result of nearly a year of dedication, hard work, and turning creative thinking into practical action.

Holistic Systems Security Model

The Holistic Systems Security Model (HSSM) was created to help define the overall philosophical foundation of our work. The HSSM is a model for protecting a collection of people, process, and technology protecting physical, digital, fiscal, and legal assets. The model consciously integrates the

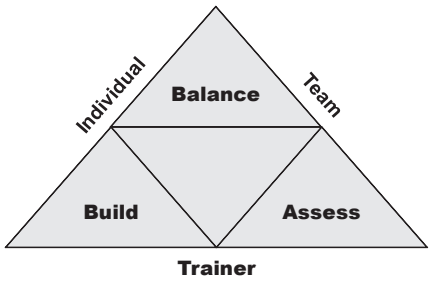

Figure 1: HSSM (Personnel)

individual, the technical, and the physical into a seamless whole that is greater than the sum of its balanced parts. Finally, the HSSM teaches that *absolute security* is not attainable, but it is the goal. The role of the individual is to contribute toward that goal every day. The Model also addresses the three primary roles of the individual: 1) as a single operator, 2) as a member of the team, and 3) as a trainer of both other individuals and teams. Figure 1 represents the people side of the HSSM.

Body and Technology

In order to reduce our theory to practice, we needed to find a practical application. We crafted a hypothetical that is plausible in its facts and practical in its solution. The hypothetical and its solution are presented as follows:

Scenario

Intel has received information that Ali Al-Kahlil ibn Halehm, a Sunni, terrorist cell leader, is using the apartment on Street of the Prophet as a safe house. This safe house is also his command and control center for terrorist operations in the Al Muqta district. The source says that Al-Kahlil leaves the apartment on Thursday evenings for approximately 45 minutes to deliver messages to cell members by dead drop in the vicinity of the bazaar 1.5 kilometers north. He normally leaves approximately 45 minutes before the evening curfew. He goes to the drop and returns by a different route; he does not make additional stops or deviations. Intel has detected a wireless network at the location. The wireless network is protected using 128 bit WEP encryption. Intel believes that by introducing a rootkit into his computer we can intercept his digital traffic and locate the adjacent cell leaders and the higher headquarters' location.

> SIDEBAR: A key thing to note is that *the computer is the target, NOT the person*. If Kahlil is apprehended, there are several others who will step up and take his place. We may or may not have any intel on his replacements. By turning his PC into the confidential informant, we will maintain eyes and ears on his communications for every day that the rootkit goes undetected. Furthermore, wherever that PC goes, we maintain control. So long as the PC can get out to the Internet, we can find it, control it, and monitor all keystrokes and network connections.

Intel successfully cracks the WEP encryption and allows access from behind the firewall. Once WEP is defeated, we identify an internal wireless surveillance camera, desktop PC, and a wireless firewall/router. The PC is patched, and we are unable to compromise the system remotely (the firewall is blocking access from across the internet and the patched system is defeating attempts from within the firewall). The only way to install the rootkit is with physical access to the PC. However, the wireless surveillance camera is setup to monitor the door and send an alert if it senses any motion. This means that if the door is breached, Kahlil will instantly receive an email on his cell phone and realize that his position is compromised. Kahlil's network must be dealt with in order to covertly enter his dwelling. The mission is conducted with a two-man entry team, one intel operator in theater (on the internet and

awaiting to receive control of Kahlil's system), infil/exfil resources, and overwatch for communication, and security. The process of the take-down is:

1. Using a commercial wi-fi enabled cell phone, entry team will acquire the visual camera signal as we move in range. We are able to successfully use their surveillance infrastructure as our own.
2. Entry team will call for the Distributed Denial of Service (DDoS) when room is verified clear. Intel operator will initiate DDoS attack against Kahlil's firewall. This attack does *NOT* deny our access to the video feed. We have successfully denied the enemy access to their information while retaining its use for the entry team. On confirmation of DDoS, we will complete infil on foot.
3. Enter room, drop power to camera.
4. Insert USB (auto-play with U3).
5. Wait 10 seconds—this will give time to auto load the rootkit and keystroke logger. This has a high degree of success even if *the target computer is in a foreign language*. No translation is necessary.
6. Stop DDoS attack and ensure successful handoff of control from field personnel.
7. Power up camera and exfil room.
8. Continually monitor comms from PC until discovered.
9. The operation is simple, and time on target is less than 5 minutes. Risk of physical harm is minimal. Risk of detection is minimal. Operational value is extremely high.

If a PC is discovered during a cordon and search, standard operating procedure is to seize the system and pass it off for analysis. This significantly delays the time it takes to turn captured intel into actionable intel. By combining cyber and physical operations, captured intel becomes actionable intel within minutes or hours; not weeks or months.

The above hypothetical has been reduced to practice and demonstrated live several times in the past year. It works, and it works well.

Network Disruption Harmonics (NDH)

Another result of our being "called out" on our theories is a better way to describe operational impact. We developed a model called Network Disruption Harmonics.[1]

All students and practitioners of information operations are familiar with the science of networks and the notion of cascading attacks. The science of networks is about studying the relationship of nodes, hubs, and the links that connect them. Specifically, much has been written about scale-free networks and their relative strengths and weaknesses. Cascading is another topic familiar to those in this arena. The concept of cascading is simple, an attack or incident against one infrastructure will have a cascading effect against others. All of this is well-traveled content and useful to planners. However, cascading is a linear progression that fails to adequately represent the non-linear nature of networks. Cascading also does not address the issues of dampening and amplification.

1. There is a longer paper available at the White Wolf website; www.whitewolfsecurity.com. I have included an overview here.

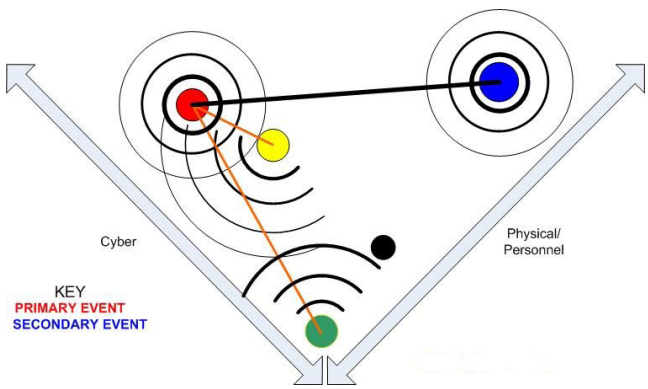

Figure 2: Network Disruption Harmonics

To address the limitations of cascading, we have created a new model for forensic and predictive modeling of attacks against a network. This new model replaces cascading with harmonics. Harmonics and wave propagation more adequately represent the true interactions between nodes on a hub. Under cascading theory, nodes must be connected in order to interact. Using a harmonic theory, nodes can be affected in several ways, regardless of their connectedness.

Everyone is familiar with general wave theory. Throw a rock into a pond and concentric rings of waves propagate out from the point of impact. The same is true of activity within a scale-free network. An incident within a node will send out concentric rings of wave. These waves represent first, second, and third order effects. Generally, the farther out from the incident a wave is, the less its impact but the greater its audience. If another node on the network is within reach of these waves, they will be affected accordingly and set off their own set of waves. For nodes that are too far away to be directly affected by the first, second, and third order effects, there is another transmission media: the link itself. Strong links will transmit a greater amount of wave energy between nodes than weak links. Again, when the wave energy hits another node through its link, it will again set off its own set of waves. This model more adequately represents the true interactions between nodes during incident activity.

Another failure of the cascading model is its inflexible view of the world. Not all nodes in a network are the same. The NDH model allows for two primary types of nodes: amplifiers and dampeners. Amplifiers are those nodes that amplify the incident wave activity. By intent or accident, an amplifier node will add intensity to an incident on a network. An example of this is a power failure at a 911 call center. The incident by itself becomes a minor nuisance as the call switches re-route call traffic to a secondary site. However, if the power outage occurs at the same time as a mass casualty causing event, the downed node now is an amplifier causing significant delays and confusion.

On the opposite side are dampening nodes. These are nodes that are adept at absorbing wave energy and slowing down or stopping wave propagation altogether. An example of a dampening node could be a simple riot control line, a group of police who absorb the energy of a mob and prevent it from propagating past a specific point.

Nodes are also multi-dimensional. There are any number of dimensions that you can carve a network into. For example, when using NDH for mission planning, you can divide the node space into physical and cyber. Some nodes will be primarily one dimensional. A ship at sea is an example of this (albeit there is a nominal cyber component that represents communications). An email server is primarily a one dimensional cyber node, while a SCADA[2] server controlling electricity is equal parts cyber and physical (land). Links can also carry nodes between dimensions. A primarily physical asset can be carried over to cyber through unsecured network connections. Finally there are also bridge

2. SCADA or Supervisory Control and Data Acquisition is the general term for industrial control systems such as those that control power flow.

nodes. A bridge node is any node connecting two or more dimensions. Examples of bridge nodes include ports (land and sea), airports, wireless access points, and cell phones.

Cross Domain Visualization (ANVISS)

As we began to better understand and refine our theories, we continued development on not only practices and models to describe our work, but tools as well. One of the tools we created was ANVISS; the Advanced Network VISualization System. ANVISS is a geographic interface to network log data that allows the analyst to interact with network data in a meaningful way. The entire engine is built off ESRI and can import any existing map layer data and overlay it on top of network traffic. The tool also allows an analyst to add systems to a watchlist and share that watchlist data with other analysts. Figures 3 and 4 show the same log data with the watchlist turned off (figure 3) and on (figure 4).

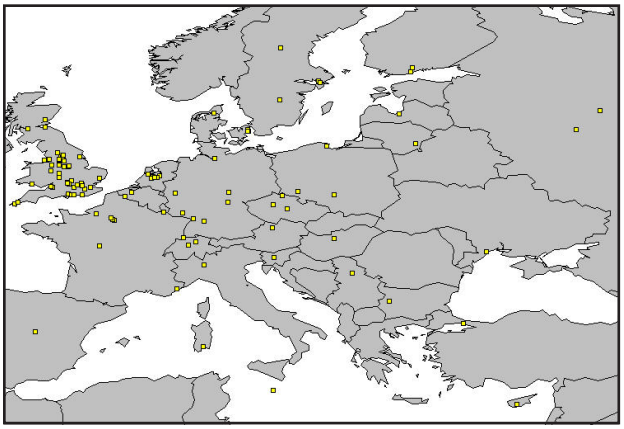

Figure 3: Watchlist off

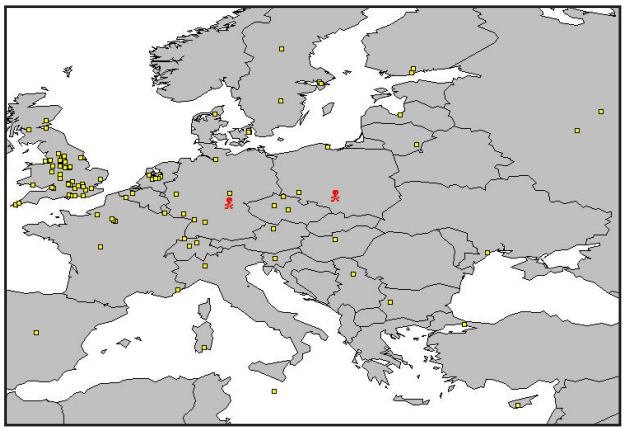

Figure 4: Watchlist on

Cyber Exercises

Finally we have continued our work on cross-domain cyber exercises. Our cyber exercises grew out of our relationship with West Point and the Cyber Defense Exercise, or CDX. The CDX is an annual competition between the service academies. It is a standard military grade exercise. The cadets at each academy are given an operational order to design and build a functional network. The cadets are limited to the use of pre-approved hardware and software. Once the networks are built, they are connected over a virtual private network (VPN) and systematically attacked by a professional Red Cell. The entire event is scored, and a winner is declared each year. We have expanded on that model to design cyber exercises that exemplify the merging of body, mind, and technology.

Our exercises are currently expanding to include computer network attack and defend on a whole new scale. We have integrated voice over internet protocol (VOIP) and SCADA components; technologies that exhibit both a strong cyber and physical component. The SCADA device is a scale model of an actual power controller. This will control power flow to the defending teams and is build from commercial, off-the-shelf SCADA components. Furthermore, this device is IP enabled with a website to track and control power flow to the team. The fall of 2008 will also see the first use of IP enabled robotics, also known as telepresence robots, in a cyber exercise. The exercise infrastructure

that we now run includes traffic generation, full packet capture, public assets (such as the root DNS's), heterogeneous networks, attacker and defender tracking, 3D scoring, and complex geo-political scenarios and mapping.

We have discovered though the running of several exercises that cyber warriors require the same training as physical warriors. Training that covers ethics, honor, discipline, and physical fitness. Stress still runs high on a multi-day engagement when the teams haven't slept. We will be integrating regular break periods that will include mindfulness training focused on de-stressing the teams and increasing their performance.

Conclusion

We have made significant progress in the year since our first paper was presented. We have proven that combined cyber/physical combat at the tactical level is very practical. Further, bringing this new option to the battlefield is relatively simple, fast, and inexpensive when compared to deploying new conventional weapons. Bringing cyberwar to the field operators is a process that is measured in months and millions of dollars instead of years and hundreds of millions of dollars. We will continue our research and to refine our training models so that, when the time comes, there will be a program in place to quickly and effectively build a more flexible and dynamic warrior for the 21st century.

CHAPTER FOUR

Future Military Challenges and Thoughts for the Future

The essays in this chapter examine new and innovative ways to look at what the future may hold for the military element of power. The first essay examines how technological advances are changing our approach to modern warfare. Matthew Armstrong, in his essay, "Unintended Consequences of Unmanned Warfare," examines the influence robots will exert in three overlapping information domains. The first domain is the psychological struggle for indigenous populations in conflict and post-conflict zones. The second domain is the impact on the global information environment and the broader struggle, and the third is the change in the calculus of foreign engagement as the American public, Congress, and the Executive Branch perceives a reduced human cost of war (on our side).

Armstrong's conclusion is that robots will provide a solution more beneficial to the American electorate with its short-term memory than to the national security of the United States. Robots can provide significant advantages in increasing kinetic affects without increasing political liability associated with deploying people. But this sanitizing comes at a price.

Mr. Jason E. Bruzdzinski, in his essay, "Chinese Military Operations Research: Considering the Impact of Culture, 'Speculative Philosophy' and Quantitative Analysis on Chinese Military Assessments," examines the evolution of Chinese military assessments. The author notes that for more than 2,500 years, the Chinese have emphasized qualitative analysis for military operations research (MOR) and assessments to advise decision making, inform planning, and enable the exploration of new theories and concepts. However, despite an ancient record of advanced military scholarship, quantitative analysis did not become a core methodology for Chinese military operations research until the late 20th century. Stunningly, the introduction of modern MOR theory in China is largely attributable to the contributions of a single individual who gained much of his operations research knowledge from education and experience in the United States. China has been actively working to develop, reform, and apply its own unique approach to MOR. However, the mixing of China's traditional, qualitative approaches with internationally accepted quantitative methods developed by the United States, England, and the former Soviet Union has created friction and considerable debate within China's MOR community. This debate is ongoing and serves as a driver for the reconsideration and reform of traditional Chinese MOR methods. However, China's propensity to emphasize and apply qualitative factors in MOR persists. This is evident from the content of an expanding body of literature published from 1985 to present. In the early 21st century, relatively little is known in the West about how the Chinese consider and apply qualitative and quantitative factors together for MOR, despite the existence of primary source data that could offer potentially significant insights. Indeed, much Western speculation about Chinese MOR appears to "mirror image" Western philosophies and cognitive processes, while failing to adequately consider China's unique culture and its profound influence on how the Chinese view and solve complex problems. Careful study of China's MOR philosophy and

methodologies can assist Westerners to achieve a better understanding of China's unique approaches to and the results from MOR as it is applied for studies, assessments, and predictions, and for advising national security decision making. The author concludes by noting that such an appreciation will be necessary if the U.S. Government is to avoid misperceptions, miscalculations, and strategic surprises in its relationship with the People's Republic of China.

In the final essay, "Developing Military Force Structure Concepts and Choices for 21st Century Operations," Christopher Wright argues that there is a need to improve the understanding and description of military capabilities and capacities for 21st century operations if the best mix and scope of capabilities is to be achieved and maintained. The appearance of new forms of conflict, sometimes expressed as "irregular," "unconventional," and "disruptive," has brought the need to develop counters that involve tools and concepts very different from traditional military force. Yet the ability of the most senior decision makers to perceive the right mix and extent of these new capabilities may be confounded by a lack of understanding of the new capabilities' capacities and limitations and by an inability to weigh what mix of traditional and new capabilities is appropriate. New analysis is needed to depict the current capability, limitations, and risks in capabilities for the new forms of conflict. New analysis is also needed to help inform decisions concerning the mix of traditional and new forms of capability in the face of significant resource constraints.

He notes that the U.S. Department of Defense fully understands that the largest tradeoff decisions—mixes of land, sea, air, space, and cyberspace capabilities—are beyond any simple mathematical determination. His sense is that there is a risk that inertia will sustain costly traditional forces, and a consequent failure to add sufficient new capabilities may leave us weak in meeting real challenges that could prove even more harmful than the traditional challenges of old. He concludes that there is a need for innovative thinking and new analytical tools that can better illustrate capabilities, capacities, and risks in new forms of conflict.

Unintended Consequences of Unmanned Warfare

Matt Armstrong

Success in modern conflict depends more on the ability to influence and less on the ability to annihilate. Whether through conventional or unconventional means, influence generated by action is, simply put, more enduring than bullets or bombs themselves. Precision-guided munitions must be subordinated to precision-guided influence that targets the strategic, operational, and tactical information environments.

Today's unconventional enemy does not need to match America's warfighting capability if they can effectively shape the perceptions of their target audiences. Insurgents and terrorists increasingly leverage the New Media environment with its 24/7 coverage, blogs, YouTube, and text messaging to shape perceptions around the globe to be attractive to some and intimidating to others. New Media collapses traditional concepts of time and space as information moves around the world in an instant. Unlike traditional media, search engines and the web in general, enable information, factual or not, to be quickly and easily accessed long after it was created. The increased velocity of information means that careful deliberation by both media and the consumers of media is gone. Today, perception too often trumps fact. By the time the truth comes out, both the media and the audience has moved on.

The unconventional warrior shifts the purpose of physical engagement to increasingly incorporate the information effect of words and deeds. The enemy does this through unconventional means, including improvised explosive devices (IEDs) that have information effects far beyond the point of detonation. The purpose of IEDs is not to kill or maim Americans but to replay images of David sticking it to Goliath.

The result is a change in the fungibility and utility of the tools of violent coercion, from bullets and bombs to the warfighters themselves. In the Cold War, the United States long relied on technical advantages to match or overcome the numerical superiority of the Soviets. In the wake of the Cold War, without an enemy to set the sights on, the Defense Department shifted away from a threat-based posture to a one based on capabilities. This capabilities-based approach has potentially negative effects as what we can do is not necessarily what we should do.

The intoxicating allure of technology risks unintended consequences in the psychological struggle for minds and wills in modern conflict. Unmanned ground vehicles are likely to figure prominently in future conflicts as they provide perimeter security, logistics, surveillance, intelligence, explosive ordnance disposal, and more. While many autonomous and remote-controlled robotic systems are already deployed, from Patriot missile batteries to Phalanx ship defense systems to aerial vehicles such as the Predator, the impact of self-propelled unmanned ground combat vehicle operating within the "sea of the people" is under examined.

To date, reports on unmanned systems ignore the impact "warbots" will have on shaping perceptions of critical audiences. A decade ago, General Charles Krulak introduced the now widely accepted notion that every soldier and Marine is a "strategic corporal" with the ability to radically influence larger operational and even strategic elements with tactical and, by definition, local actions.[1] It is essential that the United States military and civilian leadership discuss, anticipate, and plan for each robot to be a "strategic corporal" in the global information environment.

This paper examines the influence robots will exert in three overlapping information domains. The first domain is the psychological struggle for indigenous populations in conflict and post-conflict zones. The second domain is the impact on the global information environment and the broader struggle, and the third is the change in the calculus of foreign engagement as the American public, Congress, and the Executive Branch perceives a reduced human cost of war (on our side).

There are bounds to this examination. This paper focuses on armed mobile ground robots, frequently referred to as Unmanned Ground Vehicles (UGV) that will mix with host populations—the potential for blowback from the actions of a water-delivering robot is far less than from one that shoots people. The mobility aspect is important because static robots, typically sentries, will not represent the United States in the "last three feet," as will robots patrolling amongst the people, working alongside of or as replacements for American warfighters. Lastly, this paper uses the general notion that a robot is a machine capable of performing tasks with or without explicit control by a human. In other words, the robot may be a machine imbued with some amount of "intelligence" and with varying degrees of autonomy, or it may be simply a mechanical proxy for a human around the corner, behind the hill, or on another continent.

Domain I: The Local Struggle for Minds and Wills

Bullets and bombs represent short-term tactical responses to a much larger strategic dilemma. Terrorist, insurgency, counterterrorism, and counterinsurgency doctrine alike recognize and emphasize that the operational and strategic center of gravity is the people. In the global information environment of satellite television, radio, YouTube, blogs, and text messaging, every GI Joe and *jihadi* is a communicator, public diplomat, and persuader. A famous dead Prussian once said that war is a continuation of politics by other means, but the reality today is that war is not part of political intercourse with foes but an orchestrated, albeit loosely, effort to gain strategic influence over friends, foes, and neutrals locally, regionally, and globally. Al-Qaeda's number two man, Ayman al-Zawahiri, reminded us that he understood this in his 2005 letter to Abu Musab al-Zarqawi when he wrote that they "are in a battle, and that more than half of this battle is taking place in the battlefield of the media [*sic*]."[2]

Today's conflict is a struggle for minds and wills. Getting into somebody's thoughts is not enough. It is essential to affect their will to act. Influencing supporters to act, or not to act, in the adversaries' interest is essential. The "hearts and minds" mantra has come to describe only part of the struggle and to seemingly focus on increasing America's likability or popularity or on finding the answer to the question "Why do they hate us?" The concept has been decoupled from its counterinsurgency roots, in which the intent was better expressed through Teddy Roosevelt's aphorism: "speak softly and carry a

1. Charles Krulak, "The Strategic Corporal: Leadership in the Three Block War," *Marines Magazine*, January 1999.
2. Ayman al-Zawahiri, "Zawahiri's Letter to Zarqawi " (Countering Terrorism Center's Harmony Document Database, 2005), 444-46.

big stick." It is just as essential to influence support for American national interests as it is to dissuade support for our adversaries' interests.

To this end, the structure of American military operations should be inverted. Instead of beginning from an operational view with an attached information effects annex, all actions should begin with an intended information effect and be supplemented with an operations annex. The center of gravity today is not a single point but an informational ecosystem in which support systems targeted and relied upon by both the insurgent and counterinsurgent exist and propagate. These spheres of influence include physical (sanctuary), financial (money to buy things), moral (religious leader backing), social (friends and family), and recruits. The effectiveness of information campaigns across these spheres today will more often dictate a victory than how well bullets and bombs are put on a target.

It is unclear how effectively robots will interface with indigenous populations. The word "robot" itself comes from Karel Čapek's 1921 play *R.U.R*, (which stands for Rossum's Universal Robots) and is derived from a word meaning slave labor or drudgery. In the play, years of attempts to create an artificial human succeed only when "nonessential" human features are removed—feelings, appreciation for truth and beauty, and the fear of death. Removing these cognitive and emotional attributes—traits associated with humans—led to obedient robots who performed manual labor and, when they wore out, turned themselves in for recycling.[3]

There are situations where removing human traits from robots in human-robot interfaces were helpful. Studies show that both Alzheimer patients and children with social deficiencies fair better with robots than humans for certain engagements. In both cases, the subject finds prefers interacting with and receiving instruction from robots over humans. There are probably two reasons for this: robots do not judge and the interactions are simplified with fewer options.[4]

Robots, whether remote controlled or autonomous, depersonalize the engagement further by expanding the mechanical distance between shooter and target. In the same way a sniper's scope or video camera watching someone planting an IED depersonalizes and denies the humanity of the target, the distance makes it easier to kill by eliminating the "feel for the street" and other atmospherics.[5] The result is the possibility of more lethal action, or "heavy-handed" non-lethal actions, when personal interaction might be preferred.

But in a cross-cultural engagement, can a robot be a strategic corporal? Will it be able to transmit and receive verbal or non-verbal cues essential to positive perception management? In Iraq, Afghanistan, and future post-disaster zones, personal interaction with indigenous people can provide substantial long-term benefits. Can robots cross cultural divides and transform from a fierce warrior with a few simple gestures as Lieutenant Colonel Chris Hughes did in Iraq?

In 2003, Lt. Col. Hughes was confronted by a rapidly deteriorating situation in Najaf, Iraq. Choosing an option few would have thought of, let alone risk, he instructed his men to smile, point

3. George A. Bekey, *Autonomous Robots : From Biological Inspiration to Implementation and Control*, Intelligent Robotics and Autonomous Agents (Cambridge, Mass.: MIT Press, 2005), 444-46. There is more to the story, however. The leading lady gets the scientists to add more human-like traits to the robots, and as a result they revolt and kill all humans but one.
4. Interview 8/4/07
5. Dave Grossman, *On Killing : The Psychological Cost of Learning to Kill in War and Society*, 1st ed. (Boston: Little, Brown, 1995), Ch 3.

their weapons into the ground, and take a knee. This allowed his soldiers to back out of a developing Iraqi-on-Iraqi encounter that they were not prepared to deal with.[6] The human-to-human interface was facilitated by cross-cultural non-verbal communication and prevented what could have been a major flash point.

Another example from the same period involves a captain who was asked by a town leader to wear the robes of sheikh because he was the new chief. It is doubtful a robot would have received equal treatment. The depersonalization, or dehumanizing, of contact, one of the chief advantages of robots, can limit the ability to become the strategic corporal on site and in the moment. Will robots on patrol develop the same "feel for the street," understanding and incorporation of the human terrain as a person?

Major General Robert Scales captured the tendency of the United States to focus on technology and capabilities rather than addressing the requirements based on the actual threat. He noted that "wars are won as much by creating alliances, leveraging nonmilitary advantages, reading intentions, building trust, converting opinions, and managing perceptions—all tasks that demand an exceptional ability to understand people, their culture, and their motivation."[7] These are not machine tasks, and will not be for a very long time; they are human tasks. The inability of robots to perform such tasks results from the simplicity of their designed robot-to-human interface. As a result, the benefits of robotic simplicity must be weighed against the resulting loss of effectiveness in the critical tasks in the last three feet of engagement.

Removing, or even substantially reducing, the human element from our side of the engagement risks undoing the lessons learned on the importance of personal contact with local populations that were paid for with blood and treasure in Iraq and Afghanistan. Mapping the human terrain not only becomes, by implication at least, unnecessary in the sterility of robot-human interface but impossible.

In 2007, Lieutenant General Raymond Odierno issued guidance emphasizing the importance of engaging the local population and the requisite "feel" for the street. This guidance instructed Coalition forces to "get out and walk" and noted the up-armored Humvee limits "situational awareness and insulates us from the Iraqi people we intend to secure."[8]

Successful counterinsurgency requires building trust and legitimacy, demonstrating commitment to the local people, and managing an effective presence in the global information environment. To be more specific, information and perception management is required to strengthen resistance against enemy subversion, convince neutrals in both the local area of operation and globally that the enemy's path and message are ruinous and based on lies, and convince the enemy's own supporters the same in order to encourage them to stop supporting the insurgent, turning the sea against the fish, to paraphrase Mao. Focus only on the local and external support systems of both friends and foes will undermine the mission. Focus only outside and the locals will fall prey to the insurgents who will use violence to show that the government is weak and unable to protect or provide for the people. This is

6. CBS News, "A Calm Colonel's Strategic Victory," http://www.cbsnews.com/stories/2006/03/15/eveningnews/main1409061.shtml. See also Dan Baum, "Battle Lessons: What the Generals Don't Know," *The New Yorker*(2005), http://www.newyorker.com/archive/2005/01/17/050117fa_fact?currentPage=1.
7. Robert H. Scales, Jr., "Culture-Centric Warfare," *United States Naval Institute. Proceedings* 130, no. 10 (2004).
8. LTG Raymond Odierno, "Counterinsurgency Guidance," http://smallwarsjournal.com/documents/mncicoinguide.pdf.

the meaning of the Taliban saying that sows the seed of doubt in the commitment of the West in the minds of the Afghans: "The Americans have the wristwatches, but we have the time."

The Center for Strategic and Budgetary Assessment's 2007 report on Mine Resistant Ambush Protected vehicles (MRAPs) takes the argument further. It notes that the purpose of counterinsurgency is not to out fight the enemy but to "out govern" the enemy, and that MRAPs and armored vehicles in general prevent this by inhibiting the ability to connect with the local population. The distance created between the indigenous population and the warfighter "actually assists the enemy in accomplishing his objectives."[9]

In his book *Counterinsurgency Warfare*, David Galula noted the importance of commitment and the consequences of limited action in the example of the Chinese Nationalists in the failed July 1953 attack on Mainland China. Hoping for an uprising, or at least support, the Nationalists launched a raid on the Chinese mainland, but the Nationalists were soundly defeated, in part by those they had hoped would stand aside based on mutual hatred of the Communists. The locals, however, knew who was committed to watching them and who would be there the next day: the Communists.[10]

In a web survey by the author, respondents had some strong reactions to encountering a robot in a conflict environment. In the case of the accidental death of civilians, the respondents felt autonomy would have a significantly negative impact in the U.S. media and, to a slightly lesser extent, in Western European media. Respondents indicated that they believed a fully autonomous robot would result in only slightly greater sympathy than any control of the robot. Overall, respondents made it clear that using robots in lieu of Americans indicated a reduced level of commitment to the mission and a typical American tactic of throwing money at a problem. Overwhelmingly (82%), the respondents felt this handoff would be perceived as a reduced commitment on the part of the Americans. While the survey was not scientific, the results and related conversations showed a perception exists that robots have the potential of being a liability as much as a benefit in unconventional warfare.

The use of robots must not create any question that the mission is not important enough to sacrifice our own men and women, lest the local populace wonder why they should risk their own. It would quickly be interpreted as a sign that the United States was not fully behind its mission and was afraid to send its own into harm's way. Very quickly, the propaganda of our deeds would be spun to reflect that the United States was unwilling to risk American lives for the mission or the host population.

Deploying robots will not only risk the critical connection with the indigenous population, but it could have the blowback effect of increasing the value of targeting Americans, as our warfighters are an increasingly rare commodity, thus increasing the propaganda value and emotional impact of an attack. The result may be more than replaying improvised explosive device attacks on YouTube, but an escalation of spectacular attacks designed to influence an American public only partially mobilized and with a correspondingly heightened sensitivity to shocks, as well as to increase extra-regional sympathy for the insurgents in a modern propaganda contest of *mano e mano*.

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9. Andrew F. Krepinevich and Dakota L. Wood, *Of IEDs and MRAPs: Force Protection in Complex Irregular Operations*(2007), http://www.csbaonline.org/4Publications/PubLibrary/R.20071017.Of_IEDs_and_MRAPs/R.20071017.Of_IEDs_and_MRAPs.pdf. See also Jon Grinspan's comparison of the Jeep with the Humvee and the latter's influence on a "drive-through mentality" of counterinsurgency, http://www.americanheritage.com/events/articles/web/20070801-jeep-humvee-wwII-iraq.shtml.
10. David Galula, *Counterinsurgency Warfare: Theory and Practice*, 2005 Reprint ed. (New York: Frederick A. Praeger, 1968), 28-29.

Domain II: Global Information Environment

The second domain is the discourse in the global media, both formal (e.g., television and newspapers) and informal (e.g., blogs, YouTube), with foes, allies, and "swing-voters," including the American public. The purpose goes beyond justifying actions to contain and manage failures. On the former, there is work underway today to formulate rules of engagement for robots designed around a Western practice of war. The noble pursuit of "Lawfare," of discovering the truth through careful legal parsing and analysis to justify ends and means, fails in the modern information environment. The collapse of traditional concepts of time and space wrought by the global information environment prevents the kind of careful post-facto deliberation that is permitted in the traditional application of the Laws of War.

Justifying actions based on what can be done according to Western notions creates, counter intuitively, an engagement model that is too permissive and ultimately detrimental to a mission where, as Lieutenant General James Mattis put it, "ideas are more important than rounds."[11] Certain acts, justifiable under international law, could backfire if the information effects are not anticipated, planned for, and managed effectively. However, the United States has demonstrated a reduced capacity in this area since the end of the Cold War.

The United States cannot afford technological failures, or induced failures (e.g., hacking), that kill civilians. We may try to shift the blame for an action onto an agent, whether computer or contractor, perhaps even with short term success, but in the modern information environment, the principal will still suffer the consequences, especially if the negative event confirms previous impressions.

Previous incidents of "technical failure," or even "out of control" contractors in Iraq, will reflect onto the United States whether the blame is accepted or not. Deniable accountability is a myth in a world where influence matters and perceptions can trump fact.

Below are two examples involving technological failures that resulted in significant numbers of civilian deaths. Both demonstrate the ability to frame or shape perceptions, in a favorable light despite information indicating an alternative reality.

The first example began on September 5, 1983. A mistake by the Soviet Air Defenses was parlayed by the United States, leveraging its global stature, into a significant propaganda coup. Global messages were coordinated and transmitted. The shoot down of Korean Air 007 by the Soviet Union was, according to President Ronald Reagan, an "act of barbarism … [of] inhuman brutality." The President went to great lengths, including declassifying communications intercepts, to attack the very essence and reputation of the Soviet Union. The language of the administration and the American media was unequivocal: the leadership of the Soviet Union intentionally and knowingly ordered the attack on the passenger jet. Premier Yuri Andropov was even described in one report as shooting the plane down himself.[12] In the United States, Congress even reversed its positions on the MX missile and on nerve gas and authorized the production of both.

11. Matt Morgan, "Planning to Influence: A Commander's Guide to the Pa/Io Relationship," (2006).
12. Robert M. Entman, *Projections of Power: Framing News, Public Opinion, and U.S. Foreign Policy*, Studies in Communication, Media, and Public Opinion (Chicago: University of Chicago Press, 2004), 42.

These events transpired even as information indicating that the U.S. position was intentionally misleading came out. But the facts could not displace the dominant framing by the White House, which played on the public's view of the Soviet Union.[13]

The second example is when the Aegis guided missile cruiser USS *Vincennes*, a ship designed for convoy duty in the open Atlantic, shot down Iran Air 655 in 1988 in the Persian Gulf. The American response was to humanize the American actions and to shift the blame on to the Iranians. Accordingly, the incident's grammar was different than with the downing of Korean Air 007. Instead of the "loved ones" and "innocent human beings" that flew on Korean Air, Iran Air carried only "travelers" and "civilians." In the United States, blame was quickly and adroitly shifted away from the cruiser to the airliner. The civilian aircraft failed to respond to requests to identify itself despite the fact the USS *Vincennes* could not transmit on commercial frequencies. When the warship did use the international distress frequency, it gave the wrong altitude and gave ground speed instead of air speed, so it is unlikely the Iranian aircraft would have known it was the target of the query.

American strategic communication was effective, at least within the United States. A *Washington Post*-ABC poll found seventy-one percent of Americans believed the shoot down was justified and seventy-four percent felt Iran was more to blame than the United States. The audience for the information campaign after the shoot down was primarily the U.S. public and allies with little regard for Iran or the Middle East.

In a time-compressed, supersonic conflict environment, trusting the machine to make the decision may not be different from trusting the machine to execute the decision. The man in the loop can be reduced to a rubber stamp in the loop—a situation that will only be exacerbated by the impending shift to a hypersonic conflict environment—an environment where our decision loops will be so constrained as to not allow for human intervention.

Domain III: Cost of Engagement

Perhaps one of the more touted benefits of robots is reducing the exposure and vulnerability of America's warfighters. In some applications, such as traditional brute force engagements like clearing a house or "traditional" warfare, robots will provide significant value. The Department of Defense *Unmanned Systems Roadmap 2007-2032*, approved in December 2007, leads with the point of reduced exposure and repeatedly emphasizes it. However, unlike President Clinton's lobbing cruise missiles against Al-Qaeda in Afghanistan and Sudan, a future president may be able to deploy remote controlled and autonomous robots to accomplish the same mission with greater precision. But unasked is the true cost of lowering the bar for kinetic action in a world of instant communications, a world in which the American public, and arguably Congress, is increasingly removed from the cost of war. Parallels between the outsourcing to machines and outsourcing to private security contractors, which can circumvent public and Congressional oversight, must be explored.

One of the benefits of outsourcing has been a reduction in perceived human cost by shifting casualties from our uniformed personnel to contractors. The prospect of a flag-draped coffin has always figured into the political calculation in whether or not to deploy forces overseas. Increasing available firepower compensates for the smaller commitment and investment of Americans to the mission. Unwilling to provide more resources, we seek to make each resource count for more.

13. Ibid., 43.

Like arguments that contracting for security and for other military personnel minimizes the commitment of the soldier to the state, shifting responsibility to robots may have the same impact on the value of killing and even on the warrior ethos. Ownership and accountability of the mission can be handed off to technology instead of humans and, at least in the mind of policy makers focused on U.S. domestic issues, the risk will be reduced.

Arguments in favor of robots often mirror the past arguments behind using private military companies: cost, increased capabilities, allowing the military to focus on core competencies, and political distance. "Dead" robots do not need flag-covered coffins, nor do they need medical care or veteran's benefits.[14]

Insulating the American public from the costs of war is easier with fewer, or even no, boots on the ground. As Thomas Friedman observed, noting how the American public was sheltered from the war shortly after 9/11: "You all just go about your business of being Americans, pursuing happiness, spending your tax cuts, enjoying the Super Bowl halftime show, buying a new Hummer, and leave this war to our volunteer Army."[15] A white board in Iraq echoed the same: "America is not at war; the Marines are at war; America is at the mall."[16]

In a democracy, lowering the threshold for mobilization generally means commitment is shallower, based on less information and more generalizations. It also means less room for error and a lowered tolerance of marginal activities, and it increases the power of "the temperamental atmosphere of a Gallup poll."[17]

Mobilizing a democracy for war, or justifying a military strike after the fact, is challenging and creates an incentive to find anchor support in emotions rather than objective reasoning. Limiting the sacrifice by the American public has its advantages, but when the going gets tough, the public has little emotional depth or personal commitment to the cause. The effect may be increased sensitivity to spectacular attacks.

Faced with deploying an increasingly small force, the Executive Branch may find the path of least resistance in taking Congress and the media out of the debate by using robots to help sidestep the casualty sensitivity in the media and public debate. Augmenting or replacing American forces with robots reduces the cost of unilateral action to an extent greater than seen with the use of private security companies.

The increasingly scarce direct links between warfighting and both political elites and the general public is a return to the past. With fewer Americans who know somebody presently serving or even directly impacted by the conflicts after 9/11, there is a redevelopment of a distinct and professional warrior class in the United States proficient in the conduct war of that hearkens back to professional mercenary soldiers of the past. The modern All Volunteer Force (AVF) is far removed from the modern political and social spheres of power in the United States, leading to suggestions that non-veteran civilians may be more "interventionist" and simultaneously placing more constraints on the use of

14. For more, see Armstrong in Jeffrey A. Weber and Johan Eliasson, eds., *Handbook of Military Administration* (CRC,2007).
15. Thomas L. Friedman, "The Home Team," *New York Times* 2004.
16. http://mountainrunner.us/2007/08/if_the_surge_is_working_why_ar.html
17. Robert Callum, "War as a Continuation of Policy by Other Means: Clausewitzian Theory in the Persian Gulf War," *Defense Analysis 17, no* 1 (2001).

military force.[18] At the same time, the American citizen-soldier is increasingly an endangered species, as soldiers and their families turn inward and focus on their own support networks. It is likely robots will accelerate this trend.

There are lessons to be learned from the use of private security companies in Iraq. While the myth of deniable accountability is conjured up to manage perceptions in Congress and the media, the impression that matters and is ignored is the indigenous population and its regional and global support groups. In these information realms that matter, contractors are America's public diplomats. It will be the same for robots.

Conclusion

Without advancing American holistic efforts in irregular warfare, including counterinsurgency, robots provide a solution more beneficial to the American electorate with its short-term memory than to the national security of the United States. Robots can provide significant advantages in increasing kinetic affects without increasing political liability associated with deploying people. But this sanitizing comes at a price.

Reliance on robots to satisfy kinetic requirements without addressing the informational effects ignores the hard lessons learned in Iraq. To be sure, firepower can be used to dissuade effectively, but it must be used carefully. The lessons learned and captured in the U.S. Counterinsurgency Manual highlight the negative impacts of both too much defense and too much offense.[19] Their use must be considered and calibrated with the proper training, techniques, and procedures in place prior to deployment.

Today, America's warfighters are the "last three feet" of contact with local populations and the world. Creating the impressions of America through direct interaction and indirect awareness through media or other word of mouth is critically important, and it requires an appropriate interface at a time when even the appropriateness of riding in an up-armored Humvee is in question, as raised in the section on counterinsurgency.

Robots can provide real value. In 1921, Giulio Douhet wrote "victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur." Success in future conflict will be based not only on technological superiority, but also on sociological, cultural, and informational adaptability in a struggle for minds and wills. Weapons and tactics must conform to this; otherwise, we are just fighting the last war, in this case, the first two years of the Iraq War. The question is, how well are we planning ahead? Are we letting technology take us, or are we directing technological solutions that mesh with the future of conflict?

While some look to a future of autonomous robots, that future is already here. In many areas, authority has already been ceded to computers, sometimes with severe consequences. From Aegis

18. Peter Feaver and Christopher Gelpi, *Choosing Your Battles : American Civil-Military Relations and the Use of Force* (Princeton: Princeton University Press, 2004), Charles A. Stevenson, *Warriors and Politicians : U.S. Civil-Military Relations under Stress*, Cass Military Studies (New York, N.Y.: Routledge, 2006).
19. United States. Dept. of the Army. et al., *The U.S. Army/Marine Corps Counterinsurgency Field Manual : U.S. Army Field Manual No. 3-24 : Marine Corps Warfighting Publication No. 3-33.5* (Chicago: University of Chicago Press, 2007), 48.

cruisers to Patriot missiles, to navigation systems and Blue Force Trackers, computers already dominate the American warfighter, not the other way around.[20]

Just as strategic communicators, public diplomats, and information operators must be involved in the "take-offs" of any policy and not just the "crash landings," they must also be involved with the evolution of unmanned warfare. It is essential that the information effects of incorporating armed robots into the inventory are considered from the outset, including the impact on information campaigns and operations in the modern media environment. Augmenting or replacing a warfighter with a robot is not the same as changing out the M–16 carbine for the M-4. The uniformed warfighter, whom the robot will replace in the last three feet, reflects America's commitment to the mission and helps shape local and global opinions that garner or destroy support for the mission. Regardless of any real or perceived autonomy, robots will also represent, reflect, and shape those opinions. The informational effect of robots is substantial, but little research has been done on the subject. Failure to recognize the information effect of unmanned systems designed to operate within the sea of the people and participating, willingly or not, in the struggle for the minds and wills of men and women, will have tragic unintended consequences.

In an era where local and global perceptions matter, the United States must anticipate the information effects of the new systems it fields. The future is not like yesterday. Whether or not war will be turned completely over to robots is beyond the scope of this paper, but what is certain is that robots will be in some manner involved in the "last three feet," and training, techniques, and procedures must be prepared for this.

20. This has created a comfort with computers that has proven limiting. Consider Lieutenant General Paul van Riper's actions in a 2003 wargame when he outsmarted the network-warfare centric Blue Force by using motorcycle messengers, among other tactics. See http://www.slate.com/id/2080814/

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Chinese Military Operations Research: Considering the Impact of Culture, "Speculative Philosophy," and Quantitative Analysis on Chinese Military Assessments[1]

Jason E. Bruzdzinski

Introduction

The Chinese have characteristically applied holistic and "long-view" orientations to frame studies, perform assessments, and make predictions. Evidence of this orientation exists in China's best-known treatises concerning military analysis; Sun Tzu's *Art of War* and Sun Pin's *Military Methods* are both more than 2,000 years old.[2] China has a long history of using military operations research (MOR) to advise decision making, inform planning, and enable the exploration of new theories and concepts. While ancient Chinese MOR employed formulaic methods for qualitative assessments that were empirical in nature, the surviving literature shows little evidence of more scientific approaches to quantitative analysis (applying advanced mathematical equations).[3] Advanced mathematics did not appear in China until the late 1500s,[4] and no foreign mathematicians taught in China until after 1900.[5]

In the early 20th century, Westerners might have considered the level of sophistication of Chinese military operations as still resembling that of the Middle Ages. China's military methods had not changed dramatically for centuries. This testifies to the powerful influence of China's strategic culture (战略文化 *zhanlue wenhua*), its resilience over time, and its stubbornness when confronted by contradicting foreign influences.[6]

Mao Zedong attempted to cope with China's military decline after a series of "national humiliations" that occurred during the last decades of the Late-Imperial Period (1368–1911). In 1949, he founded the People's Liberation Army (PLA) and developed a national-strategic form of guerrilla warfare called "People's War." Mao considered his establishment of the PLA as revolutionary, but in fact China's revolution in military affairs (RMA) did not begin until much later—after his death in 1976.

Tradition, experience and history are important cornerstones of China's strategic culture. These cornerstones, as well as other factors,[7] affect the way the Chinese view, act in, and react to the world around them. Chinese sociology, psychology, and mindset also significantly affect the development and application of Chinese MOR theories, processes, and calculi for analytical judgments and decision making. Appreciating this important dynamic can help Westerners better comprehend how the Chinese think and behave as individuals and in groups.[8]

The Chinese tend to view MOR as the bridge that links military science with military systems engineering. However, the Chinese have historically emphasized qualitative analysis in MOR assessments by applying what one PLA theorist called "speculative philosophy" (思辩哲学 *sibian zhexue*).[9] In context, "speculative philosophy" implies a highly subjective Chinese variant of "dead

reckoning," or intuition. After a long period of time, the Chinese have only recently begun to realize that such an approach to MOR does not always lead to the most precise or accurate results and can have serious consequences for PRC national security interests.

The Founder of Modern China's Military Operations Research: Qian Xuesen

Advanced quantitative analysis did not become a core discipline for Chinese MOR until the late 1950s. Despite China's long record of advanced strategic thinking, the country was a latecomer to modern MOR (relative to the theoretical development and application of the concept by Britain, Russia, and the United States in the early 1900s). Perhaps even more surprising is that the introduction of modern MOR in China can be largely attributed to the knowledge and achievements of one man.

Millions of Chinese consider Dr. Qian Xuesen (钱学森) the founder of modern MOR in the People's Republic of China (PRC) and a national hero. Qian was born in Hangzhou, China, in 1911, but came to America in 1935 as a brilliant young engineering student at the Massachusetts Institute of Technology. He later served in the U.S. Army and went on to work as a civilian professor at the California Institute of Technology in a career that spanned more than 20 years. Qian also played a significant role in the early years of U.S. nuclear energy research and development (R&D) as well as in American missile and propulsion systems engineering. However, in 1950 Qian was accused of being a Chinese spy and was later deported to the PRC. Qian allegedly left all of his research papers in the United States, but returned to China with the great benefit of experience and knowledge obtained in America. After returning to a warm welcome in Beijing, Qian initiated some of China's most significant operations research and systems engineering programs.

In 1955, Qian led a very small pool of PRC engineers and mathematicians in a systematic effort to consolidate the MOR knowledge that China had acquired (mostly from foreign sources). In 1998, he published a comprehensive exposition in which he defined the distinct levels of Chinese military science. Qian stated that, "in military science there is military study at the basic level of theory, military operations research at the level of technical theory and military systems engineering at the level of applied technology."[10] He also defined the role and function of military systems engineering as "employing the methodology of modern science and technology to solve the practical issues encountered in the implementation of military guidelines and military strategies."[11] Qian's tiered hierarchy construct for military science and his broad view of military systems engineering application demonstrates a "systems thinking" approach. It also highlights a defining characteristic of Chinese cognition: a culturally influenced propensity for holistic considerations.

For decades, Qian Xuesen has made profound contributions to the PRC's missile, nuclear, space, and weapons development programs; he has been a powerful catalyst for the PLA's ongoing revolution in military affairs.[12] Qian's contributions as a teacher and advisor to a generation of China's best students have also helped assure China's rise to become a 21st century leader in science and technology. In short, Qian has had an extraordinary impact on the development and application of PRC military operations research and systems engineering in the field of military science. As a result of Qian's accomplishments, China today has a robust MOR organization and a system of social networks that supports a wide range of national-level programs and activities. The discipline continues to benefit greatly from the transfer and application of foreign knowledge.[13]

Chinese MOR Organizations

The PRC State Council and Central Military Commission (CMC)—executive bodies subordinate to the Chinese Communist Party (CCP) Central Committee—together provide leadership and direction to an expanding network of organizations engaged in operations research, also called "management science" (管理科学 *guanli kexue*) in China. These organizations include, but are not limited to, PRC academies, state key laboratories, research institutes, and academic/professional societies. Some research from these organizations is classified as open/public (公开 *gongkai*) and is usually published in Chinese, with a subset of this material also published in English. Other work, however, is considered sensitive, and access to it is controlled. Despite China's extraordinary secrecy, carefully conducted open source research can systematically identify some MOR organizations, personnel, activities, and their interrelationships.

In March 1986, the CCP launched the "High Technology Research and Development Program of China," also known as the 863 Program. Key areas of 863 Program R&D include information technology, biology, aeronautics, automation, energy, material science, and oceanography.[14] Although the 863 Program will continue through the end of the 11th Five Year Plan (2006–2010), the CCP in 1998 initiated the "National Key Basic Research and Development Program," also known as the 973 Program, as both a complementary and a follow-on effort. The 973 Program represents Beijing's renewed emphasis on enhancing Chinese international competitiveness in the 21st century. The core R&D areas of the 973 Program include energy, information, environmental science, medicine and health, material science, agriculture, and "basic research."[15]

PRC operations research (civilian and military) directly supports projects funded under these two national-level programs. Supporting projects are typically five-year projects managed within a 2+3 management regime.[16] Under the 2+3 regime, approved projects receive a mid-term evaluation after the first two years that determines the development plans for each project and whether funding will be provided to sustain the project for up to three additional years. Operations research supports not only the substance of many of these projects, but also the decision making about their priority and future activities. China's management mechanism for the 863 and 973 Program(s) blends government decision making with consultations with the experts involved throughout the term of the respective projects.

Characteristics of Chinese MOR

Five types of MOR aid China's efforts to address challenges in military science: 1) applied research, 2) theoretical research, 3) controlled experimentation, 4) field experimentation, and 5) simulation and modeling.[17] Some primary Chinese MOR areas include combat command, logistics, management, systems, training, and research, testing, development, and evaluation (RTD&E) for equipment and weapons. The Chinese apply MOR at three discrete levels of activity—strategic, campaign (theatre), and tactical (battle)—with quantitative and qualitative analysis directly affecting command and decision making at all three levels. The PLA uses MOR in activities that include armed forces development, arms control and disarmament, conflict resolution, deterrence, diplomacy, environmental assessment, logistics, military objectives, and national defense mobilization.[18]

China's operations researchers routinely participate in academic/professional conferences worldwide. In their work, they combine their own unique qualitative analysis theories with internationally

accepted quantitative analysis methods (e.g., graph theory, inventory theory, network analysis theory, optimization theory, planning theory, queing theory, search theory, stochastic theory...etc.). China's MOR is guided by a scientific construct composed of eight linear phases:

1. Definition of clear objectives and guidelines
2. Development of a concept design
3. Construction of models and collection of data
4. Development of "resolution models" (problem solving)
5. Development of pilots for testing and evaluation
6. Performance of in-depth testing and evaluation
7. Findings and recommendations reporting
8. Implementation of actionable results.[19]

In the early phases of MOR projects, the Chinese make distinctions between areas for macro- and micro-level analysis. As examples, Chinese military operations researchers characterize the topics of logistics planning, military management, organizational structure, operational planning, strategy development, training strategy, and weapon system strategy as macro-level MOR issues. In contrast, subjects concerning error analysis, military effectiveness, military resources management, military support, military systems, military structure, and operational art are considered micro-level analysis issues.[20] China's MOR community appears generally to agree that complex problem solving properly begins at the macro-level to ensure the correct identification of micro-level analysis topics as work progresses, and also to enhance the overall precision of larger scope, more complex assessment efforts. While a great deal of China's strategic MOR takes place at national-level institutions, work on military campaign and tactical-level issues is more heavily emphasized at lower echelon institutes, academies, and centers. Such issues are typically framed in the context of PLA force component missions (e.g., airborne assault, air defense, blockade operations, counterattack, firepower operations, landing operations, surgical strike, etc.) and warfare types (e.g., air, amphibious, electronic, ground, naval, missile, rapid reaction, etc.).

Qualitative vs. Quantitative

China's traditional emphasis on qualitative analysis and subsequent adoption of quantitative analysis has created considerable debate and friction within China's MOR community. This tension began in the 1950s and continues (albeit to a lesser extent) today. Specifically, China's mixing of these not-always-complementary analytic methodologies has made it more difficult for the PRC's MOR community to judge the validity of their assessments. Although reforms enacted by Deng Xiaoping after Mao's Cultural Revolution led to improvements in Chinese MOR and enabled greater success in China's military systems engineering efforts, the Chinese continue to struggle with the conflict between their cultural influences and the objective realities of mathematics and science.

Despite contradictions, China's military decision making continues to be strongly influenced by MOR and the application of qualitative analysis. Lack of resolution on issues of debate probably slows decision making or may even prevent information from flowing up the chain of command to decision makers. Interestingly, however, despite a cultural-historical propensity for qualitative analysis,

China's operations researchers now appear to be making better use of quantitative factors in their calculi for policy formulation and strategic-level decision making than their counterparts in the U.S. Government.[21] While this observation reveals a profound contrast between Chinese and American approaches it should be highlighted that China, like the United States, applies MOR with emphasis on quantitative factors for tactical-level planning and assessments, as well as for guiding systems engineering projects.

Trends observable from a survey of Chinese published literature demonstrate that careful consideration of foreign approaches to MOR has gained unprecedented importance in China. The literature shows considerable evidence of a relatively recent and significant increase in the level of Chinese interest in conducting operational assessments of foreign military activities, particularly those of the United States.[22] Much of this interest can be traced directly to the PLA-Academy of Military Science (PLA-AMS), PLA-National Defense University (PLA-NDU) and institutions subordinate to the PRC's four PLA force component commands.[23] The volume of the PLA's MOR activities at these leading institutions apparently increased by the mid-1980s; since 1985, PLA scientists have performed much of their MOR in a systematic and professional fashion.[24] Moreover, the published research of the PLA-AMS and PLA-NDU clearly shows that China's military scientists carefully review Western MOR studies and understand their implications; many Chinese theorists cite the work of their American counterparts in their own original research. Such efforts were forbidden during Mao's "revolutionary" period; they were also nearly impossible, given China's isolation and limited access to information from the developed nations of the West.

Although China's adoption of quantitative analysis (in some sense) contradicts its traditional focus on qualitative analysis, the quantitative approach is largely consistent with the scientific method espoused by Karl Marx. Mao Zedong adopted Marxist philosophy early in China's revolutionary period, and its influence on Chinese military affairs is apparent in his writings, as well as in those published by others after Mao's death. However, if China's own cultural challenges did not create enough stresses, Marxist philosophy exhibits internal conflicts that also pose significant challenges for Chinese MOR. For example, consider China's embrace of the Marxist dialectic[25]—a highly subjective model developed to aid the resolution of contradictions (or at least to explain the relationships between contradictory factors). Dialectical thinking is specifically relevant in the context of the PLA's long-applied military stratagem: "Defeat the superior with the inferior" (以劣胜优 *Yilieshengyou*), also occasionally conveyed in Chinese as "defeating the strong with the weak" (以弱胜强 *Yiroushengqiang*).[26]

Westerners are indirectly familiar with *Yilieshengyou* as embodied by the story of David and Goliath, but Western military operations planners seldom apply this stratagem. In general, Westerners are less comfortable betting on the "inferior" to defeat the "superior" than are the Chinese, because the emphasis on qualitative factors required by *Yilieshengyou* challenges some conventions of Western reasoning. For example, Americans, in particular, prefer to place bets on the "superior"—whether a prizefighter in a boxing ring, a thoroughbred at the racetrack, or a technologically superior military in Vietnam. While cultural factors influence both Western and Chinese approaches, the Western approach seems to reflect a cognitive process favoring quantitative considerations. By contrast, the Chinese cognitive approach appears to give greater weight to qualitative factors that may not necessarily be quantifiable or mathematically operable.[27]

The Chinese seem culturally disposed toward a holistic and dialectical cognitive process that is deeply rooted in China's longstanding acceptance of Confucian-Taoist principles. This orientation is captured in an ancient concept and expressed in a single Chinese word (*shi*), which was central to military considerations in ancient China and continues to play an important role in the 21st century.[28] The concept of *shi* cannot be easily translated into English, but is often interpreted as circumstance, situation, momentum, strength, tactical power, force, influence, authority, or energy. China historian Ralph Sawyer may have characterized it best as "the strategic configuration of power…the power that results from military might being configured to exploit temporal and spatial advantages."[29]

Qualitative assessment in China, as in every country, is unique to its culture. The difference lies in the *extent* to which tradition, experience, and history seem to influence Chinese MOR. Some evidence suggests that these influences may be stronger for the Chinese than for Western peoples.[30] If this is indeed the case, it would be consistent with China's history as one of the world's oldest civilizations and also one that has isolated itself from the outside world—or shunned foreign influences, methods, science and technology—for much of its 3,000-year history.

In the early 21st century, an evolution of Chinese views on the respective importance and functions of quantitative and qualitative analysis is well underway. According to a 1996 summary of a CMC-directed, PLA-wide exposition concerning methods of military operations, China's emphasis on quantitative analysis appears to be increasing, while traditional qualitative analysis techniques are being more widely and openly challenged.[31] The PLA's apparent establishment of formal guidance for MOR further highlights the extent of reform in this discipline of Chinese military science. The PLA now mandates that MOR be conducted in accord with the following five guiding principles:

1. Quantitative (定量 *dingliang*) and Qualitative (定性 *dingxing*)
2. Cooperative (配合 *peihe*)
3. Catalytic (触媒 *chumei*)
4. Infiltrated (渗透 *shentou*) [disseminated]
5. Disciplined (纪律 *jilu*) and Independent (独立 *duli*) [unbiased][32]

Friction Creates Problems

Despite the PLA's significant reform efforts, the conflict between China's cultural influences and modern science continues and will apparently be difficult to overcome. This conflict creates problems for the accuracy and validity of Chinese assessments and for the success of large-scale systems engineering and integration programs. It can also create misunderstandings and miscalculations and can result in disasters.

The now-obvious shortcomings of China's military research, development, and acquisition (RD&A) programs between 1985 and 1995 resulted in significant setbacks for the PLA's force modernization goals. Several key events, including the CMC's reform of the Commission on Science, Technology, and Industry for National Defense and the establishment of the PLA General Armament Department in 1998, testify to these setbacks. The PLA's quarter century of dependence on foreign military assistance to support the operational requirements of the PRC's national military strategy serves as an equally telling piece of evidence. In 1993, Admiral Liu Huaqing, a leader of the PLA's "professional soldier" faction and an RMA advocate, acknowledged the failures of China's indigenous RD&A efforts in a

speech published in the PLA General Staff Department's newspaper, *Jiefangjun bao*.[33] According to Admiral Liu, the outcomes reflected serious flaws in China's approach to military systems engineering and systems integration.

A noteworthy sequence of events revealed misguided PRC decision making between 1995 and 1997. Strategic miscalculations during that period led President and CMC Chairman Jiang Zemin to authorize the PLA's ballistic missile firings into the Taiwan Strait in an attempt to use military coercion to influence the outcomes of Taiwan's democratic elections. The actions also represented a challenge to Washington's commitment to the binding provisions of the U.S. Taiwan Relations Act. These decisions proved highly counterproductive for Beijing, as they in fact bolstered public support on Taiwan for the *Kuomentang* Party and President Lee Teng-hui. China's military provocation also prompted U.S. President Bill Clinton to order two aircraft carrier battlegroups to the Taiwan Strait in March 1996. In the face of American military power that the PLA could neither deter nor counter, China was forced to terminate its military operations ahead of schedule and without the desired outcomes from its show of force.

In October 2006, Beijing suffered another humiliating political setback when North Korea (DPRK) allegedly tested an indigenously developed nuclear weapon, defying Beijing's repeated calls for restraint. At best, Pyongyang's fateful decision to conduct a nuclear weapons test exposed more than a decade of PRC misperception and misunderstanding of North Korea's political determination, and publicly displayed Beijing's greatly diminished influence over Pyongyang. At worst (from China's perspective), the DPRK's defiance highlighted a series of consequential PRC miscalculations, also evidenced by repeated PRC diplomatic failures in bilateral talks with the North Korean leadership.

Implications and Conclusions

Despite China's relatively new and arguably sophisticated examinations of military operations, the PLA's military scientists continue to make assessments that might seem illogical to their Western counterparts.[34] For Westerners to make sense of Chinese MOR assessments, they must have a general knowledge of the Chinese theories, methods, and calculi applied, particularly with respect to how China's military operations researchers consider qualitative and quantitative factors.

Operations research is unquestionably a key resource for China's leaders and military commanders. In general, however, the United States does not understand precisely how operations research influences China's strategic forecasts, assessments, and decision making. Limited linguistic expertise and the lack of translated primary source materials to support specific case study examinations complicate efforts to gain the necessary insight. The West must ponder many questions, such as: What weighting schemes do the Chinese apply in their calculi for operational assessments and military estimates? Does China's mix of qualitative and quantitative analyses provide PRC decision-makers reliable, accurate and precise representations of reality? Do China's MOR judgments suffice to enable success in large-scale military systems engineering and systems integration projects? Can China's MOR really enable PLA commanders to "know the enemy" and also "know" their own forces?

For several years, China has been assessing the PLA's ability to effectively use ballistic missiles—so-called "assassin's mace" (杀手锏 *shashoujian*) weapons[35]—to target and destroy satellites on orbit and aircraft carrier battlegroups at sea.[36] In the case of China's anti-satellite research and development, the PLA demonstrated a breakthrough capability to destroy low earth orbit satellites on January 12,

2007.[37] This achievement should prompt the United States to consider other actions that can result from Chinese MOR; for example, when will the PLA test its ballistic missile capabilities against surface vessels at sea, and with what degree of effectiveness? A series of breakthrough capabilities of this character could result in tipping the strategic balance of military power in the Asia-Pacific region. Such prospects make it imperative that the U.S. Government seeks a fuller understanding of the MOR that supports the PLA's modernization goals and decision making.

The U.S. Government can minimize the risk of miscalculation in its assessments and expectations of Chinese national goals, policy formulation, and behavior by initiating culturally oriented studies focused on how China performs MOR. For example, authoritative Chinese journals regularly publish groundbreaking formulas, models, and resulting analyses in essays pertaining to ongoing MOR in China. Appropriate government agencies can collect and analyze these materials and conduct experiments to test the validity of Chinese MOR theories and methods and their results. The United States can develop software-based tools to build and execute Chinese MOR equations, using Chinese factors and weighting schemes, so that U.S. researchers can better understand Chinese MOR assumptions, theoretical constructs, and analytic results. This information can then be analyzed in a comparative context using corresponding U.S. and Western MOR theories, methods, and results. By correctly interpreting the Chinese approach to problems in MOR, the United States can then begin to carefully consider why U.S. models might produce different outputs than those employed by the Chinese. Such work will also be essential for analysts to anticipate and explain Chinese national security decision making for the benefit of senior U.S. decision makers.

The Chinese obviously think very differently than Westerners do, and Americans, in particular, must conscientiously avoid the tendency toward "mirror imaging" the influences of their own culture and practices upon the Chinese. Understanding the impact of culture, "speculative philosophy," and quantitative analysis on Chinese MOR can help the United States anticipate PRC decision making about national security issues, military RD&A trajectories, and the emerging operational capabilities of the PLA. A failure to perform in-depth examination and comparative analysis could lead to misjudgments that in turn might produce policy and intelligence failures or completely unanticipated "strategic surprises" and invariably create greater—and unnecessary—risk for U.S. national security interests.

Endnotes

1. The views expressed in this paper represent solely those of the author and do not necessarily represent those of The MITRE Corporation or the U.S. Government.

2. For more on the origins of Chinese military strategy and operations analysis see the excellent work of Ralph Sawyer, particularly *The Complete Art of War*, New York: Harper Collins, 1996.

3. China's existing ancient literature emphasizes the characterization of military factors and weighting, as well as the use of tally boards and sand tables for analysis/assessments. See Tien Chen-ya, *Chinese Military Theory: Ancient and Modern*, New York: Mosaic Press, 1992, pp. 21–66, and Ralph Sawyer (trans), *The Seven Military Classics of Ancient China*, Boulder: Westview Press, 1993.

4. David E. Joyce, professor of mathematics and computer science, Clark University; see http://aleph0.clarku.edu/~djoyce/mathhist/china.html, accessed on October 9, 2006.

5. J.J. O'Connor and E.F. Robertson, "Overview of Chinese Mathematics," University of St. Andrews, School of Mathematics and Statistics; see http://www-history.mcs.st-andrews.ac.uk/HistTopics/Chinese_overview.html, accessed on October 9, 2006.

6. For an overview of Chinese strategic culture see Gong Yuzhen, *Analyzing Chinese Strategic Culture*, Beijing: Academy of Military Science, 2002; Li Bingyan, "Emphasis on Strategy: Demonstrating the Culture of Eastern Military Studies," *Zhongguo junshi kexue* (China Military Science), No. 3 (Autumn 2002), pp. 80–85; Li Jijun, "On Strategic Culture, *Zhongguo junshi kexue* (China Military Science), No. 1, (Spring 1997), p. 8. See also Li Jijun, "Traditional Military Thinking and the Defense Strategy of China," *Zhongguo junshi kexue* (China Military Science), No. 4, (Winter 1997), pp. 62–64. For an excellent Western analysis see Iain Johnston, *Cultural Realism: Strategic Culture and Grand Strategy in Chinese History*, Princeton: Princeton University Press, 1995.

7. Other factors that generally influence orientation and behavior include, but are not necessarily limited to, family, ethnicity, language, ideology, mindset, wealth, institutions, authority, and security/insecurity.

8. Jason E. Bruzdzinski, "Toward a Better Understanding of the Chinese: Cultural Intelligence," MITRE Internal Paper and Presentation, September 2006.

9. Wang Houqing, "Military Revolution and Military Operations Research," *Jiefangjun bao* (Liberation Army Daily), September 6, 1998, p. 6.

10. Fan Juwei, "Qian Xuesen and Chinese Military High Technology," *Xinhua*, December 11, 2001.

11. Ibid. Note: China's national strategic 'military guideline' is referred to as Local War Under Informationized Conditions (信息化条件下局部战争 *Xinxihua tiaojian xia jubu zhanzheng*). China's national military strategy is referred to as Active Defense (积极防御 *Jiji fanyu*). The PLA's "strategic guiding operational principle" that supports China's military guideline and military strategy is called Rapid War, Rapid Resolution (速战速决 *Suzhan sujue*).

12. Iris Chang, *Thread of the Silkworm*, New York: Basic Books, 1996.

13. Li Zhangcheng and Jiang Jingzhuo, *Junshi yunchou xin fangfa yanjiu yu yingyong* (Research and Application of New Methods in Military Operations Research), Beijing: Military Science Press, 2002; Dai Feng, ed., *Junshi yunchouxue daolun* (Introduction to Military Operations Research), Beijing: *Jushi Yiwen* Press, 2002.

14. For details concerning the PRC's "863 Program" see http://www.863.gov.cn/863_105/index.html (mirrored at: http://www.863.org.cn/863_105/index.html), accessed on October 10, 2006.

15. For details concerning the PRC's "973 Program" see http://www.973.gov.cn/, accessed October 10, 2006.

16. See: http://www.chinaembassy.bg/eng/dtxw/t202503.htm, accessed online on January 30, 2007.

17. *Zhongguo junshi baike quanshu* (Encyclopedia of China's Military Affairs), CD-ROM edition, Beijing: Academy of Military Science, 1997. Entry for "National Defense Systems Analysis" (*Guofang xitong fenxi*), by Wang Yun.

18. *Zhongguo junshi baike quanshu* (Encyclopedia of China's Military Affairs), CD-ROM edition, Beijing: Academy of Military Science, 1997. Entry for "Military Operations Research Science" (*Junshi yunchouxue*), by Zhu Shoshun.

19. *Zhongguo junshi baike quanshu* (Encyclopedia of China's Military Affairs), CD-ROM edition, Beijing: Academy of Military Science, 1997. Entry for "Military Operations Research and Analysis" (*Junshi yunchou fenxi*), by Zhu Shoshun.

20. Ibid.

21. See a former PLA-AMS Deputy Commandant's framework for "strategic management science" in Li Jijun, "Military Strategic Thinking and Scientific Decision-Making," *Zhongguo junshi kexue* (China Military Science), Beijing: Academy of Military Science, No. 1 (Spring 2006), pp. 28–38. Note: In 2003, U.S. Secretary of Defense Donald Rumsfeld publicly expressed his concern about the lack of quantitative assessment supporting U.S. strategic decision making for the Global War on Terror, see: "Rumsfeld's War-on-Terror Memo," USA Today, October 22, 2003, accessed online at http://www.usatoday.com/news/washington/executive/rumsfeld-memo.htm on March 01, 2007.

22. A review of tables of contents from 1993–2006 in leading military journals revealed this trend, see: *Zhongguo junshi kexue* (China Military Science), *Guofang daxue xuebao* (Journal of the National Defense University), *Waiguo junshi xueshu* (Foreign Military Studies), *Junshi xueshu* (Military Studies), *Junshi Zhishi* (Military Knowledge), *Junshi wenzhai* (Military Readings), *Guofang* (National Defense) and *Shijie junshi* (World Military).

23. The People's Liberation Army (PLA) is the PRC's overarching military organization. It encompasses four force component commands, including: PLA (Army), PLAAF (PLA Air Force), PLAN (PLA Navy) and the PLA Second Artillery Corps (PLA SAC).

24. The PLA Academy of Military Science and National Defense University are known to have departments dedicated to MOR, as well as supporting high-technology laboratories for computing, modeling, and simulation capabilities.

25. PLA General Guo Huaruo edited the initial draft of China's *The Military Dialectics* in 1940. The manuscript was serialized in 1941 and republished as an anthology by the PRC in 1949.

26. Shen Kuiguan, "Dialectics of Defeating the Superior with the Inferior," *Zhongguo junshi kexue* (China Military Science), Beijing: Academy of Military Science, No. 4 (Winter 1994), pp. 105–109.

27. For example, the vignette of the ancient Chinese "horse race problem"—Sun Pin's advice to General Tianji to win (his wager against the King of Qi) was arguably the product of "speculative philosophy," not quantitative analyses performed in the context of deterministic and/or probabilistic modeling. For a full explanation see M. Leng and M. Parlar. "Game-Theoretic Analysis of an Ancient Chinese Horse Race Problem," *Computers & Operations Research*, Vol. 33, 2006, pp. 2033–2055.

28. Jacqueline Newmyer, "Filling a Gap in Our Understanding of Chinese Strategy." Testimony before the U.S.-China Economic and Security Review Commission hearing on Chinese Military Modernization and US Export Controls, March 16, 2006.

29. Discussed in conversations with the author in June 2003.

30. For a comprehensive examination of this see William H. Mott IV and Jae Chang Kim, *The Philosophy of Chinese Military Culture: Shih vs. Li*, New York: Palgrave Macmillan, 2006. Note: Chinese professional military journals, such as *Zhongguo junshi kexue* (China Military Science) and *Junshi yunchou yu xitong goncheng* (Military Operations Research and Systems Engineering), published quarterly by the PLA-AMS, also offer a plethora of essays containing examples.

31. Zhao Xianfeng, Ren Janjun and Zhang Zhanhui, "Watching the Tide Through a Window – Viewing the General Situation of Training Reform in 1996 from an All-Army Exposition of Results in Research on Methods of Operation," *Jiefangjun bao* (Liberation Army Daily), February 8, 1996.

32. *Zhongguo junshi baike quanshu* (Encyclopedia of China's Military Affairs), CD-ROM edition, Beijing: Academy of Military Science, 1997. Entry for "Military Operations Research and Analysis (*Junshi yunchou fenxi*), by Zhu Shoshun.

33. Liu Huaqing, "Unswervingly March Along the Road to Building a Modern Army with Chinese Characteristics," *Jiefangjun bao* (*Liberation Army Daily*), August 6, 1993, in FBIS, August 18, 1993, p. 18.

34. The most glaring examples include the assessments of some PLA military operations researchers concerning the 1999 Kosovo Conflict. See Zhang Xingye and Zhang Zhanli, chief eds., *Campaign Stratagems*, Beijing: National Defense University, 2002, pp. 105, 110, 150; Cui Changqi, "Reflections on NATO Air Strikes on Yugoslav Federation," *Jiefangjun bao* (Liberation Army Daily), April 8, 1999, p. 5. Also see Michael Pillsbury, "Dangerous Chinese Misperceptions: The Implications for the DoD," Washington, D.C.: Department of Defense, January 1, 1996.

35. Jason E. Bruzdzinski, "Demystifying *Shashoujian*: China's 'Assassin's Mace' Concept," in Andrew Scobell and Larry M. Wortzel, eds., *Civil-Military Change in China: Elites, Institutions, and Ideas after the 16th Party Congress*, Carlisle, PA: U.S. Army War College, 2004, pp. 309–370.

36. Concerning ASAT MOR see: "Leading Weapons for Future Air and Space Defense – Laser Weapons Under Rapid Development," *Feihang daodan* (*Winged Missiles Journal*), December 5, 2005, translated by the Open Source Center, document ID: 20060202321001; "Campaign Efficiency Evaluation Model of Anti-Satellite Weapons," *Zhanshu daodan kongzhi jishu* (*Control Technology and Tactical Missiles*), December 1, 2005, translated by the Open Source Center, document ID: CPP20060320424001; Zhang Aiyu, "Simulation Modeling Research for Kinetic Kill Vehicle," *Wei jisuanji xinxi* (Control and Automation), No. 8, 2005; Wang Qingchao and Li Da, "A Study of Kinetic Interceptor Attitude Control System Based on Feedback Linearization," *Yuhang xuebao* (*Journal of Astronautics*), No. 3., 2005; Wan Ziming, Yang Yuguang, and Deng Longfan, "Concept of Kinetic Orbit Weapons and Their Development," *Xiandai fangyu jishu* (*Modern Defense Technology*), No. 2, 2005; Mo Hongjun and Zhang Haiyan, "Solid Propellants Applying for Kinetic or Hyper-Velocity Missiles," *Zhongguo huo zhayao xuebao* (*Chinese Journal of Explosives and Propellants*), No. 1, 2005; Ning Ziwen and Yu Xiaohong, "Error Analysis of Orbit-transferring Velocity Increment on KKV in Space," *Zhuangbei zhihui jishu xueyuan xuebao* (*Journal of the Academy of Equipment Command and Technology*), No. 3, 2004; Huang Wanwei, "Design of Variable Structure Automatic Pilot for Kinetic Kill Vehicle," *Hangtian kongzhi* (*Aerospace Control*), No. 2, 2004; He Zhengchun, "An Investigation of a Maneuvering Long-Range Warhead's Capability to Break Through an Anti-Missile System," *Feixing lixue* (*Flight Dynamics*), No. 3, 2003; Zhang Hongan, Ye Dingyou and Guo Peng, "Preliminary Discussion on Solid Propellant Kinetic Kill Vehicle," *Guti hujian jishu* (*Journal of Solid Rocket Technology*), No. 4, 2002; Cheng Fengzhou, Wang Ziming and Chen Shilu, "Terminal Guidance Analysis of Extra-Atmospheric Kinetic Kill Vehicle," *Feixing lixue* (*Flight Dynamics*), No. 1, 2002; Zhang Yasheng, Cheng Guokai and Chen Kejun, "Design and Realization of Terminal Guidance's Method for Kinetic Energy Interceptor at High Altitude," *Xiandai fangyu jishu* (*Modern Defense Technology*), No. 2, 2001. Concerning anti-aircraft carrier MOR see: "Preliminary Analysis on the Survivability of a US Aircraft Carrier," *Zhidao feidan* (*Guided Missiles*), No. 5, 2000; "Study of Attacking an Aircraft Carrier Using Conventional Ballistic Missiles," *Dier paobing gongcheng sheji yuanjiuyuan* (*Second Artillery Corps Research Institute of Engineering Design*), Xian, 2002; "Concept of Using Conventional Ballistic Missiles to Attack a

Carrier Fleet," *Keji yanjiu* (*Science and Technology Research*), No. 1, 2003; "Movement Forecast Model and Precision Analysis of Maneuvering Targets at Sea," *Dier paobing gongchengxueyuan* (*Second Artillery Engineering Academy*), 2005; "Research on Optimization Methods for Firepower Allocation Plans in Joint Strike Fires," *Junshi yunchou yu xitong gongcheng* (*Military Operations Research and Systems Engineering*), 2005.

37. Craig Covault, "Chinese Test ASAT Weapon," *Aviation Week & Space Technology*, January 17, 2007. Accessed online at http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/CHI01177.xml on January 29, 2007.

Developing Military Force Structure Concepts and Choices for 21st Century Operations

Christopher C. Wright[1]

What kind of military force does a nation need? If called upon to describe a military establishment, widely read open publications typically list a few key "force structure" elements in simple terms, such as numbers of ground force divisions, aircraft wings or squadrons, and naval aircraft carrier battle groups or other ships of various types. Such a brief statement of force structure typically has served as a shorthand form for describing a state's military capacity. Looking further, one may find other more general data: total number of personnel in uniform, sometimes divided among active duty and reserve component shares; numbers of combat ships and aircraft; and some discussion of force quality in terms of equipment modernity, unit readiness, and various forms of support. Nuclear arsenals of course have had a place of their own in such compilations, but these accountings have receded greatly in the public eye in the post-Cold War era.

It is interesting to see, therefore, that the U.S. Department of Defense (DoD) has stopped providing simple summary force structure data in its most widely distributed public documents, after decades of their use. The Annual Report of the U.S. DoD contained such a set of "Force Structure Tables" through the 2001 edition, the last submitted by Secretary William Cohen. Indeed, the Department apparently has stopped issuing its Annual Defense Report, or ADR, altogether. The publication of the report of the DoD Quadrennial Defense Review, or QDR, in early 2006 was announced as taking the place of that year's ADR. None, however, has been issued at all in 2007.

Other public documentation can serve to provide much of the traditional force structure data, drawing on the voluminous budget justification books provided to the Congress and now posted online, for example. Reports and statements made by representatives of the military departments provide some of the data as well.[2]

The absence of summary force structure data is not the point, however. The important point is that simple summary tables of divisions, wings, and naval battle groups increasingly are understood to fall short, well short, in serving as indices of a state's military power. But if not these measures, how can we assess the capacity and adequacy of a given force? Lacking such measures, how should one think about the apportionment of resources among claimants for limited resources? Lacking such measures, how does the electorate sense the sufficiency of its security? This paper will try to develop these questions in

1. The views reflected here are those of the author and may not represent those of the Johns Hopkins University or the Applied Physics Laboratory.
2. The Defense Department also produces a relatively new, detailed annual report entitled the *Department of Defense Performance and Accountability Report* that can be found on the website of the Under Secretary of Defense (Comptroller) at www.defenselink.mil/comptroller/par/index.html. This report does not provide force structure data or aggregate force capability estimates. It focuses on financial accountability.

an effort to alert those of us who study national security issues to the need to develop new methods of summarizing force capacity in the light of new challenges.

Defining Military Forces

As noted above, the most widely noted DoD force structure data tables have summarized land, sea, and air forces in their traditional organizational groupings. Recent developments in military capabilities eventually prompted the addition of an additional category. The Defense Department's Annual Defense Report included a few entries for Army Special Forces Groups in the mid-1990s and then provided a greatly expanded set of force tables for Special Operations Forces (SOF) during the period 1999–2001.[3] Other more disparate capabilities remained unmentioned, however, such as information-gathering and information-distributing systems.

Many readers may consider that the failure of traditional national military force structure metrics to serve current purposes reflects the fact that some of the most important opponents today are, or might be, entities other than nation states. Divisions, squadrons, and battle groups had little relevance when the attacks occurred in the U.S. on September 11, 2001. In the aftermath of the 2001 attacks, furthermore, a number of the most prized victories—for example the capture of Khalid Sheikh Mohammed—have been won not by military combat forces but by other services or agencies, often overseas in friendly nations. And some have argued that our purposes in the present conflict often may be served best by limiting uniformed military presence overseas and instead aiding allied nations in conducting internal security measures.[4] In this view, winning hearts and minds might be furthered best through focus on economic and political means rather than by air strikes and ground sweeps. Along these lines, key defense capabilities might comprise such things as humanitarian aid, "nation-building," and intelligence gathering emphasizing human sources.

The emergence of non-state, or failed state threats and challenges has not, of course, removed other potential future threats from nation states, or the overall need to summarize top-level capabilities. The combination of new threats demanding new responses, including ongoing major military operations in Iraq and Afghanistan and more traditional threats in places like North Korea, has contributed to a remarkable period of sustained growth in defense spending in this country.[5] The need to conduct operations around the globe, the maintenance of a comparatively costly all-volunteer force, and a desire to accomplish military operations with minimal injury and collateral damage combine to fuel these high costs. Yet even with resources unprecedented since the Korean War, there is a constant and intense competition for resources within the U.S. defense establishment, and a resultant pressing need to choose wisely among the many possible priorities, preferences, and risks.[6] A concise means of

3. Electronic copies of selected Annual Defense Reports can be found at www.dod.mil/execsec/adr.
4. A recent argument along these lines can be found in Rory Stewart, "Where Less is More," *New York Times* 23 July 2007, p.A23.
5. See Figure 1-1 [Past and Projected Spending for Defense] Updated in Congressional Budget Office, "The Long-Term Implications of Current Defense Plans: Detailed Update for Fiscal Year 2007 (April 2007)," http://cbo.gov/ftpdocs/80xx/doc8018/04-20-Defense.pdf. Spending in constant values has increased annually since the mid-1990s, including the funds provided for Operational Iraqi Freedom and Operation Enduring Freedom.
6. For historical budget data, see Office of the Under Secretary of Defense (Comptroller), *National Defense Estimates for FY 2007 (Green Book)*, March 2006, Table 6.9. Annual spending is expressed in constant FY 2007 Dollars (thus adjusted for the estimated effects of inflation) in this table.

summarizing forces and their capabilities will be valuable in helping facilitate the necessary choices among competing demands.

It is clear that some substantially new forms of capability are wanted to deal with new, more porous and elusive threats and that these new capabilities must be understood and quantified in ways that will permit them to be sized in parallel with the traditional force structure elements. One couldn't quote a number of "computer network attack squadrons," for example, and generate any recognition of the capacity or value of their product.[7] This kind of shortfall in understanding the capabilities of new force types is a critical challenge in developing overall defense policy. On the other hand, military forces have been evaluated for many years on more than capability in traditional combat operations. Thus, studies of deterrence and the value—and sizing—of "peacetime presence" have been important for a very long time and have confounded comprehensive mathematical solutions. While firepower scores and war games might suffice to give some sense of adequacy in a tank battle, calculation of the number of forces located in a forward area to deter some enemy initiative rely in fair part on judgments about an adversary's thinking that we cannot expect to always predict correctly.

Defining Military Capabilities

Useful force structure definitions depend upon understanding force capabilities, because any useful top-level force structure summary should help gauge that force's ability to deliver the most important needed capabilities. This paper will discuss how capability has been described in top-level military force assessments and how new forms of military capability suggest a need for new methods in describing forces and assessing alternative force mixes.

Single aggregate measures of military capability don't exist today (perhaps the closest approximation was the aggregate "throw-weight" of nuclear weapons payload during the Cold War, or, in the 1920s, the number of capital ships allowed under the arms limitation treaty of the time.) Instead, as already shown, simple force structure summaries often serve as an initial proxy. Such force structure numbers can be expanded upon through quantification of selected capacities, such as volume of space occupied or surveyed and length of time present, and such exercises sometimes provide helpful insights.[8] Aircraft force structure, for example, may be expressed in terms of the number of individual aircraft sorties that could be generated in a day or the numbers of targets that might be struck under uncertain circumstances. Land-based tactical fighter/attack aircraft, for example, sustained an initial average of about two sorties per day during Operation Desert Storm in 1991.[9] Thus the time spent on task, and the number of targets attacked per 24-hour day would seem small. The resulting small number of engagement opportunities reflects, in large part, the lengthy flight time spent traveling to and from the target area as well as the time needed to prepare mission plans prior to combat and the need to

7. As will be discussed below, the actual product of a "traditional" force structure element, such as an aircraft squadron, often isn't well appreciated, either, but a general sense from the historical record conveys valuable impressions that would not be available for substantially new forms of capability like Computer Network Attack.
8. The Defense Department published a few such compendia of capability metrics in the *Military Status Report* (MSR) series, published as classified documents during the later 1980s, for example.
9. A useful overview of the sortie generation process and the factors militating against high sustained rates can be found in John Stillion and David T. Orletsky, *Aircraft Vulnerability to Conventional Cruise-Missile and Ballistic-Missile-Attacks: Technology, Scenarios, and U.S. Air Force Response* (RAND, 1999), esp. Chapter 5. Basic data can be found in the *Gulf War Air Power Survey*, a report that has been posted in its entirety on the U.S. Air Force's history center website at www.airforcehistory.hq.af.mil/Publications/Annotations/gwaps.htm.

conduct damage assessment and aircraft maintenance afterwards. Ground force capability might be expressed, again for example, in terms of the number of miles of ground frontage that might be held using doctrinal planning factors.

All of these more detailed measures are abstract, divorced from consideration of corresponding operational demands, and many thus reflect what are called "input" rather than "output" measures. Optimally, one would like to measure military power in terms of its ability to obtain effects. Indeed, much recent mention can be found of "effects-based operations" and "capabilities-based analysis."[10] Analysts will recognize that the telling contribution a given force structure unit makes tends to be reflected in somewhat narrow and sometimes arcane terms, such as "time on station" and "probability of target detection," but these measures also often are input values rather than mission-level performance outputs.

Force structure traditionally has emphasized equipment counts, particularly for air and sea forces, and can be thought of as focusing a lot of attention on what some people call "platforms"—individual weapon systems that are themselves agents to carry a wide variety of sensors and weapons to conduct various operations. There are several potential problems today in fixing only on these major platforms. In the first instance, these "platforms" increasingly must share operational significance with other very different capabilities. The wide arena of "information operations," for example, extending from surveillance to active disruption methods, may play an increasingly important role in future conflicts and cannot be summarized in a data table as easily as the major "platforms."

Secondly, most of the major weapons systems can perform several military functions, sometimes all at once. Some can deliver firepower effects, collect situation information, and direct other operations while also protecting other friendly activities, for example. And today more of these "platforms" are capable of performing significantly different operational tasks at different times than often was the case during the Cold War, complicating an assessment of force adequacy. The ability to perform a series of different task sequentially, rather than simultaneously, may overcome numerical limitations at a starting point in time. It is difficult to imagine, however, the analytical methodology that would be needed to provide a widely accepted representation of the cumulative benefit of performing such a shifting series of combat tasks.

Evaluating Military Capabilities

Traditionally, force planners have resolved some such dilemmas in judging the relative capability, and desirability, of different force elements through the use of hypothetical scenarios of future events. These scenarios support analysis that is intended to take into account geographical as well as time phasing concerns in estimating force sufficiency. When a particular future conflict is relatively easy to imagine—as was the so-called "Orange War" in the Pacific between the United States and Japan, before

10. The military Services have implemented this philosophy in their operations. For example, the Air Force recast its deployment process during the late 1990s when it established what it called the Expeditionary Air Force (EAF) concept. A key EAF goal was to level the overseas deployment burdens across the force; to do this, ten force packages were created that were deemed equally capable. Each of the ten units might vary in equipment mix, but the aggregate combat potential was considered equal. One problem this concept solved arose from the frequent calls for the dispatch of certain aircraft types that were limited in inventory. Previously, calls for their deployment often had violated desired personnel deployment tempo norms, creating personnel hardships.

1941, such scenario-based analyses have proven to be very beneficial.[11] Imagining specific scenarios has been increasingly difficult in the post-Cold War era, however, a challenge of great and perhaps central significance in force structure planning.

The DoD employed for decades a standardized set of planning scenarios for use in estimating the needed aggregate size of the military establishment, such as that underlying the notional "two and a half" war policy of the 1960s.[12] More recently, the Clinton Administration Defense Department leadership resolved in their minds quite quickly the dilemma of how to accomplish post-Cold War planning, completing their work in the "Bottom-Up Review (BUR)" of 1993. One upshot of the BUR was the establishment of the goal to size the overall conventional force to be capable of handling two "nearly simultaneous" Major Regional Contingencies (MRCs). More focused review of specific force elements adjusted the numbers somewhat, including adding a couple of aircraft carrier battle groups to accommodate peacetime presence personnel tempo planning factors, for example. Subsequently, of course, the present Administration sought to recast many of the concepts for conventional force employment, under the rubric of Force Transformation. "Scenario-based planning" gave way to a broader set of analyses now subsumed under the heading of "Capabilities-Based Planning."

Identifying forces aligned according to planning scenario needs has a number of virtues. Specifying the geographical demands in deploying forces informs consistent decisions about strategic mobility, basing, and logistics support. (It may be desirable to hedge against larger demands in some of these categories but at least a minimum baseline capability will be in hand.) Perhaps as important, specifying force structure quantities imposes limits on acquisition and support costs within a given budget level. The strategic implications of force structure reduction in favor of weapon system investment come into play much more readily when such a scenario-driven structure goal has been agreed to.

Moreover, use of standard scenarios may make it possible to quantify associated increments of new capability, such as Computer Network Attack and certain SOF capabilities. Such relationships would permit the detailed calculations for the sizing of these force elements to remain classified while allowing at least some public indication of the relative importance of these new force elements.

Scenario-based analysis has been criticized as irrelevant in a world where the future is profoundly more uncertain than previously imagined, and where optimization based on one set, or two sets, of so-called "point scenarios" may leave the force ill-prepared for actual demands.[13] One expert observer recently offered the following criticism, for example, of the suitability of the product of the BUR today, 14 years later:

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11. Edward S. Miller, *War Plan Orange: The U.S. Strategy to Defeat Japan, 1897-1945* (Naval Institute Press, 1991). Among the operational benefits of pre-war planning in this case were an understanding of the logistics support needed for trans-oceanic operations and the preparation of draft plans for acquiring and adapting commercial vessels for wartime logistics support tasks. The U.S. Navy conducted systematic analysis of potential wartime demands through a long series of major fleet exercises (see Craig C. Felker, *Testing American Sea Power* (Texas A&M University Press, 2007) and through a long series of analytical war games (see Michael Vlahos, *The Blue Sword: the Naval War College and the American Mission 1919-1941*, Naval War College Press, 1981).
12. William W. Kaufmann, *Planning Conventional Forces, 1950-80* (Brookings, 1982), esp. pp.4-17. U.S. war planners considered warning time of any major Warsaw Pact troop movement to be perhaps the single most critical factor in preparing for a NATO/Warsaw Pact conflict.
13. Davis, *Op. cit.*, criticizes the use of one or two "point scenarios," see p.25. Instead, he favors the use of a wide range of scenarios in generating broad initial insights in an approach that may be similar to that in use by the Defense Department today.

> *"…a force designed for the middle—crudely, the composition that served well for "two major contingencies" in the 1990s and until the watershed attacks in 2001 on the Twin Towers and the Pentagon—is badly configured to handle either the China [peer-competitor] or small-wars end of the spectrum of conflict."* [14]

So in abandoning "scenario-based planning," the DoD currently does not specify force structure adequacy in terms of capability to prevail in some specific scenario set. Instead, the Department has created a large number of scenario "test cases," inviting force providers and force employers to evaluate the adequacy of planned forces in light of these various samples and suggest improvements to better balance overall resilience in the face of uncertainty. In implementing their new force planning approach, the Department has instituted a larger process of "capabilities-based planning" to create a diversity of competencies that offer flexibility while better accommodating an uncertain future.

"Capabilities-Based Planning"

The Defense Department introduced "Capabilities-Based Planning" (CPB) as a process as a result of the 2001 Quadrennial Defense Review. A good many papers, reports, and briefings are available that describe the Department's intent.[15] CPB is seen as a "top-down, competitive process that weighs options versus resource constraints across a spectrum of challenges."[16] CPB encompasses a wide variety of analytical efforts, including a good deal of scenario-based analysis. Methodologies and data are developed and provided under the so-called "Analytic Agenda" process, managed by the Office of the Secretary of Defense (OSD) and the Joint Staff.

Capabilities-Based Planning apparently has not yet evolved to provide a single decision-support system like that provided, for example, by the Draft Presidential Memoranda (DPMs) that served to inform top-level decision making during most of Secretary of Defense McNamara's tenure in the Pentagon.[17] The DPMs, of which there eventually were sixteen to cover critical defense program issues, focused on what were thought to be the key force capability packages, for example, "Anti-Submarine Warfare Forces," "Tactical Air Forces," and "Land Forces." Parallel (overlapping) treatment was provided along regional lines, with "Strategy and Force Structure" DPMs each for Europe (NATO) and Asia. Many DPMs had associated "Force and Effectiveness Table" documents that made available the key quantitative data base drawn upon in presenting quantitative assessments in the DPMs. The force packages treated in a given DPM mapped to force program elements in the (then) Five-Year Defense Program (FYDP). These force packages also mapped directly to specific divisions within the Systems Analysis office in the OSD.

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14. Captain Wayne P. Hughes, Jr., USN (Retd.), "A Bimodal Force for the National Maritime Strategy" in *Naval War College Review,* Vol.60, No.2 (Spring 2007), p.38.
15. Examples include Stephen K. Walker, *Capabilities-Based Planning—How it is Intended to Work and Challenges to Successful Implementation* (U.S. Army War College, March 2005) and Paul K. Davis, *Analytic Architecture for Capabilities-Based Planning, Mission-System Analysis, and Transformation* (RAND, 2002). The Military Operations Research Society (MORS) held informative workshops on the concept in 2004 and 2006 that are summarized on the organization's website, www.mors.org.
16. Capabilities-Based Planning (CBP) Workshop briefing, Military Operations Research Society, 13 June 2006.
17. Leonard S. Kaplan, Ronald D. Landa, and Edward J. Drea, History of the Office of the Secretary of Defense, *The McNamara Ascendancy 1961-1965:* (GPO, 2006), esp. pp.83-85. See also Alain C. Enthoven and K. Wayne Smith, *How Much is Enough?: Shaping the Defense Program, 1961-1969* (Harper & Row, 1971), esp. pp.53-57.

Currently, published DoD statements suggest that "Capability Portfolio Management," treated as one aspect of the CBP process, is seen as becoming ready to deliver comprehensive, integrated analysis in direct support of budget choices. To be fully successful, however, these initiatives must accomplish several analytical tasks. They must rise above technical arguments concerning system characteristics to help inform strategic choice; they must achieve some common ground for evaluating unlike capabilities, such as traditional combat forces and Information Operations; and they must be conducted with sufficient skill as to withstand challenge sufficiently well to overcome the resistance that may be expected from unsuccessful claimants for priority.

"Missions" versus "Functions"

In considering the job that "Capability Portfolio Management" must accomplish, an approach should be included that provides assessments at high levels of aggregation. It is argued here that such focus should start at what the Joint Chiefs of Staff defines as the strategic level of war, focusing on national-level missions having some political dimensions, rather than lower-level functional warfare operations that also often are styled as "missions."[18] Current usage of the term "mission" may lead to misunderstandings about priorities in force development, however. References to the "air superiority mission" or the "undersea superiority mission" (for example) can be seen all too easily as ends in themselves in a world that is considered to be fundamentally uncertain. According to this view, if we can't know where or when or how our forces might be used, the default should be to sustain the best basic core competencies that we can and be ready to integrate and apply these as cleverly as possible. "Capabilities-Based Planning," arguably, may risk the promotion of optimization at this lower level, as will be argued below.

One current problem is that sustaining planned inventories of such basic tools—from aircraft carriers to supersonic stealth fighters—is proving unaffordable and inventories, and force structure, are declining to what some policy makers see as unacceptably risky levels as a result.[19] Lacking a control mechanism to force retention of sufficient force structure to control a certain space at a certain level of conflict, the appearance of steadily declining inventories also may encourage potentially circular efforts to enhance the performance of those remaining weapon systems that are being produced. The cost impact of enhancing individual platform capabilities is exacerbated by production base concerns. Smaller production runs of major systems have contributed to reductions in the number of prime contractors capable of delivering major weapon systems, risking the creation of monopoly supplier pressures and of reducing or losing altogether any benefits of "mass production."

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18. The Joint Chiefs of Staff Dictionary of Military Terms allows the term "mission" to apply to tasks at any level of war, strategic, operational, or tactical. See the dictionary at www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf. Defense analysts sometimes refer to these three conflict levels as the campaign or theater level, the mission level, and the engagement level.
19. The U.S. Congress only reluctantly, and after some delay, agreed to the U.S. Navy's proposal to inactivate the aircraft carrier *John F. Kennedy* (CV-67) this year, for example, and directed the Navy to retain the ship for two years in a condition permitting reactivation if needed. Other Congressional action, such as the push to increase submarine building rates with an avowed purpose of preventing force level reduction below some given level, has similar import but also reflects concern for the associated production base with all its implications for local employment levels. The Air Force "gapped" fighter production during the 1990s, ending requests for F-15 and F-16 production, but did not "gap" fighter investment—significant funding continued throughout for development of the F-22 and, later, also the F-35.

Force structure reductions in the immediate post-Cold War years gave promise to the notion of short-term production "holidays," ceasing production of certain weapon types altogether because existing inventories would sustain force structure for some years prior to the need to acquire replacement capabilities. This opportunity to "gap" production of certain major weapon systems, such as aircraft carriers and submarines during the early 1990s, was rejected after study because of the determination that restarting such highly specialized, complex construction programs after a production base shutdown would face potentially insurmountable problems.[20] Thus few if any production lines have been shut over the last decade, leaving residual production operations with small numerical outputs and comparatively high overhead costs. Most if not all of these production base issues also probably will involve domestic political interests through the economic impact of production termination, regardless of whatever scenario and force structure planning postulates the DoD may want to present. An effective defense program plan should accommodate these production base aspects of force planning, however.

Stating mission goals at a top level should facilitate tradeoffs and prioritization that may not be possible otherwise. In an example from the Cold War, one of the key national-level goals was the defense of Western Europe, defined as moderating territory lost and avoiding escalation to the use of nuclear weapons. A wide variety of combinations of capabilities might have accomplished that goal, within the context of the various planning scenarios.

Looking at the problem from the highest level enabled efficiencies at the highest level. A classic example can be found in the concept of U.S. Prepositioned Material Configured in Unit Sets (POMCUS), also called "Prepo," typified by the creation of stockpiles in Western Europe but also proliferated around the world in various forms to the present day. At the high-water mark of the concept, the United States planned to build to nine division sets of POMCUS material in Western Europe. In fact, stocks peaked at about 4-3/4 division sets, and indeed there was debate about the merit of placing too much valuable equipment at risk in densely-packed warehouses that were well-known to an enemy that happened to possess large aerial attack forces.

The point of the argument, however, is that the goals of holding territory and avoiding escalation invited massing heavy land forces, with attendant air support, early. Moving U.S. military forces from the CONUS to Europe during a period of warning was very time consuming, and opened resupply shipping to the threat of Soviet naval interdiction. In this light, Navy efforts to build anti-submarine capability were encouraged, but the top-level goal of holding the western front made "ships saved" (and cargos delivered) a much more important early campaign metric than "subs sunk." The ability to fly troops to their pre-positioned equipment reduced the urgency of sea lane control at the outset. Avoidance of the urgent need to move military resupply shipping at the outset enabled naval emphasis on long-term attrition against the enemy's submarine force, which was hindered in engaging shipping by its remote basing that placed it some two to three weeks from the shipping lanes if forced to transit at slow, acoustically "quiet" speed. Commercial resupply shipping, needed to deliver food and fuel to western European populations, also was essential but probably wasn't nearly as time-critical as the military reinforcements speeded by the Prepo concept.

20. RAND carried out two such studies for the Department of Defense and the Navy, considering potential gaps in aircraft carrier and submarine construction. The DoD chose to sustain continuous production of both types to avoid potentially serious risks in restarting production some years later.

The Prepo example offers some fairly clear-cut tradeoffs. The problems we face today are more complex. Thus restoration of domestic security inside Iraq involves many aspects of engagement that we cannot control. But the Prepo example does remind us that we need to start with a statement of the basic problem and our overall goal. Today one can see useful measures of effectiveness, for example, such as the numbers of Iraqi citizens returning from abroad to live in Iraq and the level of local, consumer-level economic activity as useful metrics in tracking the restoration of a safe and effective civil society, rather than numbers of anti-government combatants killed or detained. The solution in Iraq may lie not only in providing enhanced local security to underpin a regenerated civil society but also in overcoming long-standing enmities among domestic sects as well as cutting off external (foreign) support for anti-government action.

Acknowledgment must be made, in promoting the conduct of top-level, or strategic or theater-level, assessments, that the analytical methodologies for these assessments are both limited in their depth and often contested in the inferences to be drawn from them. While close combat sometimes may seem readily quantified, particularly with weapons systems where sensor and weapon performance can be modeled based on live testing, theater-level operations seldom can be. Theater- or campaign-level modeling typically simplifies force characteristics and interactions dramatically, even though sophisticated procedures may be incorporated for drawing on more detailed underlying analysis. It is argued here, however, that a high-level initial review of threats, capabilities, and risks at the theater level may bear fruit in allowing the kinds of insights that sparked the creation of the Prepo programs.

If we proceed to make a list of top-level missions, what would such a list look like? The DoD provided its views of how to consider force orientation in the 2006 QDR report.[21] The report defined five fundamental focus areas to "operationalize the strategy," as follows:

- Defeat Terrorist Networks
- Defend the Homeland in Depth
- Shape the Choices of Countries at Strategic Crossroads
- Prevent the Acquisition and Use of Weapons of Mass Destruction
- Refine the Department's Force Planning Construct for Wartime

In seeking to implement these ideas through changes in the planned force, the report treated ten capability areas:

- Joint Ground Forces
- Special Operations Forces
- Joint Air Capabilities
- Joint Maritime Capabilities
- Tailored Deterrence/New Triad
- Combating WMD (Weapons of Mass Destruction)
- Joint Mobility
- Intelligence, Surveillance, and Reconnaissance
- Achieving Net-Centricity
- Joint Command and Control

21. The report is available at www.defenselink.mil/pubs/pdfs/QDR20060203.pdf.

The Department's QDR report stayed clear of specific planning scenarios and instead emphasized the refinement of a selected range of capabilities that were considered applicable to a wide range of challenges both near-term and farther in the future. An observer can infer that scenario-based analysis took place but that it failed to gain pride of place in the QDR report.

Outside observers have offered somewhat different candidate procedures for thinking about force needs and capability emphasis. Andrew Krepinovich, for example, suggested in Congressional testimony on 20 June 2007 a set of seven "contingencies" that correspond fairly well to traditional planning scenarios and that in turn support his formulation of six "primary missions."[22] Mr. Krepinovich's seven contingencies are as follows:

- Major Power Anti-Access/Area-Denial
- Minor Nuclear Power State Aggression
- Nuclear State Failure
- Modern Insurgency
- Global Commerce Raiding
- Global Commons (space, cyberspace, sea, undersea) Attack
- Nuclear/Biological Homeland Attack

His presented his argument in outline form but his argument follows a simple logic for force planning that meets the needs suggested in the present paper for adoption of a set of top-level politico-military goals matched by derivative estimates of military capabilities demanded, utilizing several hypothetical conflict scenarios to assist force planning.

Captain Wayne Hughes, writing in a previously quoted *Naval War College Review* article, has presented a similar conceptual approach in making recommendations for naval force planning, postulating two parallel strategic goals—holding off a peer competitor while also effectively conducting "small wars."[23] He identifies five major force elements—not the same ones for each goal, though several are related—as essential to fulfill each of the two sets of strategic goals.

The Defense Department may be trending further away from such scenario-based thinking, however. Recent DoD statements suggest that the new process of "portfolio management" is seen as the preferred tool in optimizing force capabilities. There is some evidence that the Department's focus may end up focusing more on investment efficiencies than on force structure and top-level capabilities.

Portfolio Management

The DoD currently is placing great emphasis on "Portfolio Management."[24] The key gain sought through portfolio management is to extract greater efficiency in accomplishing certain functions or goals by placing an expert manager in charge of a selected set of resources, with the direction to improve their product within planned funding levels. The tension involved reflects the fact that the

22. Andrew F. Krepinovich, President, Center for Strategic and Budgetary Assessments, "Defense Roles, Missions, and Requirements", Testimony before the United States House of Representatives Committee on Armed Services.
23. Hughes, *Op. cit.*, pp.34-38.
24. An overview of the concept and a discussion of current DoD applications can be found in Government Accountability Office (GAO) Report to the Committee on Armed Services, U.S. Senate, "Best Practices: An Integrated Portfolio Management Approach to Weapon System Investments Could Improve DoD's Acquisition Outcomes," GAO-07-388, March 2007.

manager usually will be charged with assessment and recommendation for changes in some activities and investments that often will not belong to his or her parent service or agency. The definition of the portfolio will vary widely but initially has been defined in a set of four test cases to reflect shared, joint activities for which there currently is not a strong proponent within the DoD. These initial DoD test cases are "Joint Battlespace Awareness," "Joint Command and Control," "Joint Logistics," and "Joint Net-Centric Operations." The Under Secretary of Defense (Acquisition, Technology and Logistics) and Director, Joint Staff, co-chairs of the Institutional Reform and Governance (IR&G) working group formed during the QDR and sustained to date, are charged with leading the development of portfolio management tools as part of their charter.

Deputy Secretary of Defense Gordon England stated in Congressional testimony of 26 June 2007 that the Department intends to submit its justification for the FY 2009 budget "in three different ways: 1) capability portfolios, building on the four test cases currently underway; 2) Military Services, and 3) appropriations titles."[25] Budgets previously have been submitted with funding identified in both force programs by military service and also by Congressional "appropriations titles," the latter categorization matching Congressional committee responsibilities. The proposed alignment of the entire defense program by "portfolio" category thus creates great interest in understanding how the Department proposes to evaluate its priorities in the future.

Indeed, Secretary England's June 26 statement says that it is "the Department's intent to oversee the accomplishment of its mission through capability portfolios and to associate clear, objective performance measures with its missions and activities."[26] The Department's understanding of the scope of the portfolio management process thus has expanded greatly over the last two years. Mentioned early on in rather narrowly applied terms, such as "information technology portfolio management," it later was adopted and applied more widely in the context of "business transformation" initiatives.

One clear risk in broadening the scope of portfolio management is the step from evaluation of efficiency in business operations, often reckoned in terms of financial profit, savings, or loss, to the delivery of the full range of defense capabilities, many of which are not easily quantified. Some DoD operations, such as transportation and maintenance, often can be understood in terms much like that of a commercial business, where financial savings are the chief impetus for change.[27] But others, involving for example the creation of an impression in the enemy's mind, are not.

Creating a defense-wide set of portfolios obviously risks revisiting many "roles and missions" debates of past decades. There has been some discussion of the potential to use the twenty-one so-called Tier I "Joint Capability Areas" (JCAs) as some or all of the portfolio set that would encompass all DoD activities.[28] (These twenty-one JCAs are listed in the appendix to this paper.) There are significant potential problems in using the JCAs as the decision categories. They are said to be "highly overlapped,"

25. Statement of the Honorable Gordon England, Deputy Secretary of Defense, Before the House Armed Services Committee, 26 June 2007, available online at http://armedservices.house.gov/pdfs/FC_062607/EnglandPattersonBrinkley_FC062607.pdf.
26. Ibid.
27. Note that the March 2007 GAO report on DoD portfolio management opportunities is focused on desired improvements in the systems acquisition process.
28. See the DoD briefings on the Military Operations Research Society website under Completed Meetings, Capability-Based Planning Workshop II (2006): http://www.mors.org/meetings/cbp_II/cbppres.htm. In particular, see *Supporting the Implementation of Joint Capability Areas (JCAs)*, a briefing presented by Ms. Teresa Gerton of ODPA&E.. Available on the MORS website at http://www.mors.org/meetings/cbp_II/briefs/gerton.pdf . Accessed 17 May, 2008.

that "many DoD capabilities can contribute to multiple JCAs," and while they cover combat force capabilities fairly, they "lump most "infrastructure" functions (roughly half the TOA [DoD funding]) into two JCAs (Force Generation and Force Management)."[29]

Will the Department's final preferred portfolio set be defined in terms of strategic-level tasks, such as "defense in East Asia" or "homeland security," or will they be couched in the more platform-centric terms, more nearly "operational-level" or "tactical-level" aggregations, such as "aviation forces," that represented operational demand in the QDR? One conceptual approach could assess forces in the packages that might be provided to the Combatant Commands for employment, though such an approach would involve many overlapping allocations. A default setting that would equate the four Military Services to domains that roughly matched their current budget appropriations titles (e.g., the Secretary of the Navy would become the "maritime force portfolio manager") might not change anything. An effort to fashion portfolios to match current Joint Chiefs of Staff Joint Capability Integrated Development System (JCIDS) categories (e.g., "Force Application" and "Force Protection") would create very uneven groupings and might not help resolve the problem of overlapping force capabilities. The creation of capability areas more on the scale of the 1960s Draft Presidential Memoranda (combat forces would be broken down further than in the present JCAs) would need ambition and imagination to field and might promote some new tradeoff insights but also would involve overlapping force application.

The question is what may be done to help improve the chances for success for the Department's portfolio management initiative. In doing this, let us concentrate on what is perhaps the biggest potential challenge that the concept must deal with, the potential for multiple different operational applications of most force structure units.

Multi-Role Forces

As noted previously, many current operational forces—equipment and their associated personnel—can accomplish different military functions—at the same or different times. A fighter squadron might operate in an air defense role for two days and then operate in various attack roles subsequently. Similarly, naval forces might protect the sea lanes one week and deliver long-range strikes the next. Ground forces might provide local security in a threatened host nation one month and then carry out a prolonged maneuver into enemy territory later on. The era of highly specialized forces, such as "deep interdiction aircraft" and "armored divisions" has eroded greatly over the past quarter-century, partly as a result of technological advances and partly due to pressure to make increasingly expensive forces more widely applicable.[30]

At issue is whether this inherent multi-role flexibility will prevent, potentially for the foreseeable future, any big tradeoffs among force elements. Can trades be made between forces allocated in different regions, such as Europe and the Pacific? Can trades be made among force elements, shifting the mix of land, sea, air, and space forces, for example? Can new capabilities, like Computer Network Attack, be traded for traditional force elements? How should combat force structure be sized with relation

29. *Ibid.*, Gerton, Slide 3.
30. The countervailing challenge in fielding complex multi-role systems is to provide sufficient peacetime crew training to permit full exploitation of multiple capabilities, in part to help prevent task saturation in combat. Automation is seen as the antidote to this challenge, but employing such forces in a challenging environment will involve some uncertainty and risk as a result, absent relevant operational experience.

to its support, including mobility forces, command and control, and intelligence, surveillance, and reconnaissance capabilities? These kinds of higher-level, integrating trades have been sought in past strategic reviews but very seldom, if ever, executed explicitly as such. Instead, there have been desires to proceed vigorously in developing all these capabilities, contributing, potentially, to the growth of the defense budget. On the other hand, a number of recent planned force improvements have been truncated—such as the reduction of the Navy's planned DDG-1000 destroyer program from thirty ships to about five to seven and the Air Force's F-22 fighter from 339 to 183 over the last few years—reflecting, perhaps, insufficiently convincing rationale in earlier needs statements (rather than changed world conditions). It is notable, further, that at least some of these reductions have appeared as the fallout of arguably narrow budgetary or technical reviews, which nonetheless produced explicit direction concerning one or more major acquisition programs or force structure elements, outside the context of some top-level strategy or policy review.[31]

Compounding the complexity of multi-role force application is the need to reckon with sequential force deployments. The same set of forces may present the best aggregate capability in very different ways at different times during the course of a conflict. Scenario modeling and war game assessments offer a means to think about sequential force employment but also face challenges in their acceptance as authoritative guides for decision making. How portfolio management will treat such temporal considerations in force sizing is not yet clear. It seems that a renewed emphasis on scenario-based assessments may be the only way to gain useful insights into the issues of multi-role force allocation and sequential force employment, however.

Concept Decision

Mention also needs to be made of another potentially significant Pentagon planning initiative, the so-called Concept Decision (CD) process, which the DoD identifies as an important part of Capabilities-Based Planning. Concept Decision focuses on reform of the initial phases of the system acquisition process and thus focuses more on investment than operations.[32] Concept Decision seeks to speed (and improve) the launch of acquisition programs through new analytical approaches aimed at providing early insights into "requirements," technical, and funding issues. Concept Decision introduces what is called an Evaluation of Alternatives (EOA) that replaces other existing OSD acquisition and Joint Staff "requirements" studies in an effort to provide broader insights into system design priorities more quickly. A so-called "tri-chair" management team, drawn from the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics), Office of the Director, Program Analysis and Evaluation, and the Joint Staff, leads CD reviews. The CD analyses can be expected to help inform top-level assessments concerning force structure needs and force capability goals and risks but do not look to be designed to replace them.

31. The decision to cancel the Army's Crusader gun system was criticized by some who said its divorce from any associated larger strategy review removed considerations that might have allowed its justification. Perhaps most notable in recent memory, however, according to press reports, was the issuance of Program Budget Decision (PBD) 753 on 23 December 2004, making significant changes in several acquisition programs, including reducing planned F-22 fighter production from 275 to 179.
32. An introduction to the Concept Decision idea can be found in the briefing by James "Raleigh" Durham, "Concept Decision Implementation," on the Military Operations Research Society's website under Meetings, CBP Workshop II, 4 to 6 June 2006.

Concluding Observations

The job that defense analysts face today looks to be much more demanding than that of Cold War years, when objectives—such as countering Warsaw pact armored penetrations across the inter-German border—often appeared very straightforward. Future challenges are more diverse and less predictable. The place and time of conflict is much less certain, and some may be completely unknowable. (Indeed, it is sobering to reflect that the element of surprise at several levels has played a major role in many of our defeats in recent years.) The fielding of substantially new military capabilities, such as those oriented toward Information Operations, creates a much wider scope for choice among competing capabilities and risks. Inherent technical advances in the tools of conflict make the understanding of operational strengths and weaknesses increasingly less intuitively obvious to senior political leaders and to the electorate. Yet the leadership in the DoD and the Congress must confront the resulting daunting range of considerations and set a plan for investment and operations that will gain acceptance and be implemented on a sustained basis.

Several principles look to be important in trying to improve support for decision making about future top-level military capabilities. Attention to identification of measures of effectiveness and metrics that affect desired top-level outcomes is key. There needs to be a control in place to speak for the quantities of force needed, expressed in terms of volume, space, and time, so that individual, one-on-one weapons performance improvements don't unknowingly threaten the concession of certain important regions or areas through the diminution of force structure. Setting force structure goals based on a selected set of scenario demands might help establish that control. Scenario-based planning cannot be reduced to one or two scenario samples, or "point scenarios," but advances in computing and displays may permit a new facility in handling a multiplicity of scenarios to help understand the challenges of a more uncertain world. Done well, such tools may help to enforce consistency in assumptions among forces, their logistics support, and their disposition and deployment. Further, these scenario-based assessments may permit the treatment of new forms of capability, such as computer network attack, on a basis enabling tradeoffs across all capability areas.

Moreover, and lastly, new emphasis needs to be given to generating simple representations of force structure and force capability for the new capabilities that are being generated to meet today's new challenges. Wise choices among traditional force elements and the new force capabilities may depend upon new work that needs to be done.

In the end, failure to develop capability and output metrics will leave the department with one common ground for comparison—funding levels. For all the derision accorded to "budget-driven analyses," comparison of equal-cost options has the great benefit of giving decision makers real choices. Our challenge is to try to work the other end, producing descriptions of capability and output and thereby giving the decision makers greater confidence in the benefits their choices should deliver. Much, however, remains to be done.

Appendix: DoD Joint Capability Areas

- Joint Force Generation
- Joint Force Management
- Joint Battlespace Awareness
- Joint Command and Control
- Joint Netcentric Operations
- Joint Public Affairs Operations
- Joint Interagency/Inter-Government-Organizations (IGO)/Multi-National (MN)/Non-Governmental Organization (NGO) Coordination
- Joint Protection
- Joint Logistics
- Joint Support of Civil Authorities
- Joint Homeland Defense
- Joint Global Deterrence
- Joint Shaping
- Joint Stability Operations
- Joint Information Operations
- Joint Access and Access Denial
- Joint Special Operations and Irregular Warfare
- Joint Land Operations
- Joint Maritime/Littoral Warfare
- Joint Air Operations
- Joint Space Operations

CHAPTER FIVE

Future Global and Economic Challenges and Thoughts for the Future

The essays in this chapter describe the milieu in which the United States will be wielding its economic element of power. Increasing global interdependence has caused major changes in the use of the economic element of national power. National economies have become increasingly dependent on international trade and on international financial markets. From a national security perspective, this economic interpenetration is reflected in the mutual vulnerability of national economies.

In the first essay, "China: A 21st Century Dragon?," Dr. Marv Cetron and Owen Davies examine five of the many factors that make up the total picture of China's power and prospects. They analyze the Chinese economy, military, foreign policy, environment, and people. They believe that China will successfully meet all the challenges of economic development, social change, and national security that face it in the years ahead. But they forecast that this will happen only with difficulty. Their analysis is that Beijing will spend the next 20 years struggling to balance capitalist profit against rural need, environmental damage against development, military spending against domestic priorities, the need for economic cooperation with its neighbors against the realities of trade and geopolitical competition. Cetron and Davies foresee that this will be a difficult balancing act for such a closed system. But their conclusion is that in 20 years, China will be stronger, wealthier, and more stable and free than it is today. And they believe that thanks to its economic and diplomatic influence, and also to its military might, it also will hold more power over world affairs than any Asian nation in history.

In his essay "The Impact of Global Economic Parity," David Coffman notes that the United States is accustomed to dominating the world, especially economically. However, as the global economy grows, he believes that the United States will find itself competing in a world where the playing field has become more level. His essay describes how this greater global economic parity will affect the United States.

The author notes that the United States is the only advanced industrialized country with a high rate of population growth, and the vast majority of that growth comes from immigration. According to Census Bureau projections through 2050, over 60% of U.S. population growth will come from immigration. If the gap that fuels immigration shrinks, it is likely that this source of population growth will shrink as well. He believes that the United States may face a period of slowing growth followed by stabilization and an eventual decline in population. He also examines the issue of education, pointing out that many foreigners come to the United States for higher education. For a variety of reasons, a large number of students choose to remain after graduation. As the economic parity gap shrinks, fewer of these students will stay in the United States.

Mr. Coffman notes that Services drive the U.S. economy and account for over 60% of our economic output. As the flow of immigration dwindles, the shortage of low-skill, entry-level workers will have dramatic effects on the U.S. service economy. Likewise, he notes that capital formation and investment is global. There are fewer restrictions on the flow of capital between nations, more countries and regions have established securities markets, and financial reporting is becoming more open and consistent. Widespread economic growth offers more global opportunities for capital appreciation. To a large extent, investors can invest wherever they want. Currently over 60% of U.S. obligations are held by foreigners. That may change as global capital markets continue to develop. If U.S. obligations are no longer the safe haven of the world, then deficits will become more difficult to fund with debt. The increased demand for credit within the United States will tighten credit markets and drive interest rates higher. In response, the U.S. Treasury will be forced to fund deficits by issuing new currency, thus creating substantial inflationary pressure.

In his conclusion, the author provides some thoughts on how the United States can prepare for the effects of increasing global economic parity. He warns that the government should attempt not to do anything to make the situation worse. Current initiatives to limit or restrict immigration may haunt us in the future. Reversing them will be difficult and will happen only after they have already done serious damage. He cautions that industries that rely on readily available, cheap, and low-skill labor need to rethink their business models. He also notes that many small service businesses will be squeezed out of business if they don't come up with some innovative ways to deal with a shortage of low-skill, entry level workers. New, innovative, and entrepreneurial companies will replace the ones that don't make it.

In the essay "Visionary National Economic Development: Plans, Potentials And Progress," Graham Molitor notes that a number of epoch-setting economic activities already can be discerned or surmised with confidence and clarity. Identifying national goals is not always this easy. Interesting targets of opportunity abound. Tracking major economic eras in the United States reveals the following progression: agriculture (peaking in the 1880s); to an industrial base (peaking in the 1920s); to a brief interlude with a services-based economy (peaking during the 1950s); into a broadly construed communications-information-knowledge-education based economy (currently accounting for over 70% of GDP). Scientific and technological developments are stepping stones of epochal change. Epochal shifts displace existing outdated undertakings, advance the economic well-being of nations pursuing them, transform institutions and structures of society, alter the general welfare of the populace, and represent overall the fundamental "hallmarks of progress."

Looming over the course of this millennium are prospects for at least five new major economic centers of activity that will shape and transform things yet to come. The "Big Five" eras expected for the United States are Leisure (year 2015), Life Sciences (year 2100), Meta-materials (between years 2100-2300), Fusion Energy (between years 2250-2500), and New Space Age (beyond year 2500). Technological and organizational advances will further reduce time on the job, creating the demand for increased leisure-time activities. The Life Sciences, or biotechnology, will see innovative genetics and other significant changes. Meta-materials will see advances in nanotechnologies and particle detection. Fusion Energy, or the New Atomic Age, will see a succession of resources to meet energy demands as the world runs out of fossil fuels and petroleum. The New Space Age will provide increased space travel and new technologies. The United States needs to be in position to take competitive advantage of these

opportunities, and that requires deliberation and the development and setting of realistic national goals and the appropriate strategies to realize those goals.

He addresses two examples of nations' use of foresight in economic planning to position them for the future. He describes Singapore's extraordinary "rags to riches" success story, which dramatically highlights the tremendous potential of scientific and technological foresight planning. Singapore accomplished what may be the most rapid and best-balanced rise to global socio-economic prominence ever. He then reviews Japanese national planning as a late-20th century example of deliberate economic goal setting supported by specific strategies. Japan's economic planning and policy primarily targeted potential high growth undertakings requiring long term development—termed "sunrise" sectors. More immediate or short-term economic targets were also specified.

Mr. Molitor concludes his essay by noting that economic development policy based on visionary thinking and planning holds enormous potential to enhance human conditions and change the destiny of entire economies. Directing development of promising new targets that will confer major socio-economic advantages is becoming too important to ignore. When the stakes are high, decision makers tend to be less likely to remain hapless victims of haphazard and directionless change; they are no longer willing to stand outside the processes of change. Instead, the best hope involves turning to more conscious and aggressive long-range thinking and planning. Dreams, after all, can be fulfilled only when they have been spelled out. Visionary thinking can, quite literally, change the world.

China: A 21st Century Dragon?

Dr. Marvin Cetron and Mr. Owen Davies

To hear some forecasters tell it, the Age of America is over. As the United States dominated the 20th century, so China will dominate the 21st. At Forecasting International, we are not so sure. Yet, it is clear that China is gaining the economic power, political influence, and military might to dominate its region and be taken seriously on the global stage. It is worth spending some time to examine this potential adversary's strengths and weaknesses.

For this brief discussion, we will consider just five of the many factors that make up the total picture of China's power and prospects: its economy, military, foreign policy, environment, and people. We will take them in order.

Economic Might

The story of China's dramatic economic success is well known. However, it is critical to any examination of that country's future.

Since 1978, China's Gross Domestic Product (GDP) has grown by more than a factor of ten. Over this period, China has emerged from poverty to become the world's third-largest trading nation, the second-largest partner for the European Union (the largest if we include Hong Kong, which is calculated separately), and the second-largest partner of the United States (tied with Mexico) and Canada. In 2007, it became the second-largest economy in the world, with a GDP—measured by purchasing power parity—estimated at $7.043 trillion and per capita GDP of $5,300. (Note that although China continues to grow rapidly, both these figures are down from some estimates of previous years, which have been revised as China's economic picture becomes clearer.)

China remains one of the fastest growing economies in the world. In 2007, China's GDP expanded by 11.4 percent, according to official figures. Its growth rate has continued to accelerate despite Beijing's attempts to rein in its overheated economy.

In fact, China may be even richer than it appears, thanks to a vibrant "gray economy." According to estimates, unreported income in 2005–06 could add as much as 24 percent to the country's GDP. That could make city dwellers as much as 75 percent richer than official numbers suggest, while rural residents would be about 53 percent richer.

That expansion flows from manufacturing, which provides more than half of China's GDP. In 2005 alone, industrial production grew by an amazing 27.7 percent. By 2007, that had declined to about 18 percent. Yet, this was still an astonishing performance by the standards of any other country.

Exports usually get most of the credit for powering this dramatic growth. They have risen by double digits annually for years, with almost 40 percent growth in 2007 alone. China's exports to the United

States have grown by 1,600 percent in 15 years. According to most estimates, exports account for about 37 percent of the Chinese economy.

However, that impression does not survive analysis. Economist Jonathan Anderson at UBS points out that exports are measured in raw numbers, while GDP is measured as value added. Put them on the same basis, and exports amount to only about 10 percent of GDP. Thus, in 2000–01, when export growth slowed by 35 percent, GDP growth contracted by less than 1 percent. China's economy can stand on its own.

Over the last ten years, China has substantially modernized its economy. It has privatized or eliminated half of its 300 million inefficient, often money-losing state-owned companies. In the process, it has cut some 45 million jobs those companies supported, about 45 percent of the total.

One fairly recent development is especially encouraging. Several years ago, China's banking system was in trouble. Its three largest banks—Industrial Commercial Bank of China, Bank of China, and China Construction Bank—did not really function as banking institutions at all. Instead, they existed largely to lend government funds to prop up inefficient, often money-losing state-owned enterprises. At least 30 percent of their loans were in default.

In 2005, China decided to fix the problem. First, it spent some $80 billion to wipe out the bad debts. Then it sold parts of the banks to Bank of America, Goldman Sachs, Royal Bank of Scotland, and some other global financial firms. The investors also sent experienced bankers to train their Chinese colleagues

These efforts have not completely eliminated the problems with China's banking system. Lesser institutions still carry a substantial burden of nonperforming loans. Nonetheless, the results have been impressive. By 2007, the investors had tripled their investments. Beijing, which still owns about 70 percent of the banks, had made some $440 billion. Most important of all, China's banking system gained credibility that it had never possessed. In the future, this should make the country a more attractive place for investment.

Economic Weakness

For years, the lowest wages of any major industrial nation made China the low-cost producer in fields from textiles to telecommunications to auto parts. Distributed through discounters like Wal-Mart, Chinese products are credited with taking 1 or 2 percent off the American consumer price index.

But in many fields, China has lost much of its competitive advantage. Beset by rising prices for energy, materials, and labor, it is no longer the cheapest source of goods for many industries. Instead, manufacturers of consumer electronics and many other products are beginning to make their merchandise in places like Vietnam, India, Indonesia, Bulgaria, and Ethiopia.

The results are predictable. In Guangdong, between 50,000 and 60,000 factories are owned by companies in Hong Kong, which lies next door. An estimated 14,000 are believed to be in danger of closing by the end of 2008. According to the China Light Industry Council, roughly one-third of the region's 1,000 shoe factories already have been shuttered.

At the same time, inflation is beginning to slip out of control. Food costs rose sharply in response to winter storms, and prices for plastics, electricity, and other industrial necessities are climbing as well. In January, the annualized inflation rate touched 7.1 percent. Speaking at the opening of China's annual parliamentary session, Premier Wen Jiabao said that controlling inflation would be a major priority for the coming year. He noted that economic growth would slow to about 8 percent as a result.

Beijing also has cut the export tax rebates given to manufacturers of 2,800 products sold abroad in a deliberate effort to drive small companies in "sunset" markets out of business and free productive capacity for ventures with higher profit margins and better growth potential.

China also is beginning to suffer from a shortage of trained workers. While an estimated 150 million displaced peasants roam from city to city looking for employment, jobs for skilled workers, technicians, and managers go begging. Shortages in these areas are expected to last at least five years and possibly ten.

One reason this may come as a surprise is that China exaggerates the rate at which it produces trained personnel. For example, it claims to turn out some 600,000 engineering graduates each year. In fact, it appears that Beijing set 600,000 as the number of engineers it would like to graduate annually, and university administrators have helpfully reported making their quotas. According to a study by Duke University, the real graduation rate is about 356,000 engineers per year. That is substantial compared with the 70,000 estimated to graduate in the U.S. each year—it's really about 137,000 in the U.S., according to the same study—but not enough to keep up with demand. It seems very likely that graduation rates in other critical specialties are similarly inflated.

It does not help that Chinese workers retire young—age 60 for men, or 65 for executives, and age 55 for women, or 60 for managers. Under special plans, many retire as young as age 50.

Yet two other problems may be even more significant. One is corruption. It is endemic at the local level, where Party officials enrich themselves by seizing peasant-owned land and developing it for housing, mines, and factories. In 2005, China admitted that there had been 87,000 riots during the year, with most occurred in response to local corruption. In early 2007, another wave of riots followed reports that officials in Guangxi province were forcing pregnant women to have abortions or pay fines for excess children in order to meet their target figures for allowable births.

The other problem is opacity, a combination of corrupt business practices, an unpredictable legal system, economic policies, deficient accounting standards, and a regulatory framework that acts as a hidden tax on the economy. According to an annual survey by the Kurtzman Group, China is one of the most opaque of the world's major trading nations. As a result, it pays foreign creditors a risk premium of roughly 649 basis points more than the most transparent countries do.

Military Strength

China is working hard to expand its power within the region and beyond. It is modernizing its army. It is building a blue-water navy, and developing nuclear-capable missiles with intercontinental range. When China achieves its goal, it will represent the first major shift in the balance of the world's military power since the end of the Cold War. This also will raise the stakes in any future confrontation between China and India, Japan, or Taiwan and its American protectors.

In raw manpower, the Chinese People's Liberation Army (PLA) has long been the largest military force in the world, with about 2.25 million active troops and reserves of 800,000. In times of crisis, the People's Armed Police and other paramilitary units can add nearly 4 million more to this total.

What it is gaining now is effectiveness and reach. In addition to modernizing its Russian-built *Sovremennyy*-class guided missile destroyers, China is developing a host of new ships. It has recently introduced three new guided-missile frigates equipped with medium-range surface-to-air missiles (SAMs) and four guided-missile destroyers with long-range SAMs. Its SONG-class diesel-electric submarines, equipped with anti-ship cruise missiles, are in full production; seven have already been delivered. Two new SHANG-class nuclear-powered attack submarines and one JIN-class ballistic-missile sub are expected to enter service soon. Whenever the decision is made, a domestically built aircraft carrier could enter production within two years. There have been ill-substantiated suggestions that the first could be launched by 2010. China held week-long war games at the end of 2007 to display much of this newfound naval power.

In the air, China is modernizing its FB-7A fighter-bomber, upgrading its B-6 bomber fleet with a variation armed with a long-range cruise missile, and developing at least two models of airborne early warning and control aircraft. It also is buying several hundred Su-27 and SU-30 fighters from Russia and developing its own J-10 "fourth generation-plus" fighter jets and equipping them with stand-off air-to-air and air-to-ground munitions.

According to American analysts, China has the most active ballistic missile program in the world. It has stationed roughly 1,000 short-range missiles opposite Taiwan, adding more than 100 per year. It has built or bought a large supply of highly accurate land attack cruise missiles. It is developing an anti-ship ballistic missile with a range of 1,500 km. It is believed to have 24 to 36 liquid-fueled ICBMs capable of reaching the United States, up to 150 medium-range missiles that could strike Russia or Eastern Europe, and as many as 600 tactical missiles with ranges to 600 km. An unknown number of road-mobile DF-31 ICBMs with a range of 8,000 km also are in the inventory, with an 11,000 km variant in the works.

Beijing has long pledged never to strike first with this nuclear force, but American strategists see considerable "wiggle room" in this commitment. Some observers have pointed to China's demonstration of an anti-satellite weapon in January 2007 as evidence that it covets the ability to destroy an adversary's space-based communications and intelligence systems as part of a pre-emptive attack.

Yet, it is China's least violent weapon that may in some ways be most troubling. Online "hacker" attacks believed to have originated in China reportedly have stolen non-critical information from the Oak Ridge and Los Alamos laboratories; stolen sensitive data from the State and Commerce Departments; filched an "amazing amount" of data from the Pentagon, in the words of Defense Secretary Robert Gates; and blacked out electrical power in several American cities. China admits that it considers "cyber-espionage" to be a major priority.

All these developments point to the rise of a China that can not only deter an attack on its own territory but back up its diplomatic efforts with the implied threat of military force. This is a change with profound implications for the global order in the years ahead.

International Influence

Even when it is not backed by military might, economic power always translates into political and diplomatic power. So it is in Southeast Asia. China wishes to lead its region and become a significant player on the world scene. Its wealth is making this possible. Often, it has chosen to support underdogs in confrontations with the United States.

For example, China has been selling weapons and providing military, economic, and infrastructure aid to Myanmar—about US$3 billion in all—in return for using ports there to rest and refuel its naval ships. When the United States used trade sanctions to promote democratization in 2003, it cost Myanmar an estimated US$200 million; however, deals with China brought in roughly US$1 billion that year, and the loss of American trade went almost unnoticed.

Similarly, late in 2004 Beijing signed agreements to buy some $70 billion to $100 billion worth of oil and gas from Iran. The deals irretrievably undermined the Bush administration's attempt to bring Teheran to heel through economic sanctions. Recently, Pakistan—long a Chinese ally and client state—has suggested building pipelines from Iran and Iraq through its territory, Afghanistan, India, and Tibet to China. If the scheme goes through, it would finally insulate China against problems in the Strait of Malacca, through which most of its imported oil flows.

Chinese ties with Sudan are, if anything, even stronger. Sudan supplies nearly 5 percent of China's oil. China has invested US$2 billion to develop Sudan's oil resources. It also supplies weapons to Sudan's armed forces and has blocked an American attempt to obtain UN sanctions against the country for its slow genocide in the Darfur region.

China also is building relationships in America's own back yard, thanks to its economic muscle, ferocious demand for raw materials, and to Washington's neglect. In 2005, China announced massive new investments in Argentina—US$20 billion for offshore oil and gas exploration, railways, construction, and even communications satellites. China also has bought oil assets in Ecuador and signed deals to invest $350 million in Venezuelan oil fields and $60 million in a gas project there. It even has concluded an agreement giving it access to Canadian oil sands and uranium.

Under the circumstances, Sino-Latin trade has grown by no less than 900 percent in the last five years. Brazilian exports to China doubled in 2003 alone, to US$4.5 billion; China is now its second-largest trading partner. It is Chile's largest export market. In all, China's trade with Brazil, Argentina, and Chile amounted to US$14.6 billion in 2003, including imports worth US$10.7 billion. In 2004, nearly half of all Chinese direct investment overseas went to Latin America. Chile signed a free-trade agreement with China in November 2005, and Brazil has announced plans to negotiate one. For China, this rapidly growing trade has two benefits: It provides another source of much needed oil, raw materials, and foreign exchange profits, and it may serve to lure the twelve Latin American countries that still support Taiwan toward Beijing's one-China policy. Of the two, the economic benefits are by far the more important.

These developments may be only the beginning of a sustained trend in which Chinese dominance at least partially displaces that of the United States.

Environmental Catastrophe

China's environment is suffering to a degree not seen in the industrialized West. Seven of the world's ten most polluted cities are in China. Acid rain alone costs the country an estimated $13 billion per year, while air pollution cuts as much as 3 percent off China's GDP.

Coal provides nearly two-thirds of the country's energy; carbon emissions have more than doubled since 1980 and are now rising by 11 percent per year. In 2007, China surpassed the United States, to become the world's largest emitter of carbon dioxide. At least 500 more coal-fired powerplants are under construction or planned, one-fourth of the current total, and by 2020 China is expected to become the world's largest emitter of greenhouse gases. Already, an estimated 750,000 Chinese, mostly in the cities, die of diseases caused by air pollution each year.

Water problems are endemic, thanks both to misuse and to a persistent drought that has cut water resources per person to one-thirtieth of the global average, less than in Israel:

There are about 50,000 miles of major rivers in China. According to the U.N. Food and Agriculture Organization, 80 percent already are so polluted that fish can no longer survive in them. But at least there is water.

In Gansu province, the Badain Jaran and Tengger deserts are spreading at a rate of 1,500 square miles per year.

Beijing's ground water table has fallen 76 feet in 50 years. In other areas, two-thirds of the ground water has been depleted.

So much water is being pumped from the Yellow and Huai Rivers that they run dry for at least four months of the year. Shandong province, which produces one-fifth of China's corn and one-seventh of its wheat, relies on the Yellow River for half the water used to irrigate its crops. About 140 million people depend on the Yellow River for their water. Water problems, as much as economic need, may help to explain why 150 million Chinese peasants have become migrant laborers. In response, Beijing has recently resurrected a scheme to transfer some 12 billion gallons of water per year through aqueducts from the Yangtze River in the south to the northern plain. Two of three planned conduits are under construction, while the third is on hold owing to environmental concerns. The system could be completed by 2050.

At the same time, Beijing is diverting water from the countryside to the Olympic sites. For two years, farmers some 70 miles outside the city have been ordered to grow only corn, which requires less water than rice or vegetables, but even those crops are failing.

In 2007, China announced a plan to reduce its environmental problems. Six new nuclear plants will help to slow the growth of coal-fired electric plants, and laws call for doubling the use of alternative sources of energy and meeting 15 per cent of China's energy needs from renewable sources by 2020. As a demonstration of its commitment, 20 percent of the electricity used at the Olympics will come from wind power. A reported 30 million households already use solar power for heat or hot water. How fast the rest of its environmental ambitions will be realized remains to be seen.

Society and People

China's vast population is both an asset and a challenge. Unlike many other developing countries, most of its people are literate, with 91 percent able to read and write well enough to meet UNESCO standards. And thanks to a rigid policy of one child per couple, population growth is a scant 0.6 percent per year. Thus, China has escaped some of the worst stresses that beset neighboring India and other relatively poor lands.

However, the second result of a low birthrate is an aging population. At the moment, about 11 percent of Chinese are over age 60, the standard age of retirement. By 2040, the number will be 28 percent. As a fraction of the total, China's working-age population will peak at about 72 percent about 2010. Thereafter, it will decline, reaching just 61 percent by 2050. Thus, the number of workers available to support each retiree will decline. According to the official numbers, there already are 11 people of retirement age for every 100 workers. Given the number who retire early, a study by Deutsche Bank puts the figure at 26 elderly dependents per 100 workers. By 2050, official estimates say there will be 39 retirees per 100 workers. Deutsche Bank says the number will be 79 per hundred. Unfortunately, China's elderly are relatively poor by the standards of their peers in Japan and the West, the other lands with aging populations. They will need even more support than their peers elsewhere. This can only be a heavy drag on the Chinese economy.

One factor that Forecasting International weighs heavily in evaluating the stability of any country is the income gap between its rich and its poor. The wider the gap between the most prosperous and the least well-off tenths of the population, the more likely it is that political chaos, and even violent revolution, lie ahead. This was one of several factors that, long ago, allowed us to predict the fall of the Shah of Iran two years before the revolution that brought the Ayatollah Khomeini to power.

China claims that the wealthiest tenth of its population makes, on average, only 21 times as much as the poorest. Yet this is clearly not credible: Roughly one-tenth of Chinese subsist on $1 a day or less. In fact, including "gray" income, its richest tenth makes about 300 times as much as the poorest. In FI's experience, China is well outside the stable range.

Beijing seems to understand the danger inherent in this income gap, but not how pressing that danger could be. The country's 11th five-year plan, announced in 2006, contains extensive measures to improve the lot of its poor. Yet by early 2008, essentially nothing had been accomplished. In India, which has much the same problem, the Singh government has declared that whenever GDP growth exceeds 7 percent, all national income beyond that will be devoted to providing jobs for the poor. While there is some question how well India's program is working, China urgently needs to take similarly dramatic steps to reduce its growing income gap. Without an effective program to help its poor, China could face instability much greater than its occasional riots.

China lacks several assets that would help it to prosper:

- China is not a democracy, and it has no intention of becoming one in the near future. There is no need to go into much detail on this point. On average, democracies are simply more efficient than any other form of government, because elections provide a feedback mechanism that encourages the speedy correction of mistakes. Democracy does not guarantee that governments will establish sound policies or react well to emergencies, any more than a monarchy is certain

to get things wrong. Democracy does not even guarantee that voters will punish their leaders' blunders quickly. Yet, it does improve the odds.

Democracy also gives people a stake in the management and future of their country. An old joke from the Soviet Union said of its labor system, "They pretend to pay us, and we pretend to work." Such an attitude is much less likely to spread when national policy is set by freely elected leaders who can be held accountable for their actions.

Over a period of years, the incremental efficiencies of democratic government are likely to overcome the greater short-term efficiencies of a command system. It was those efficiencies, not some clever ploy on the part of Washington, that eventually put the Soviet economy so far behind that of the United States that the Soviet system could no longer be tolerated. Until China can benefit from those efficiencies, it will be handicapped in a way that other lands are not.

- In the modern world of technology and business, there is no more useful tool than the English language. Witness the startling growth of India, whose most recent "native" tongue has been its greatest asset in building a global IT and business services industry. Anyone who doubts the value of an English-speaking education need only look at how many American consumer-products companies have outsourced their call centers to China instead of India. We have yet to encounter one. For this single reason, China has no large companies like India's Wipro, Tata Consultancy, and Infosys Technologies, which can take on high-value design and engineering jobs for foreign high-tech firms. Speaking English is a prerequisite in this market and many others.

  Of late, China is working hard to overcome that Indian advantage. Many Chinese are learning English in preparation for the 2008 Olympics in Beijing. The Chinese government also has committed itself to training 100,000 new workers for the tourism industry by 2010, all of whom will be required to learn English. Additionally, a recent edict from Beijing, issued to improve the country's competitiveness in global markets, requires that all students learn English in primary and secondary school. Unfortunately for China, preliminary reports indicate that progress in teaching English to Chinese workers and students is proving harder to achieve than the government had expected. At present, it seems that China will remain handicapped in this critical respect as well.

- The third item grows from the other two: free contact with the outside world. According to the most recent figures available, China has 111 million Internet users, plus about 4.9 million in Hong Kong. Yet Beijing heavily censors the Internet. With the aid of Western technology companies such as Google, Yahoo, and Microsoft, it filters out ideas that the government considers destabilizing.

  In fact, China has good reason to fear the Net. Beijing's leaders worry that any force promoting a quick transition to democracy could set off the kind of chaos that allowed the formation of a kleptocracy in Russia. They may well be right. Yet in trying to avoid political chaos, Beijing's Net censors also have cut the country off from much-needed intellectual stimulation. In the years ahead, this may slow China's development of industries that require creativity and offer high value added, with profits to match.

Forecast

The issues considered above are representative, but certainly not definitive. Many others would have to be weighed in an exhaustive report.

One of these is the relationship between China and India. Relations between the two have been strained ever since the Sino-Indian war of 1962. The competing territorial claims that sparked that conflict have yet to be resolved, and Beijing recently irritated sensibilities in New Delhi by razing some long abandoned Indian fortifications in the disputed area. India in turn has long offended China by providing a home to the Dalai Lama, whom Beijing blames for Tibetans' continuing resistance to its rule.

Nonetheless, ties between the two countries are spreading rapidly. Bilateral trade between China and India reached $20 billion in 2006 and nearly $39 billion in 2007. Flights between China and India have tripled every year since 2004. Some major Indian firms are moving corporate headquarters to China, to be closer to their most important customers. The two countries have even carried out small joint military and naval exercises in the last few years, with a joint air exercise planned for 2008.

Well before 2020, this growing economic alliance is likely to mature into a trading bloc of global importance. Combined, the two countries are home to 40 percent of the world's people. If so inclined, they could form a single self-sustaining market for which external trade would be a matter of convenience, not economic necessity.

As China works on its economy, and so many other issues, it also has begun to ease some longstanding international tensions. Last April, President Hu Jintao met with Taiwanese Vice President Vincent Siew, the first meeting between a Chinese leader and a high-level official from Taiwan since the two sides split in 1949. The meeting lasted only 20 minutes and focused on trade issues. Yet it had enormous symbolic significance in a region where symbols carry uncommon weight. At FI, we view this as a recognition that investment from Taiwan is one of the most important forces driving the mainland economy. In the not-too-distant future, we expect politics to catch up with economic reality. Taiwan will rejoin the mainland, of which it already owns a substantial piece, with quasi-autonomous status like that of Hong Kong and Macau.

Beijing also has made a few modest gestures that appear to be aimed at reducing tensions over Tibet. In early July, it acknowledged conducting half a dozen low-key talks with the Dalai Lama since 2002, the most recent ending on July 2. The Chinese government then demanded that the Dalai Lama renounce Tibetan independence and any attempt to disrupt the coming Beijing Olympics. In this, it was merely reverting to type.

However, in a change of plans, it has also kept Gyaltsen Norbu away from the Olympic preparations. Norbu is the officially sanctioned Panchen Lama, selected by the government to replace Gendun Choekyi Nyima, who was chosen by the Dalai Lama and has not been seen since 1995. It had been announced that he would receive the Olympic torch at the Potala Palace, and his absence can be seen as an attempt to ease Tibetan hostilities.

In all, Beijing's post-crackdown moves toward Tibet appear to be a classic attempt to act simultaneously as "good cop" and "bad cop," and in that light have little significance. Yet, they suggest at least a minor improvement in the government's attitude toward Tibetan Buddhists. If they are followed by further

signs of a thaw, they could represent the first significant evidence that Beijing wishes to defuse this situation as well.

These possible signs that Beijing could become a more comfortable neighbor to have are at least partially offset by developments in Sri Lanka, where Chinese experts are helping to construct a port at Hambantota and to explore for oil in the Mannar area. Sri Lanka also has signed several arms deals with China. In return for its help, China has receives a semi-permanent station in the Coco Islands, from which it can monitor significant nuclear and space facilities in India. All this, combined with Sri Lanka's growing ties with Iran and Pakistan, has New Delhi increasingly uncomfortable. For the rest of the world, it signals that—conciliatory gestures aside—Beijing will continue to prefer its own economic, political, and military interests over getting along with its neighbors.

Beijing still faces challenges. It is struggling to achieve energy independence, and its success or failure in that effort will help to determine its future economic growth. The world's pharmaceutical companies are migrating rapidly to China, where technological sophistication is high, bioethics are unknown, and human test subjects are easy to find. Tens of millions of Chinese tourists are beginning to flood out across the globe, where they will be exposed to ideas that Beijing would prefer to avoid. Yet these issues and others all lead to the same conclusions:

> *China will successfully meet all the challenges of economic development, social change, and national security that face it in the years ahead. It will happen only with difficulty, but it will happen. Beijing will spend the next 20 years struggling to balance capitalist profit against rural need, environmental damage against development, military spending against domestic priorities, the need for economic cooperation with its neighbors against the realities of trade and geopolitical competition. This will be a difficult balancing act for such a closed system. Yet in 20 years, China will be stronger, wealthier, and more stable and free than it is today. Thanks to its economic and diplomatic influence, and incidentally to its military might, it also will hold more power over world affairs than any Asian nation in history.*

The Impact of Global Economic Parity

Mr. David E. Coffman

Introduction

The United States is accustomed to dominating the world, especially economically. As the global economy grows, the United States will find itself competing in a world where the playing field has become more level. How will this greater global economic parity affect the United States?

Defining Economic Parity

The United States is likely to continue to dominate the global economy in terms of sheer economic output, except possibly for China. For the purpose of this paper, economic parity will be defined in terms of the following factors as perceived by the residents of non-U.S. countries:

- Standard of living
- Level of opportunity

These factors are critical because much of the impact pertains to immigration.

Reasons Fueling Immigration

Population growth in the United States has been fueled for centuries by immigration. The sources (originating countries) have varied, but the primary reasons for immigration have remained relatively constant—people seeking a better life. The gap between the standard of living and the level of opportunity in the originating countries compared to the United States drives immigration. This gap (lack of economic parity) must be significant in order to justify the enormous costs associated with leaving home, family, friends, and heritage to start a new life in a foreign country and culture.

Regardless of the size of the gap, the population of the originating country must be aware of it and be politically and economically able to emigrate.

Potential Sources of Immigration

When considering the available pool of immigrants, the sources (originating countries) can be categorized as developed, developing, or primitive/repressed.

Developed countries are not a significant source of immigrants because the gap is not large enough to justify the costs of emigrating. People from primitive countries lack the economic ability to emigrate and may also lack global awareness. People from repressed countries may be able to afford to emigrate but are not allowed to and may not be globally aware.

The primary source of immigration is from developing countries where the gap is large enough to justify emigration. The population is more likely to be globally aware, and emigration is possible, although not easy.

Greater Economic Parity

Economic growth is becoming more widespread, with over 120 countries expecting growth rates of over 4% in 2007.[1] World trade has tripled between 1990 and 2006. China had virtually no foreign trade 30 years ago. The global nature of commerce has increased competitive pressures, leading to higher economic output due to higher corporate profits and lower taxes.

Financial capital can flow more freely across the world than ever before. Most countries had controls on the flow of capital 25 years ago. Today most of those controls are gone.

Effects on the United States

Immigration

The United States is the only advanced industrialized country with a high rate of population growth, and the vast majority of it comes from immigration. According to Census Bureau projections through 2050, over 60% of U.S. population growth will come from immigration. If the gap that fuels immigration shrinks, it is likely that this source of population growth will shrink as well. The United States may face a period of slowing growth followed by stabilization and an eventual decline in population.

An analysis of the data from the 2000 census discovered that about one-third of all job categories would have experienced a shortage of workers without recently arrived immigrants.[2] Many of these jobs were low skill, low wage, and entry level, but immigrants also make up an increasing share of the scientific and technical workforce. In 2002, about 24 percent of this workforce was foreign-born, up from 17 percent in 1996.[3]

Education

Many foreigners come to the United States for higher education. A large number of students choose to remain in the United States after graduation for a number of reasons. Some become accustomed to the American culture and lifestyle. Others perceive greater opportunity for pursuing their careers. And some find mates.

As the gap shrinks, fewer students will stay in the United States. The existing shortage of qualified science and technology workers will get worse. Companies will adapt by outsourcing technical work offshore. This tactic will be necessary to survive, not just to cut costs.

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Service Economy

Services drive the U.S. economy, accounting for over 60% of economic output. As the flow of immigration dwindles, the shortage of low-skill, entry level workers will have dramatic effects on the U.S. service economy.

Wages for service workers will increase due to the limited supply of workers and increasing demand for the services they provide. Service businesses will be squeezed from many directions. They will have to raise prices to offset the wage increases. They will struggle to find and keep workers. They will be operating at full capacity with no ability to expand. Many service businesses will quit or fail due to the shortage of workers and to not being able to pass on higher payroll costs. Customers of the defunct companies will not be able to find replacements because fewer companies will be in existence, and those that remain will not be able to take on new customers.

Eventually, demand for services will fall due to much higher prices and a scarcity of service providers. Customers will cope with this situation a number of ways. Some people will do it themselves. The ones that still have a provider will use them less often. Many will just stop using the service.

The combination of these factors will cause the U.S. service economy to contract substantially or possibly collapse. The demise of the service economy will cause a severe recession that will hasten the increase of global economic parity.

Capital Markets

Capital formation and investment is global. There are fewer restrictions on the flow of capital between nations. More countries and regions have established securities markets. Financial reporting is becoming more open and consistent. Widespread economic growth offers more global opportunities for capital appreciation. To a large extent, investors can invest wherever they want.

U.S. Treasury obligations are considered one of the safest investments in the world. Over 60 % of U.S. obligations are held by foreigners. That may change as global capital markets continue to develop. Emerging market investments offer greater returns and an increasing level of stability and security. Currently, 42% of emerging market countries has achieved investment-grade status.[4] If U.S. obligations are no longer the safe haven of the world, then deficits will become more difficult to fund with debt. The increased demand for credit within the United States will tighten credit markets and drive interest rates higher. The U.S. Treasury will be forced to fund deficits by issuing new currency, thus creating substantial inflationary pressure.

Economic Growth

Population growth is a large contributor to economic growth. As U.S. immigration slows, so will its population and economic growth. Around the same time, the service economy will be contracting or collapsing, causing a severe recession or possible depression.

The economic downturn will cause tax revenues to decline, increasing annual deficits and the national debt. Fewer foreign investors will be willing to buy the U.S. Treasury obligations that fund the increasing debt, so the Treasury will be forced to issue even more new currency.

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Preparing for Global Economic Parity

How can we prepare for the effects of increasing global economic parity?

Governments should attempt to do nothing to make the situation worse. Current initiatives to limit or restrict immigration may haunt us in the future. Reversing them will be difficult and will happen only after they have already done serious damage.

Industries that rely on readily available, cheap, and low-skill labor need to rethink their business models. Companies that already have a hard time finding and keeping science and technology workers should plan for the situation to get even worse.

Many small service businesses will be squeezed out of business if they don't come up with some innovative ways to deal with a shortage of low-skill, entry level workers. New, innovative, and entrepreneurial companies will replace the ones that don't make it.

In the initial stages of the service economy contraction, low-skill service workers will be in demand and getting paid more than ever. This temporary boom will attract many new workers and cause existing workers to believe that good times have finally arrived. When the boom busts, workers that don't have higher level skills will be in for rough times.

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Visionary National Economic Development: Plans, Potentials, and Progress

Mr. Graham T. T. Molitor

Introduction: Taking Charge of Change

The tide of most human endeavors and outcomes is subject to conscious direction. That is what economic development policy and planning is all about—taking control, providing a sense of direction, specifying goals, and mapping ways to fulfill goals. Oliver Wendell Holmes underscored taking advantage of controlling destiny, asserting "The greatest thing in the world is not so much where you stand as in what direction you are heading." It comes down to some manner of more rational, more logically arrived at consensus regarding national priorities and goals that control destiny.

Tendencies to merely go along as passive victims of crucial change are waning. The slow drift of haphazard trial and error, free play of market forces, is being displaced. Policy makers increasingly are undertaking foresight activities to affect change, not merely be affected by it. Policy planners are coming into their own and assuming new roles as architects of destiny, not its captives. Explicit planning embracing and encompassing national economic development is coming into its own. There is a growing awareness of pace-setting and dramatic successes along these lines. Such accomplishments encourage others to consider similar national economic development approaches.

Many lenses and levels of analysis can be brought to bear to scan the horizon. Reasoned balance of perspectives is essential to successful endeavors. Too brief a timeframe may be short-sighted. Too narrow coverage may suffer from tunnel vision. Too broad review of the entire landscape also may be self-defeating. Though seeing far enough into the future might never be clear enough to satisfy everybody, there is no reason why efforts shouldn't be undertaken.

Targeting Epochal Goals: Big Four and Big Five Economic Eras

Scientific and technological developments are stepping stones of epochal change. Epochal shifts displace existing outdated undertakings, advance economic the well-being of nations pursuing them, transform institutions and structures of society, alter the general welfare of the populace, and represent overall the fundamental "hallmarks of progress."

Economic development has many levels and many targets. The focus here is leveled at how to identify and pursue epoch-changing economic pursuits. The end goal involves identifying and encouraging emerging economic activities that will dominate entire eras. The target dwells on clusters of economic activities that become so dominant and overshadowing that they come to characterize an era. The historical sweep of epochal economic development reveals patterns encompassing episodic economic stages characterized here as *Economic Eras*.

The great scaffolding of evolutionary patterns reveals three basic tiers: the *past*, where we've been; the *present* predicaments and positions; and, finally, the trends and trajectories toward possible and most *probable* outcomes. As the course of economic development wends its way, new sectors ascend. Answers to what the future holds come down to a matter of *perspective* and choosing from among *alternative possibilities*.

As older economic sectors mature, "yesterday's industries" wane and new sectors step in to fill the breach. Relative importance ebbs and flows between and among economic sectors. Previous economic linchpins wane as new centers gain predominance.

There is a series of dominant economic activities that periodically punctuate the course of global economic history. Successive waves of technological clusters covered here include the emerging Big Five and the Big Four. Each sector, in its own turn and time, will become the economic mainspring of economies as societies progress along a continuum of change.

Economic undertakings constitute the central institutional structure upon which societies are built. These undertakings include the vital activities that generate financial wherewithal and draw humanity together in a socio-economic matrix. It is questionable to attribute any one factor the linchpin of society. Tagging economics in all its specialized undertakings as the mainstay, however, may not be an overstatement.

A number of epoch-setting economic activities already can be discerned or surmised with confidence and clarity. Identifying national goals is not always this easy. Interesting targets of opportunity abound. Tracking major economic eras in the United States reveals a progression from: agriculture (peaking in the 1880s); to an industrial base (peaking in the 1920s); to a brief interlude with a services-based economy (peaking during the 1950s); into a broadly construed communications-information-knowledge-education-based economy (currently accounting for over 70% of GDP). Looming over the millennium are at least a Big Five potential sectors that are most likely to dominate the socio-political-economic landscape: 1) Leisure (taking off around 2015 when 50% of every American's lifetime is likely to be taken up by such pursuits), 2) Life Sciences/Biotechnologies (acquiring dominance around 2100), 3) Meta-materials/Nanotechnologies (becoming the linchpin undertakings 2200-2300), 4) a New Atomic Age (acquiring the lead between 2250-2500), and 5) a New Space Age (the most exciting adventure dominating prior to 3000).

The history of humanity traditionally is mapped and measured by a series of "Ages" or "Eras" through which various undertakings have provided the key economic activity and principal driver of change, advance, and progress. In the beginning, the Stone Age dominated human activities for millions of years. In more rapid succession, came the Copper Age (6400 BC), the Bronze Age (3000-500 BC), the Iron Age (1700-51 BC), and the Steel Age (1800s). Broadly characterizing contemporary times, it might be fair to attribute an on-going succession of materials technologies: Plastics (1900s), Silicon (1950), Bio-materials (animate matter—around 2100), Meta-materials (inanimate matter—around 2200-2300), Atomic Matter (around 3000), and, perhaps, Anti-matter (around 3000, or later). Pushing the envelope further into the future might be new hosts of technologies based upon gravitational mechanics, controlling "dark matter," or new powers posited upon quantum physical phenomena and photonics.

Basic Principles of Long-range National Economic Planning

Predicting the future provides a powerful basis for creating it. This presentation dwells heavily on the "laws" and indicators of history. Timelines of basic principles and constructs reveal trends, their direction and momentum. These dynamics help sharpen perspectives on things yet to come.

Discussion presented here reviews the recent shift toward public policy targeting and actively promoting cutting-edge technologies that hold promise for economic growth overall. Nations acting to gird their economic base strive to insinuate and accommodate new and promising growth sectors. The end goal is to build more productive and stronger economies that will advance entire nations and enhance the condition and fate of their inhabitants.

Economic development policy basically centers upon the predominant economic undertakings within political jurisdictions. Driven primarily by waves of scientific and technological invention, successive economic eras generate the dominant source of jobs. As a result, population centers emerge near those centers of economic activities. In turn, this prompts housing and a vast range of supporting services (utilities, roads, sewers, heath care, parks, schools, and so on) that become mutually dependent. Taken together, this skein of principal and allied or ancillary activities literally shapes the dominant character of a given economic period.

Critical to "seizing the moment" is identifying and targeting high-tech opportunities important to national well-being on down the line. Mapping out visions and defining goals opens up opportunities for planning and building a better Tomorrow. Economic policy development, as a planning function, derives from and responds to prevailing predominant economic undertakings within political jurisdictions.

Visionary economic goals and national planning efforts help to speed up (or slow down) the pace of change. Visionary perspectives and goal setting provide the inspiration. Sizing up the political and psychological climates of opinion help to gauge support or disapproval. Execution measures success. Results depend on how well stewards and supporters understand, plan ahead, and execute essential steps that have been specified.

The art of the possible is the stuff of visions. Economic policy development, properly directed, can turn visions into reality. Core undertakings specify structures for plotting and managing the pace of oncoming projected—but yet to be realized—changes.

Detailing new economic prospects entails assessing crucial steps required if specified goals are to be realized. Perspectives developed from amassed experience help guide decision makers to capitalize upon the positive prospects and avoid potential pitfalls. Focused in this manner, conscious direction can influence, speed up, guide, and shape—if not actually determine—specified outcomes.

So, who's doing what or anything about all of this foment and impending change? A few prescient and savvy nations already are in the process of transforming themselves into leading economies of the world.

Singapore's Exemplary National Economic Development Success

Singapore's extraordinary "rags to riches" success story dramatically highlights the tremendous potential of scientific and technological foresight planning. Singapore has accomplished what may be the most rapid and best balanced rise to global socio-economic prominence ever.

Until recently, Singapore was a relatively impoverished island nation. Directed development and incentives catapulted this tiny nation to world leadership positions in economic growth sectors important to the future. Currently, this small nation has consistently ranked among the top five countries worldwide in terms of Gross Domestic Product (GDP) per capita!

Singapore accomplished its miraculous economic development from a starting point of being a relatively minor third world nation. Against the enormous odds of being orphaned from Great Britain's Empire and from Malaysia, and still struggling to recover from the devastation of WW II Japanese occupation, this beleaguered nation managed to transform itself into cutting-edge global leadership positions. Rising from war-torn shambles and Third World status was not the result of luck or fate. The crucial element in Singapore's single-minded determination entailed targeting emerging economic engines of growth underpinning the long-range future. Singapore's success required recasting its economic base into centers for innovation and development upon which the global economy will be premised in the years ahead. National economic planning efforts, above all else, forged this small nation into an exemplary champion of "techno-entrepreneurship."

Singapore's notable and impressive successes have been duly recognized by many counts and measurements. Recent "globalization" surveys (based on nine measures, including trade as percent GDP, foreign direct investment, percent using internet services, number of minutes of international calls, etc.) provide one measure of success. Rank order of nations surveyed by these measures: Singapore number 1; Netherlands 2, Sweden 3, and Switzerland 4; the United States ranked 12. *Business Week* magazine's listing of the five most competitive economies provides another determination of prowess. For 2002, the rank order was U.S., Finland, Taiwan, Singapore, and Sweden. From a starting point of impoverishment and economic insignificance, the country's economic position currently ranks (per capita) among the highest in the world.

How is it that a miniscule nation—253 square miles in size, populated by 4.3 million persons—rates as a pacesetter among the "giants"? This amazing accomplishment was not a result of mere happenstance. This accomplishment came about largely as a result of visionary economic planning and steadfast determination. Singapore's remarkable accomplishments stand as a powerful model for others.

Championing Tomorrow's Economic Linchpins Today

Selected undertakings consciously strive to stake out state-of-art advantages associated with leading-edge technologies. Singapore's Ministry of Science and Technology's planning efforts spearheaded high-value-added, knowledge-based potentials inherent in promising emerging economic sectors.

A major focus targets bio-medical development. Why? Singapore's spokespersons simply assert, "because people always get sick." Other undertakings focus on stem cell research, genomics, bio-informatics, and biochips. Tending to matters close to home, another bio-medical emphasis is dedicated to controlling diseases rampant throughout Southeast Asia.

Other promising high-tech targets include language processing, optical recognition, photonics/optics, nanotechnologies (nano-film—carbon and silicon based), wafer fabrication, semiconductors, wireless devices, automation, enhanced processes (communications, wireless), new designs, intelligent roadways, and advanced transportation systems. Growth potentials inherent in all these areas are integral components of future economic progress. These targets are impressive and forward-looking "wish lists." All of these undertakings are within the scope of the emerging "Big Five" Economic Eras that are projected to dominate the future.

One more area of importance should be added to this list: leisure-based enterprise. To be sure, Singapore does cater to international tourism, and millions of visitors do come. More significant is on-going negotiation to snare the largest-ever casino-based resort—a $3.5 billion concept pursued by Las Vegas Sands. All things considered, the growing economic importance of the Pacific Rim area make high-stakes games of chance an obvious growth area. The dawning of an impending "Leisure Era"—commencing around 2015 (in the United States), when over 50% of American's lifetimes will make time available for pursuing such interests.

Singapore also created favorable climates for cutting-edge technologies that are not quite yet dominant but bound to become the bastions of important jobs and economic opportunity in coming years. For example, it is among the first countries to limit introduction of new motor vehicles to those that are hydrogen-fueled—another wave of the future.

Other ongoing domestic priorities promote enhancing basic education, re-learning and updating for lifelong learning, retraining, and augmenting talent pools by attracting foreign expertise. The nation has fast become a magnet for multi-cultural expertise. By 2005, the country hosted some 6,000 multinational corporations.

Turning Adversity to Advantage: Making Do with What's at Hand

The nation's petro- and fine-chemical complex is the largest in the Pacific Rim. Making a "silk purse out of a pig's ear," this sprawling chemical complex was built on a rim of shoals and shallows and an archipelago of seven offshore islands that once posed major shipping hazards. Now, those obstacles and annoyances have been transformed into a major asset connected to the mainland by causeways and bridges.

Singapore's outstanding seaport ranks consistently as the world's largest. Anticipating the enormous impending increases in modularized global shipping, the port boasts the biggest container port in the world. State-of-art seaborne traffic management systems are capable of tracking and guiding a thousand vessels simultaneously in real time. Controlling "turn-around" time for loading/unloading has been refined to a fine art. The facility has become one of the most modernized, advanced, and best managed seaports anywhere. In a period of time when international commerce is becoming the key driver of economic development these assets—especially considering the growing influence of Pacific Rim nations—are a prime asset.

Deftly capitalizing on its familiarity with the West, Singapore promotes itself as "Asia for beginners," and the "entry hub" for erstwhile Western nations into other Asian countries. Fully cognizant of the growing economic significance and prowess of China, Singapore holds itself out as an East-West crossroads and entryway into Asian business, in particular, as a springboard into its giant neighbor, China.

Whereas China poses problems as a major transgressor of intellectual property rights, Singapore concentrates on protecting and safeguarding research and development. This girds the confidence of major world players.

Maximizing the value of its limited human resources, Singapore readily concedes the lesser-valued labor-intensive activities of producing products to its low-cost giant neighbor. After all, there's a much higher value-added human input that can be reaped. Accordingly, Singapore concentrates and capitalizes upon matters of the mind—a rational adjustment in the international division of labor.

The tiny nation boasts no vast reserves of natural resources or cheap labor. Instead, efforts are premised upon something more appropriate to these times—the battle for technologically astute undertakings coupled with high-tech oriented human resources. Specifically, the country's select targets involve capitalizing upon high-tech, value-added efforts and intellectual pursuits. Following the prime rule of "making do with what you've got," Singapore capitalizes upon knowledge. The list of accomplishments could go on at great length.

Other Notable Accomplishments to Singapore's Credit

Perhaps just as important as technological advance is Singapore's dedication to seeing that "nobody gets left behind." This benevolent totalitarian society provides important answers for dealing with the less fortunate and poverty-stricken. Social well-being sometimes tends to be overlooked or minimized in the sweep of the onslaught and rush inherent in a single-minded determination to pursue economic progress. Without plunging into the details, suffice it to say that this enviable accomplishment is extraordinary. Particularly so, when considering that this tiny nation was engulfed in poverty not so many years ago.

Other less important pace-setting events, although marginal to the onrushing stream of economic accomplishments, are worth mentioning. Contending with other lesser problems, chewing gum was outlawed because discarded wads were considered a blemish and a blight. On another far more serious plane, in Singapore, individuals involved with illegal drugs simply face the death penalty. It comes as no great surprise that there's not much of a drug problem in the nation.

Singapore's Prime Ministers Lee Kuan Yew and Goh Chok Tong, along with President S.R. Nathan, have accomplished in the span of mere decades what lesser developed nations everywhere else have been unable to realize over the course of centuries. The salient consideration implicit in Singapore's successes underscores the importance of coherent and integrated national planning. Singapore has impressively proved that an entire country can be literally catapulted into positions of enviable global leadership. What a great model of success. Singapore's story is one well worth examining, explaining, and emulating.

This cursory review underscores that just because a nation is small, it shouldn't be overlooked. Nations don't have to be a giant to be economically advanced and prosperous. Accomplishing that feat requires foresight and a national will. And that imperative is precisely what well-conceived visionary goal setting is all about.

Japan's Prototype Economic Development Successes

Japanese national planning stands as a late-20th century example of deliberate economic goal setting supported by specific strategies. Visionary planning requires specifying both promising long-term goals as well as strategies for realizing them. Japan's economic planning and policy primarily targeted potential high-growth undertakings requiring long-term development—termed "sunrise" sectors. In addition, more immediate or short-term economic targets also were specified.

Japan's success story exemplifies the potential value of visionary leadership. It provides another notable example of national economic planning. Targeting prime economic targets with great growth potential drove Japan's national economic prowess to new highs. Japan's visionary thinking, goal setting, and accomplishments catapulted the nation into prominent economic leadership positions. Keep in mind that Japan's total land area is smaller than the state of California. The four island archipelago is 1/25 the land area of the United States (142,000 square miles as opposed to 3.7 million square miles).

"Former Prime Minister (July 1972–December 1974) Kakuei Tanaka is credited with creating enormous benefits by purposely and tirelessly pushing Japan into the economic forefront." Intensive and high-level Japanese long-range planning efforts commenced during Tanaka's political prominence. His leadership in visionary planning gathered impetus during several prior Ministerial positions (notably, the Ministry of International Trade and Industry [MITI], as well as those for Finance, and Postal Service), several terms as Secretary General of the Liberal Democratic Party, and long membership in the Diet (House of Representatives). Tanaka's early efforts in technology assessment included those of the Subcommittee of Technological Advancement of the Economic Council, the Science and Technology Agency, and the Japan Techno-Economics Society. If ever there was a well-prepared political leader to undertake the ambitious task of setting course for a "ship of state" venture into the future, it was Prime Minister Tanaka.

Tanaka's visionary plans, published as a best selling book in Japan, also were widely circulated in English.[1] Continuing these efforts, Japan's Minister of State for Science and Technology Policy, Iwo Matsuda, continues to pursue new five-year planning activities. The third five-year plan was launched during April 2006. Long-range planning is seldom a one-shot event. Continuity invariably requires constant tweaking and upgrading.

Japan parlayed assessment of science and technology visions into a grandiose strategy that guided and culminated in prominently positioning the country in economic sectors with huge growth potential. The structure of industry in Japan, the cultural mindset, and a vast range of government incentives and encouragement contributed to making Japanese firms among the most aggressive to focus and capitalize upon new technologies.

Science cities or centers were established to spearhead select technologies. Tsukuba Science City, begun in 1966, was home to the best laboratories anywhere by 1982. Tanaka had been deeply impressed by the inherent advantages of clustering vital economic activities. He was taken by the successes of the "motor city" (Detroit, Michigan), Silicon Valley (California), and the "movie capital of the world" (Hollywood, California).

1. Kakuei Tanaka, *Building a New Japan: A Plan for Remodeling the Japanese Archipelago*, Tokyo: the Simul Press, Inc., 1972; 1st English edition, 1973.

A panoply of inducements supported and sheltered designated new technologies with major growth opportunities. Generous government supports, tax preferences, and other incentives were provided to encourage investments in targeted sectors. Research and development efforts received preferential tax treatment and write offs. Capital investments were accorded quick tax write-offs. Foreign trade competition was stifled to shelter nurtured sectors. Trade restrictions discouraged or even shut out foreign competitors until a domestic base could be solidified. In short, commercial interests and investors received powerful inducements, incentives, and reassurances of continuing support. These assurances bolstered resolve to move ahead.

Infrastructure development to meet Japan's needs of expansive economic development was another prominent feature in Tanaka's overall plans. Inter-island bridges, along with enlarged and extended roadway grids, were put in place. Seaports and airports were upgraded and enhanced. Utility capacities and grids were enlarged and improved. Communications infrastructure was upgraded.

Undergirding shifts in economic priorities was the emphasis upon knowledge-intensive undertakings (not to mention environmental relief accomplished by minimizing heavy industrial activities). Greater use of knowledge and wisdom was given high priority. Through advanced knowledge came greater pride in work, attitudes, and commitment. Educational pipelines encouraged science and engineering. From top to bottom, vital undertakings, as well as supporting infrastructures, facilitated robust growth. Fully executed, those goals boosted Japan into a globally vibrant economic position, particularly during the 1980s. In the United States, experts fretted that Japanese technological advances were overtaking and overwhelming the vaunted U.S. position. Sector dominances challenged or eclipsed vaunted U.S. dominant positions in a number of high-tech areas. Although the United States may have played dominant roles in inventing new technologies, Japan "stole the thunder" by developing them into mass marketable goods.

Government policies bolstering "sunrise" industries included micro-electronics, machine tools, computers, communications, and robotics. Government planners also designated "new frontier" technologies, ones with longer term timeframes, including advanced ceramics, nuclear power, non-oil energy sources, bio-technologies, and laser products. These new frontier technologies embrace prominent core competencies of the impending Big Five economic eras. Time will tell how sustained encouragement and support of new frontier technologies plays out.

Japanese economic planners, spearheaded by Prime Minister Kakuei Tanaka, also tagged so-called "sunset" industries, ones in substantial and inevitable decline. Rather than lending further encouragement and support for these waning activities, governmental programs were aimed at easing the economy away from such undertakings. Declining industries included aluminum, cardboard, cotton and wool spinning, electric-furnace steel, ferro silicon (a steel alloy), fertilizers, shipbuilding, and synthetic fibers. Mature industries, such as those just enumerated, had been diminishing in economic importance for decades. A good number of these undertakings—at the time—were globally dominated by Japan's mighty industrial base.

Precursor Jurisdictions and International Diffusion of New Concepts

The concepts of precursor jurisdiction patterns and international diffusion of successful new concepts and public policies applies equally well to economic development undertakings reviewed

here.[2] A growing cohort of nations—as well as local governmental jurisdictions—have embarked on economic development policy planning. Experiences gained provide a sounding board for measuring principles, policies, and progress.

Economic development patterns typically, though not always, commence in advanced polities. Some nations are more aggressive than others in moving technologies into widespread commercial application. As positive experiences with something new amass, others take heed and often emulate the proven successful undertakings. There is much to be learned from the experience of others. Not infrequently, hopeful nations not quite ready or up to the task of devising long-range economic development goals strive to do so. Unfortunately, timing and circumstance are not always appropriate to the task.

Currently, devising and executing efforts to support the newly emerging high-tech pillars of economic growth already is proving successful in a number of countries. A host of other nations—besides Singapore and Japan previously stressed here—have undertaken similar efforts. Sometimes the focus is limited to only one or more high-tech targets. The growing list includes Great Britain (U.K. Foresight Programme), France (French National FutuRIS Operation), Germany, Netherlands (since 1980s), Finland (National Technology Agency), Italy (Target Project on Biotechnology), the former Soviet Union, Poland, the former Czechoslovakia, Hungary, Bulgaria, Israel, Korea, Indonesia, Malaysia (National Biotechnology Directorate), Australia, New Zealand, Egypt, Mexico, the Philippines, Pakistan, Canada, Ireland, Malta, Cyprus, Estonia, and Turkey (Vision 2023 Turkish National Technological Foresight Program).[3]

Careful examination of experiences amassed by this growing number of nations provides a powerful basis of data for assessing the "art of the possible" in economic development planning. The future is being created—in large measure—by unstinting efforts of planning ahead to put entire countries into the vanguard of creative economic development. As powerful success stories amass, the masses will follow.

Precursor Nations: Does Size Matter?

Some nations are so very small that few persons even know about them, let alone give them much consideration. International and cross-cultural comparisons often are limited by eliminating from consideration many small nation states considered too insignificant. However, not infrequently it is small and obscure nations that blaze new trails for the entire world.

Iceland, a tiny country (40,000 square miles) populated by 304,367 persons, usually isn't included in globally significant comparisons.[4] Yet, a good number of the world's important benchmark accomplishments originated there. The same could be said about a significant number of other nations. Look to Iceland for innovations, especially in bio-genetics. For example, the whole world is watching

2. The "precursor jurisdiction" concept as a forecasting tool was first developed by Molitor. Early development of the concept began taking form during the late-1950s; first publication in professional journals began during the early 1970s. The most recent description of the concept can be found in Molitor, Graham T.T. *The Power to Change the World: The Art of Forecasting.* (Potomac, Maryland: Graham T.T. Molitor, 2003). An extract from that publication is available in the appendix to this paper.
3. Note that some listed programs may not be national-government-sponsored undertakings.
4. Population and square miles for Iceland Finland and South Korea (see below) are from the CIA Factbook, accessible on line at https://www.cia.gov/library/publications/the-world-factbook; accessed 7 July 2008.

(and capitalizing upon) Iceland's commitments to genetic profiling of all its willing inhabitants. The purpose entails ferreting out genetic "flaws" and discerning disposing factors that lead to cures and corrective therapies. Such leading edge developments will help to shape tomorrow.

Finland (130,100 square miles; 5.2 million population) has benefited from current successes that can be attributed in large measure to foresight planning that zeroed in on electronics and high-tech enterprise during the 1970s. In like manner, South Korea (38,000 square miles; 49.2 million population) targeted reproductive technologies, genetics and cloning. Tabulations placing these modest-sized nations into global leadership positions provide powerful examples for others to follow.

Every nation moves at its own pace. Some countries may be able to skip over and bypass eras not suited to local capabilities and conditions. Singapore's scant 253 square miles of territory, for instance, does not have enough land to realilstically target agricultural pursuits. This exemplary country bypassed most of the Big Four economic undertakings and devoted its efforts to "hot pursuit" of the Big Five high-tech sectors. Countries like Singapore demonstrate that it is possible to bypass ill-fitting and lackluster sectors and "leap-frog" ahead to economic undertakings more appropriate to their situation and available resources—physical and human.

Recent stunning successes—such as those in Singapore and Japan, among other nations—have attracted attention and boosted interest in economic development policy planning. Conscious goal setting that directs and accelerates change is on its way to becoming common practice. Time will tell whether economic policy development becomes widespread.

Leadership Roles In Visionary Economic Development Planning.

Who or which institution is best equipped to decide whether or not to embark upon developing and deploying new technologies?

Rarely do political leaders have the resolve, tenure of office, and popular support to pursue distant future goals. Political leadership typically succumbs to the pressures and problems of the moment. Commitments to immediate situations leave little room for addressing long-range visionary goals.

Some countries are more adept in utilizing high-level blue-ribbon gatherings of experts to come up with serious visionary propositions and targets. Sweden's Royal Commission reports are exemplary. These undertakings are structured to reflect and represent viewpoints by experts representing almost every important sector materially affected. Opportunities for additional views also are structured into the rigorous review process. It comes as no surprise that most of the new and novel concepts put forward in these Royal Commission reports are swiftly passed into law. Likewise, England's blue-ribbon Royal Commission reports, probably the most carefully thought out and technically proficient of any nation, almost always are right on the mark—intellectually. Unfortunately, while England's scholarship is superb and frequently unsurpassed, there tends to be a reticence and reluctance to swiftly implement new concepts. As a result, the track record of swift response falls somewhat short of hopes.

Political resolution, as used here, is cast in the broadest sense. It involves far more than government and bureaucratic efforts. Public policy deliberation and decision making is a far flung activity. "Political" gatekeepers include more than governmental officials charged with public policy decision making. No single institution—including government planning authorities—can be successful without the support

of others. Entrepreneurial and commercial interests play critical roles. The panorama of influences that determine outcomes of economic high-tech developments covered here includes inputs from the public and private sector.

The mechanics of pluralistic consideration are always at play. Increasingly, however, it is the various specialized institutions of government that are undertaking the task. Implicit in top-down proposals is the shift away from freely operating mechanisms of the marketplace. Visionary planning is tilted toward deliberate policy setting involving government-directed leadership.

Broad scale consensus, including formal as well as informal activities extending to all levels of society, is vital. All manner of institutional players are involved. Business leaders who help bring economic targets into reality play vital roles. Somewhat more removed, although important to deliberations, are roles played by special interests steeped in the specifics of their specialized domains. Educational institutions, research organizations, and think tanks of all kinds provide other useful inputs. Public attitudes supportive of on-going efforts also are important. Instead of being nobody's business, the gravity of these decisions makes determination "everybody's business."

Major new economic eras are poised to commence drives to dominance. It is high time to get on with the difficult tasks of long-range economic development.

Some Basic Planning Principles

Defining important goals and mapping strategies for implementing them represents no small undertaking. However, identifying new pillars of economic growth and potential prosperity that will dominate contemporary times, although not easy, is possible.

Selecting the key milestones for any national visionary project requires a great breadth of knowledge and the wisdom of Solomon. In today's rapid pace of scientific and technological advance, just staying on top of one's field of interest is difficult enough. The history of science and technology is one of constant sub-divisions into fields that have become so specialized that only gifted insiders are capable of successfully integrating looming developments. Everybody has their own sphere of interests and expertise. Attempting to span the full range of activities that make up "national" goal setting poses overwhelming but manageable challenges.

Developing, deliberating, and setting national economic goals poses a difficult enough undertaking. National goals are broad and pervasive, frequently requiring myriad ancillary goals. For the paramount goal to succeed, a range of considerations vital to underpinning success must be addressed.

The measure of success requires accomplishing the substance of visionary potentials. Goals must be realistic. Most important to such plans is specifying the implementing strategies for realizing set goals.

Rarely are massive undertakings accomplished in a single fell swoop. Progress toward major goals is incremental. Successes prod constant striving to achieve the next step, and the next. It is the refinements, extensions, updates, and elaborations—along with sidestepping, avoiding, or otherwise subduing shortcomings or deficiencies—that often make the important difference.

Planning efforts often tend to set too many targets. It would be folly to target pursuing all the "hot" high-tech projects on the planning horizon. Embracing too many promising targets can be self-defeating. Overwhelming numbers of opportunities require sorting out.

Focusing on realistic opportunities that are "doable" is essential. Developing visionary goals starting from "scratch"—launching off into particle physics, for example—tends to be overly ambitious, at least for most nations.

Abstract and theoretical goals are fine—on paper or as a stage-setter. Extravagant hopes about a "wild blue yonder" and "shooting for the stars" stand little chance of going anywhere, let alone succeeding. The high-tech growth targets selected may not always work out. Public policy makers, however, retain the ability to stop, change direction, and start anew.

Though projections may be off target, the mere serious assertion of them can give rise to "self-fulfilling prophesies." Possible targets can take on a "life of their own." Once a goal is identified, continuing efforts devoted to realizing it may actually wind up keeping hopes high and bringing even the loftiest aspirations to fruition. The great futurist and thinker, Herman Kahn, once ensured me that "virtually anything that the mind can conceive, human beings can achieve."

Specifying concrete targets helps to move jurisdictions and institutions along toward slated goals. But that may not be enough to get the private business sector into high gear. Government assurances and commitments to economic policy targets, favorable tax considerations, seed money, and a host of government supports provide important incentives.

The hard part often involves securing consensus and enduring commitment. Beyond that is the formidable task of actually executing and implementing grandiose visions and plans. Orchestrating consensus on clearly defined realistic policies and programs and managing execution and successful implementation require dedication and resolve. Great changes involving breaks with the past and entrenched mindsets are seldom easy to swiftly or fully realize.

The final arbiter may be the marketplace itself. If the public doesn't accept the proposed policies and programs, their fate may be sealed. Consumer support, at the end of the chain, is crucial to acceptance. New and novel products or services must be acceptable to the marketplace.

Advancing a given technology is limited by the accumulated fund of knowledge, the understanding that science provides, the skills of human competence in applying it all, and institutional arrangements for adopting and integrating the new. Practicality of planning efforts rests on capitalizing on assets at hand and finding ways to maximize their unlocked potentials.

Is Contemporary Economic Development Policy New?

Broadly construed, the idea of economic development probably has always been around. Only more recently has the need for designating key economic activities and marshalling resources to fulfill them taken on national and epochal dimensions. Francis Bacon (1561-1626), credited with developing scientific methodology based on observations and experimentation, conceived of a utopian civilization based on science and technology in his book *New Atlantis*. Rene Descartes (1596-1650) advocated "critical rationalism" to build a better society.

Over a century ago, national economic planning attracted serious interest with Karl Marx (1818-1883). Marx maintained that every society, regardless of its relative historical stage, rested on economic foundations that shaped social, political, and spiritual activities. Specifically, he asserted, "The sum total of these relations of production constitutes the economic structure…on which rise legal and political superstructures…The mode of production in material life determines the general character of the social, political, and spiritual processes of life." [5]

Spearheaded by the USSR's State Planning Commission, numerous Five-Year Gosplans strove to reshape that nation. The Soviet Union's State Planning Commission was established in 1921 to supervise the planning of economic objectives and to translate them into specific plans. Although execution may have been deficient, long-range planning on this scale marked a great stride forward in contemporary national government direction of major undertakings for an entire country.

Steven Vago synopsizes Marx's concepts revolving around the centrality of economic undertakings:

> *"For Marx…The economic production is the substructure upon which the rest of society, the superstructure, is built. Social institutions–such as the government, the family, education, and religion–are dependent upon the mode of economic production in a given society. Variations and changes in economic production give rise to variations and changes in other social institutions with their associated values, attitudes, and norms."* [6]

Establishing and directing massive goals for political jurisdictions has overtones and potentials tending toward totalitarian despotism. Those propensities can be somewhat offset and blunted by consensus building, coupled with opportunities for intervention of popular inputs to provide course corrections and changes.

Turning Point: Post-WW II National Economic Planning

A turning point in national economic planning occurred during the Post-World War II reconstruction period (late 1940s) aimed at re-building "basic" infrastructures and sectors in nations decimated by the ravages of war. France's first "reconstruction plan" was drawn up in 1946 under the leadership of General de Gaulle and the supervision of Jean Monet. German reconstruction was well underway by 1945–46. Similar efforts toward national planning were underway in Great Britain in 1960, spearheaded by the National Economic Development Council (1961). Other national reconstruction efforts followed.

Only within the last fifty years have nations begun to seriously grapple head on with long-term economic development potentials. Since the mobilization of World War II undertakings, the onus of actively pursuing development of massive and powerful new technologies has been undertaken and led by government. Multiple institutions—legislative, executive, judicial, and independent regulatory agencies—play important roles.

Economic development of a different sort, involving Third World or lesser developed nations, came into vogue during the 1950s and 1960s.

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5. Feuer, L.S. (ed.). *Marx and Engels: Basic Writings on Politics and Philosophy* (New York: Doubleday, Anchor Books, 1959), pp. 43-44.
6. Vago, Steven. Social Change (New York: Holt, Rinehart and Winston), 1980, p. 41.

Author H. W. Arndt, asserted, "The term 'economic development' as denoting a process which societies undergo was hardly used before World War II, although the use of 'economic development' in the sense of an activity applied, especially by governments, to a country's land and natural resources is at least a hundred years older."[7] As an aside, it wasn't that economic development was not considered. It was. J.A. Schumpeter ascribed technology as the driving force in economic development creating "gales of creative destruction" outmoding and displacing earlier technologies.[8] Nikolai D. Kondratieff described "boom and bust" long wave cycles carried along by echelons of technological advances, shortly after WWI. Legions of other scholars contributed to carrying such policies along.

Conscious Control: Taking Charge of Change

Policy planners increasingly turn to creating willed, not fated, futures. During the 1970s Robert Heilbroner asserted, "The surrender of society to the free play of market forces is now on the wane… the pressures in the future will be toward a society marked by a much greater degree of organization and deliberate control."[9] Many other prominent scholars have devoted huge efforts to advancing concepts.

Economic development policy based on visionary thinking and planning holds enormous potential to enhance human conditions and change the destiny of entire economies. Directing development of promising new targets conferring major socio-economic advantages is becoming too important to ignore, to let things drift along. When the stakes are high, decision makers tend to be less likely to remain hapless victims of haphazard and directionless change. They are no longer willing to stand outside the processes of change. Instead, the best hope involves turning to more conscious and aggressive long-range thinking and planning.

Dreams, after all, can be fulfilled only if they have been spelled out. Visionary thinking can, quite literally, change the world.

7. Arndt, H.W. *Economic Development: The History of an Idea*. (Chicago, Illinois, The University of Chicago Press, 1987), p.1.
8. Schumpeter, J.A. *Theorie der wirtschaftlichen Entwicklung* [Theory of Economic Development]. (Leipzig, Germany, Dunker and Humblot, 1911).
9. Heilbroner, Robert L. *Technological Determinism*. (New York: Vintage Books, 1970), p.164.

APPENDIX: PRECURSOR POLITICAL JURISDICTIONS

This extract from Graham Molitor's *The Power to Change the World: The Art of Forecasting* is reproduced here by kind permission of the author [ed.].[10]

PATTERNS OF CHANGE: STATE AND LOCAL BELLWETHER ACTS

Precursor or Bellwether Jurisdictions. Governments consistently the first to adopt and test new concepts are characterized herein as precursors, bellwethers, pacesetters, or leading jurisdictions. The basic principle remains the same: someone has to be first and others follow. Small vanguards of national, state and local governments, during any point in history, tend to be the most venturesome, experimentally inclined and progressive. Precursor nations, jurisdictions continually in the vanguard of change, provide an important indicator of changes likely to be emulated by other jurisdictions that respond later in point of time. Adoption and actual experience with a particular phenomena moves it beyond abstract and theoretical concepts. Practical application of new laws tests and establishes the merit and mettle of new concepts. Successes are quickly emulated elsewhere. By the same token, mistakes are avoided by those who heed errant steps.

Clusters Up Front, Other Trailing Along Over Time. Timelines arraying state and local laws reveal a typical sequence of legislative leaders and laggards. After all, not everybody can move in lockstep fashion all at once. What actually happens is that a small vanguard of governments consistently are "out in front." The makeup of those jurisdictions changes over time, but the principle of clusters of "first actors" remains the same. Arrays of policies or programs listed by chronological adoption dates indicate likely timing for responses "further on downstream." Proven successes lead to emulation elsewhere.

Lead-Lag Adoption Patterns. State and local government precursors test the mettle of solutions. These "patterns of change" follow S-curve patterns. Lawmaking never occurs everywhere at the same time. The sequence starts cautiously with initial innovators and early adopters, followed by a surge of followers during mid-course, and terminates with a slow finish (if ever) by a few laggards.

Jurisdictions Consistently "Out In Front." The innovative tier of U.S. early adopting state jurisdictions include: California (the current front runner), New York and Massachusetts (previously the front runners), Illinois, Pennsylvania, New Jersey, Oregon and Washington. [Historically, Massachusetts was the first U.S. precursor jurisdiction, followed by New York, and then California as westward expansion took its course.] Futurist John Naisbitt's list of front runners includes: California, Florida, Connecticut, Colorado and Washington. Political consultant, Martin Ryan Haley, touts a different list: California, New York/New Jersey, Massachusetts, Illinois, Wisconsin, Oregon, Minnesota, and Michigan. Consultant, Ken Orski's picks include: California, Florida, Texas, Colorado, Minnesota, Wisconsin and Washington. The lists are in basic agreement, with some exceptions.

Points of "Critical Mass." While surveying the entire field of potential change—all the 50 states—provides a complete data base, it may amount to "overkill." Because it is a tiny vanguard of jurisdictions—4-6, perhaps 10 states—that set the pace, scanning for patterns of change can be limited

10. Molitor, Graham T.T. *The Power to Change the World: The Art of Forecasting.* (Potomac, Maryland: Graham T.T. Molitor, 2003), pp. 135-45.

to the leading top tier of first and early adopting jurisdictions. Experience amassed by early adopters proves soundness of principles, and emboldens the followers. Not a bad deal for the followers, since the problems and pitfalls of, the expense and false starts of wrong moves can be avoided.

Precursor Positions Vary by Issue. My own lists, fine tuned and varying by issue, include most of the states mentioned by other trend spotters. Precursor status varies somewhat by issue: Oregon, Minnesota, Maine and Washington have been among the leaders on environmental issues; Wisconsin, Minnesota and Florida (especially regarding retiree benefits) are in the vanguard for social-welfare issues. The New York/New Jersey combo is largely a result of a lesser light living in the shadow of a dominant neighboring state whose lead it follows (lest it find a jurisdictional disadvantage with its neighbor).

Oregon, heads up the boldest activity regarding initiatives and referenda (along with California). States accounting for a dominant share of an activity turn out to be the leading jurisdictions regarding controls imposed by excesses and abuses of those activities: the largest agricultural producing jurisdictions—California, Texas, Florida, Massachusetts, New York, and Maine—turn out to have the toughest and earliest pesticide control laws. CFC aerosol restrictions were first imposed in New York and Oregon (1975). EMF overhead power lines were first regulated in New York, California and Florida. Truth in lending and no-fault automobile insurance were initially introduced in Massachusetts and California. The pattern is much the same for most any issue.

Laggards and Holdouts. Laggard state and local jurisdictions in the U.S. include Mississippi, Alabama, Arkansas, South Dakota and Louisiana. In Canada, Yukon tends to be the laggard jurisdiction. Internationally, lesser–developed and impoverished countries, such as Bangladesh and Ethiopia, are among the laggards.

Local Government Bellwethers. Local government bellwethers among U.S. county and city governments include: Berkeley and Mountain View in California, New York city and Suffolk county in New York, Boston and Cambridge in Massachusetts, and Dade county in Florida. Berkeley, California and Long Island, New York were the earliest adopters of legislation restricting use of blow-formed polystyrene "clam-shell" packaging. New York City was the first jurisdiction to ban x-ray shoe fluoroscopes. Berkeley, California and Cambridge, Massachusetts were the leading jurisdictions to impose bio-engineered material handling controls. Dade county was one of the first local jurisdictions to ban phosphates that had been polluting waterways. New York City was the first local jurisdiction to establish open dating for perishable consumer goods.

Sub-jurisdictional bellwethers internationally include: Stockholm, Oslo, Copenhagen, Amsterdam, The Hague, North Rhine-Westphalia, Bonn, London, Brussels, St. Gallen, Zurich, Basel, Bern, Saskatchewan, Tokyo and New South Wales.

"Sure Fire" Small but Consistently "Right" Bellwethers. During the 1960s, when my thoughts about bellwether jurisdictions were being jelled, one of the nation's most accomplished political pollsters shared a "deep-dark secret" with me. Over years of polling for Presidential election outcomes, he had come across a small precinct where he unerringly obtained almost the precise percent of voting for Presidential candidates election after election! While national polling, precision voting samples, and all the other trappings of sophisticated (and expensive) polling could and were being conducted, what he had discovered was—after all was said and done—a much simpler, easier, less costly, and tremendously

accurate way of prognosticating outcomes! It was that wisdom, that insight, and the practical nature of it, that got me to thinking about identifying "precursor jurisdictions" where the inklings of change can be spotted first.

How to Spot Precursor Jurisdictions. The shortcut is simply to ask somebody familiar with laws and legislatures. Their experience will intuitively (if not consciously) give you the answer(s). There are common characteristics that can help pinpoint these bellwethers. Sheer enormity of the most populous jurisdictions and the scale of confrontations encountered there quickly brings what may be inconsequential in smaller areas to the forefront. Beyond mere size are a host of socio-political predispositions. These jurisdictions also are intellectual centers. They are home to great universities, often hosts to Nobel laureates and other accomplished elites, and boast a well educated populace–in short, they host a vital intelligentsia. Elites don't like being left behind, being second best. They're always on the prowl for the new. Besides, for the most part, they are the very ones that dreamed up the new, and are eager to see their handiwork fulfilled. In these jurisdictions popular support is amenable to government directed change and welcomes actions that promote the greatest good for the greatest number. At another level of activity, there is a "bootstrapping" effect that tends to take hold. Reform tends to breed upon itself. Recognition for being out in front, tends to encourage "more of the same."

Obversely, smaller (usually remote and rural areas), economically less advanced and poorer areas, less culturally advanced (fewer universities, centers of learning) communities, with a smaller (or non-existent) intelligentsia, cajoled by fewer activists, with limited funds to carry out ambitious undertakings, and reluctant or ambivalent attitudes toward government—all of these factors, and more—discount much bellwether activity in such jurisdictions.

Lead-Lag Relationships (the Process of Diffusion. The lead-lag relationship between initial adopters and following ones is termed a diffusion pattern. At any point in time, there tends to be a pattern and timing sequence to change. The sequence commences with initial adopters, and is closely followed by a tier of early adopters, with the tail end brought up by laggards and a few holdouts. Laws establishing state consumer affairs offices commenced in New York (1957), and other early adopters included "regulars" such as Massachusetts, California and Illinois. Laggards included Mississippi and South Dakota. By 1974—17 years later—every state had established consumer affairs offices. Years earlier, the pattern shown for workmen's compensation laws was much the same: the same four states adopting the law early-on, and Mississippi bringing up the rear.

Tracking and Using Precursor Patterns to Your Advantage. Diffusion throughout the 50 U.S. states (let alone the thousands of local jurisdictions), simply takes time. For important issues that really count, and where the stakes are high, diffusion time among the U.S. states may take 5-10 years, and up to 15-25 years for some issues. If you know where and when the "axe will fall," then you have "a leg up" on responding to impacts that may affect interests in which you have a stake. In much smaller nations with far fewer local jurisdictions, from start to finish, response is much swifter.

From the 50 state proving grounds, come a profusion of different approaches to the self-same developments. Impractical, excessively costly, unduly burdensome, and unsound approaches fall by the wayside. The good is soon separated from the bad. Negative experience provides ample warning for others not to follow. Sound principles involve "survival of the fittest."

Diffusion Patterns: States Precede Central Government Response. Federal lawmaking in most every case is influenced and preceded by a steady build-up of earlier responses undertaken in lesser jurisdictions. In federated systems, the central government response usually follows in the footsteps of its state and local jurisdictions.

Constitutional mandates direct the U.S. federal government to provide for the free flow of commerce among the states. This often includes providing for uniformity among a melange of disparate and discordant local governmental laws. In many cases, a single uniform law that supersedes the diverse local approaches may be interposed to "cap the mess" and get things moving smoothly. Supremacy of federal laws and their exclusive occupation of the field, as specified by the U.S. Constitution (and its interpretation), are especially permissive when it comes to avoiding the fettering of interstate commerce.

Shorter and Shorter Diffusion Cycles. Things everywhere have speeded up. It's no different for the lead-lag timespan between earliest adopting jurisdiction and the Federal government. From Colonial times to the 1880s, this lapse typically spanned up to 100 years. During the early years, limited government was the rule. If action was indicated, state and local governments undertook the task. Most social issues were left to self-help, private contract, and individual initiative. Laissez faire economics prevailed. "Every barrel stood on its own bottom" was a popular way of putting it. Beginning in the early-1900s, things changed. Diffusion time from state and local response to Federal action typically ran 15-45 years. Marked from the 1920s to current times the time span has dropped to an average of 5-15 years. Impetus for this shift came from rigors and responsibilities imposed by WWI, the Great Depression, and WWII. These national emergencies brought about a drastic change in philosophy as governmental aid and assistance and providing order out of chaos was accepted.

From the 1930s-on, the U.S. federal government, which had been wont to intercede in state affairs, became much more interventionist. Intervals between the time a new law was established by a first adopter and response by the national government averaged 20 years for social welfare issues.

Exceptions to Uniformity: Forums of Least Resistance. There's always room for mavericks. "Frontier towns," for example, "danced to a different drummer." Reno, Nevada, established laws in 1930 that "broke the mold," concerning sanctity and perpetuity of marriage contracts. Liberalized divorce laws that required a mere six-week residency to establish domicile (an essential factor in establishing party "standing" in legal transactions), turned Reno into the U.S. divorce capitol. The U.S. Supreme Court "weighed in" by upholding the "full faith and credit" of "quickie divorces." The die was cast. (Mexico went much further by providing for "mail order" divorces that didn't even require physical presence. The legality of such divorces has endured a "checkered" existence, and are not recognized by many jurisdictions.)

Las Vegas and Reno also became the "maverick" jurisdictions permitting casino gambling. The state has also authorized legalized prostitution–typically a criminal activity–in set-aside locales. Delaware has been the state of choice for incorporations, because of the favorable terms accorded to companies "registering" there. Some heavy polluting industries have flocked to jurisdictions where costly environmental controls are less onerous or "environmental sinks" (low levels of prevailing pollutants) enable harmless dissipation of discharges into ambient surroundings. Other entire industries have moved from high labor markets to low-wage areas–textile abandonment of New England for the Deep Southern states, for example.

PATTERNS OF CHANGE: NATION-STATE PRECURSOR ACTS

Precursors Define and Prove the Way. Response by nation-states, as well as state and local polities, occurs in predictable patterns. Precursor post-industrial nations are the most venturesome, experimental, and progressive. They also are most likely to develop and implement longer ranged visions and accomplish them. Principles proven by one nation spread from one country to the next. Once a first tier of 4-8 earliest adopters have moved on a particular situation, the experience and successes (or failures) amassed stimulate similar responses elsewhere. After actual implementation somewhere, the principle(s) involved ceases to be merely theoretical. Implementation moves proposals from theory to practice, from concept to reality. Practical experience tests the mettle of new concepts, and weeds out unsound ones. As new concepts undergo "field testing," validity and desirability of particular approaches for coping with matters tests and proves its mettle. Sound answers tend to be quickly emulated elsewhere.

Precursors: Leaders and Laggards. The usual S-curve patterns of adopting new laws also pertains to nation-states. These "patterns of change" commence in Scandinavia and Western European nations. Responses there almost always foreshadow what's ahead for the U.S. Precursor jurisdictions, corroborated by innumerable timelines arrays, currently include: Scandinavia (Sweden Norway, Denmark, sometimes Finland), Western Europe (Netherlands, Germany, Switzerland, France, U.K.), and North America (U.S., Canada).

Additional nations sometimes included among early adopters include: Australia, New Zealand, Japan and Iceland. Eastern European nations (Poland, the former Czechoslovakia, and the former USSR) also have been leaders for some issues, such as environmental matters (pesticides, synthetic food colors, electro-magnetic field hazards). Lesser developed nations in Asia (Bangladesh, Nepal, et al), and Africa (Burkina Faso, Zaire, Ethiopia, et al) consistently are among the laggards. Rank ordered adoption of legislative solutions typically follows the sequences arrayed in the chart and described here in much the same manner as a string of falling dominoes.

Precursor Shortcut. Sweden and California so often have been the "very first by whom the new is tried," that they provide a forecaster's shortcut. In other words, activities in just these two jurisdictions provide a somewhat reliable indicator for anticipating developments likely to be undertaken elsewhere. Nations positioned later in this continuum of developmental stages have opportunities to assess and alter the sequence and course of their destiny.

First Adopters Vary Over Time. During the previous century, Great Britain and France typically vied for being the first by whom the new was tried. Since WWII, Sweden has consistently been the bellwether country, the one to concentrate on tracking to watch for new developments, policies, and programs.

Sweden's Unique Bellwether Status. The crown prince of Sweden, when I asked him how it was that his country was first to adopt so many innovative policies and programs, gave me a response that reinforced and emboldened my search for pinpointing roots and development of new concepts. Acknowledging his country's small size and limited resources, he stated that they concentrated on monitoring "windows of the world." This included carefully following leading research activities, concentrated mainly in a few intellectual urban centers with vast funds to pursue ideas—New York City, Tokyo, London, and a few other such obvious centers of influence were mentioned. It was by studying

the best ideas generated there, carefully considering them, and proceeding to consciously adopt them in order to advance Sweden's well being that "good" things got done. Furthermore, recognition over the years for being a world leader in progressive ideas, tended to stimulate the leadership to do more – bootstrapping. It was that simple, and that obvious.

Centers of Civilization Vary Over Time

Throughout history as many as 40 different empires hold forth as the dominant force in advancing progress among nations. Each center of influence in this succession was, in effect, a "bellwether of change." Slowly at first, the diffusion of new findings spread to other nations. Major influences created in these countries made their mark on the history, development and progress of humanity. Currently the U.S. holds forth as the dominant power in the world. That is not to say that the source of major currents of change necessarily originate there. In fact, the thesis of the Molitor Model of change is that during "a season of history" one or more, often a tier of nations set the pace, pave the way, and through their example confirm developments, policies, programs and inventions of all kinds worthy of emulation elsewhere.

Rise and fall of great civilizations, previously involving thousands of years, now span hundreds of years. Lessons of history show that a succession of jurisdictions temporarily have been acknowledged as leaders of the civilized world. Mesopotamia was dominant for nearly 3000 years (3600-539 BC). Egypt predominated for nearly 2,000 years (3200 BC–200 AD). Phoenicia, India and China were other early centers of global civilization, as were Greece, Rome, Turkey, Persia, and other jurisdictions whose footprints in the shifting sands of time have been blurred. Western cultures predominated the planet over the past 500 years, or so. Over the course of recorded history, Eastern nations have overwhelmingly dominated global affairs and appear poised to do so again. China and Pacific Rim nations seem destined, once again, to become the center of global influence before the end of the next century.

Diffusion Patterns. Lead-lag relationships between tiers of leading, following and lagging jurisdictions provide a telltale indicator of response time in late-adopting jurisdictions. Once ascertained, these timing sequences help to gauge approximate response by laggard nations on similar issues.

Diffusion of Social Welfare Laws. The U.S., along with other post-industrial nations, is an early adopter. Rarely, however, is it to be found among the vanguard of earliest adopters. When it comes to social welfare benefits, the U.S. takes a "back seat" to far more socially progressive Western European and Scandinavian countries. Prior to the turn of the century, early adopting nations were some 40-70 years ahead of similar action being taken by the U.S. More recently, the lead-lag timespan has dropped to around 30-40 years. Old age insurance programs in the U.S. trailed Germany by 46 years—1889 compared to 1935. Worker injury assistance and workmen's compensation assistance was established in the U.S. 37 years after Germany inaugurated this bold new (back then) program—1884 compared to 1921. France's spearheading of unemployment insurance preceded U.S. emulation by 30 years—1905 compared to 1935. More recently, national hospital planning laws in the UK and Denmark preceded U.S. similar response by 20 years—1946 compared to 1966. Even slavery, initially abolished by France, was not ended in the U.S. until 68 years and a civil war later—1794 versus 1862.

National Health Insurance–General Revenue Financed with Universal, Comprehensive and Compulsory Coverage. The U.S. continues to be the last holdout among all the industrialized nations regarding universal, comprehensive, compulsory healthcare insurance. America's inching step toward

national health insurance occurred during 1965 when Medicare was adopted. Applying the 30-40 year evolutionary lead-lag pattern for social-welfare matters, suggested 1995-2005 as a time slot during which implementation might come about. The Clinton administration, in one of its mightiest (and most significant political setbacks, took its best shot and lost the battle. Proving, once again, that "timing is everything." (My estimates, assuming further collapse of diffusion time leads and lags, indicates that the U.S. may shift from insurance-based funding to general revenue financing for healthcare sometime around 2010-2020.) Time will tell.

Speedier Diffusion. One basic principle in cross-cultural and historical time series is that some one or a few jurisdictions have to be first and others follow. Throughout history a few centers of influence always have led the way. There will be early and late adopters in these cycles of diffusion. Human activities of any kind do not flow evenly. They never have, and they never will. Nations do not move all at once in lockstep fashion.

Leads and lags between the first adopter nation(s) and U.S. federal response that used to involve a century or longer, dropped to 30-60 years during the early-1900s, and since the mid-1900s comes about in 1-30 years.

U.S. social welfare programs still tend to lag others by as much as 30 years, or more. For environmental issues prior to the 20th century the lead-lag time spanned 60-90 years; by the early 1900s it ran some 20-30 years; and currently tends to range between 2-7 years. Diffusion time for consumer policies and programs may be as short as 6 months, with a modal average of 4-6 years.

Diffusion: U.S./State & Local Jurisdictions and Foreign Jurisdictions. Not only do state and local domestic precursors often respond before the U.S. federal government, but foreign nation-state precursors–often acting at about the same time as domestic state and local jurisdictions—also tend to precede U.S. federal government response to public policy questions, typically by as much as 1-15 years.

CHAPTER SIX

Advanced Methods for Decision Makers and Thoughts for the Future

The essays in this chapter describe new and unique ways to look at how we think about and deal with situations in the future. In the first essay, "The New Strategy: Using the Operational Level Differently," Commander Alfred Elkins makes a case for revising how to plan and execute operations. He also explores how to think about that revised method, and he looks at how operational-level forces should be organized. In the physical and non-physical networks of the altruistic and the insidious—as well as everything in between—he argues that the United States should have a hand in exploring a new approach, one of setting conditions at the operational level. His approach is an inventive and fundamentally different proposal than "achieving effects"; it leverages complex systems thinking, cognitive science, advancements in technology, and novel practices and organizations. His notion of setting conditions involves perturbing an environment, and exploring or exploiting those disturbances long before a context arises that makes the need for such action obvious.

His decision method is called VAST (Vantage Point, Aperture, Scale, and Timeframe) and incorporates its elements for utility in the three types of decision environments:

- Solving a problem
- Dealing with an evolving context
- Setting conditions for later exploration and/or exploitation

Commander Elkins describes Vantage Point as the set of points of view, in addition to his own, that the decision maker will take into consideration in making decisions. Aperture is the range of feedback that the decision maker is prepared to consider. Analogous to a lens, it's an indication of the decision maker's approach to leadership at any given time. A wide aperture indicates a micro- or control approach, concentrating on a wide range of details and on the path to the objective, and less concentration on the long-term objective. A narrow aperture indicates a macro or command approach, focusing on relatively few details while maintaining a clear focus on the future objective. He notes that scale can be interpreted as the size and scope of the operation—the number of forces and missions, the geographic size of the are under consideration, or the level of war—tactical, operational, strategic. In the Elkins VAST paradigm, timeframe is a window in time representing the period of execution that results from a decision or a set of decisions. The author notes that VAST can also help decision makers by aiding in associating large amounts of feedback. By definition, the accumulation of actions and their consequences both share responsibility for the setting of conditions. He argues that normally we arbitrarily choose a contextual time and space as a starting point—the initial conditions, the ones we have "set." "Setting conditions" refers to the ability of the force to directly explore or exploit conditions that it has established by dropping a pebble into the water and watching the ripples, and

the interaction of those ripples with other intended and unintended augmenting, countering, and crossing ripples from other players in the political, military, economic, social, and informational circles. Associating the feedback in a meaningful way would help our force to distinguish the signal of the conditions they set from the noise of all other conditions. Using the VAST framework would help achieve this association.

He also argues for a new organizational design that he calls "Thematics." This design is based on themes that are universal to every human endeavor. According to his construct, the thematically designed organization seeks early and continuous "intervention" at the operational level, in ways that are not inconsistent with policy, strategy, and tactics. The thematically designed organization must *value* continuous interventions (exploration and exploitation) in the environment at the risk of not seeing "effects" until the future—a future which, he argues, we can neither accurately predict nor control.

The bottom line in Commander Elkins' essay is that the conditions-setting approach to conducting operations, the VAST decision-making framework, and the Thematic organizational structure that stresses "execution today for conditions tomorrow for future results you have loosely defined" are a new trinity and offer the Joint operational-level force an advantage in a level of war in which art and science coexist, but in which art has been less valued. He ends with the cautionary note that overtly incorporating the demon uncertainty, and a way ahead in its murkiness, renews the artfulness—yes, artfulness—of the force.

Dr. Noel Hendrickson authored the next essay, "Counterfactual Reasoning and Structured Scenario Fusion: How to Integrate Multiple Independent Estimates into a Single Projection." In it he offers specific principles that analysts can apply to integrate independent estimates with greater rigor and reliability. He notes that integrating distinct estimates is precarious because one cannot simply combine individual results. Each estimate has its own unique purposes and assumptions. Thus, in synthesizing estimates, these different assumptions may conflict. Hendrickson cites the example that a projection about the consequences of a nuclear Iran might have made assumptions about our being able to purchase oil from Venezuela, and projections about the consequences of an even more hostile Latin America might have made assumptions about our being able to purchase oil from Iran. But, each of these assumptions would not make sense if the possibility imagined in the other scenario came to pass. Furthermore, he notes that at an even more basic level, logicians studying counterfactuals have long known that it is a simple fallacy to reason from 'If A were to occur, then B would occur' and 'If C were to occur, then D would occur' to 'If A & B were to occur, then C & D would occur.' Therefore, an analyst who seeks to fuse independent scenario estimates risks not only mutually undermining assumptions but also basic logical fallacies. Hence, he believes there needs to be a way to do structured scenario fusion: a formal method for integrating multiple independent estimates into a single projection.

Dr. Hendrickson notes that counterfactual reasoning has been a subject of some major recent academic investigation. Philosophers have explored the truth conditions of counterfactual statements, as well as the logical relations between them. Historians and political scientists have developed procedures for counterfactual thought experiments to test causal hypotheses. And, social and cognitive psychologists have described the most common human counterfactual thinking processes. In his opinion, none of these projects have directly engaged the difficult challenge of how to integrate independently formed assessments. In response, he proposes the first formal theory of scenario fusion, which draws from

the resources of all three realms. In particular, he demonstrates that the challenge of scenario fusion is directly related to another aspect of counterfactual reasoning: selecting intermediate states. In counterfactual reasoning, he believes that once the antecedent conditions have been properly specified, analysts have to fill in the details for the period between those antecedent conditions and the time of the outcome they seek to discover. In selecting those intermediate states, they have to draw from what is already independently projected for that time period much like one has to do in fusing scenarios. He notes that several strategies have been developed for testing whether a particular projected event is reasonably incorporated including employing probabilistic relevance, causal efficacy, and supporting counterfactuals. In his essay he explores the arguments for and against each technique, and draw from the results to create a full method for structured scenario fusion. With it, he notes that analysts can bring together independent estimates without affirming conflicting assumptions or committing logical fallacies.

Dr. Barton Kunstler in his essay, "Rethinking Thinking: Three Methods for Achieving More Creative, Responsive Strategic Intelligence Analysis," examines the area of foresight analysis. He proposes three inter-related models that, taken together, represent an alternative to traditional approaches to foresight analysis. The Cleisthenian Model (CM) takes its name from the ancient Athenian politician Cleisthenes, who in 506 BC devised a new constitution for the city-state, a scheme radical in its democratic and integrative character. Cleisthenes' system placed each citizen within an interlocking grid of ten civic associations and three regions of natural allegiance, thus guaranteeing that each person would be working with members of groups with whom they normally shared no common interest as well those with whom they shared traditional interests. This integrated system transformed authority relations within Athens, and propelled Athens to cultural and military leadership of the Greek world.

Dr. Kunstler describes a second approach, The Hothouse Effect (THHE), which refers to the factors and methods of highly creative groups as they have been evidenced throughout history and in modern organizations. He noted that THHE has found thirty-six consistent variables common to groups that experienced an explosion of often world-changing creativity. He believes that THHE offers a unique model of organizational development and intellectual capital which is best suited to teams that operate at a particularly high level of cognitive efficiency. He avers that it also reinforces the Cleisthenian Model by emphasizing multiple functions for all individuals in the group, critical self-analysis of disciplines and methodologies, and attention to internal dynamics that demand a more dynamic, open processing of ideas than do traditional organizational structures.

He also describes the Converging Uni-Modal Approach (CUMA) that resides within a single individual or several individuals working closely together. The notion of "convergence" becomes operative when one such initiative converges with another. Although the individuals involved will generally represent an organization of some kind, the exercise of foresight emerges out of the inspiration of individuals rather than a pre-designed procedure, thus enabling the individuals to operate unencumbered by institutional structures.

His paper notes that all three systems can be described by recourse to the science of networks, which demonstrates recurring patterns in the formation of information networks in organic, inorganic, and abstract systems. The CM provides for intensive cross-linking of hubs so that the usual power laws governing networks are violated in favor of a more sustained inter-penetration of perspectives stemming from each hub. THHE also violates the power laws by cultivating methods for enriching

the output of all hubs within a network and, in effect, increasing the signal output and signal-to-noise ratio of messages traveling along the links. CUMA focuses on the most strategically placed hubs and looks for their ability to galvanize links with the greatest potential differential between the other hubs in the network.

Taken together, the three models can radically transform the internal culture of a knowledge-based organization, be it Homeland Security, think tanks, analytic groups within entities such as the Defense and State Departments, or groups—such as interim governments—charged with fusing a new governing entity out of widely disparate interests. They all rest, to an extent, on the general notion of galvanizing systems' latent intellectual capital, and all represent a challenge to standard operating procedures (SOPs) in most organizations. His conclusion notes that their value lies not only in the opportunities for implementing suggestions derived from the models, but from the inherent critiques they engender of SOPs, wherever they may be identified.

Mister Bruce LaDuke, in his essay, "Future Decisions: The Dynamics of Society: Knowledge, Social Context, and Economy," argues that there are three dynamics that contribute to the current state of any society or social division. These include Knowledge Advance, the Social Context, and Economy. He notes that when any one of these dynamics is weak, or when synergies between these dynamics are weak, a variety of social imbalances emerge that cause conflict.

He believes that knowledge advance has arisen as a driver of change in our world. As knowledge advances logarithmically, it is also converging. He describes the final end of a simultaneous advance and convergence as singularity. Singularity will be realized as artificial knowledge creation and will be the culmination of our increasing understanding of knowledge working models. He notes that as we move toward a single model of knowledge working, there will be sign posts along the path, some of which are obstacles that will need to be overcome. For example, there will be an escalating conflict between open source and intellectual property. He feels that eventually a single knowledge working model will emerge that is based on roles for working knowledge and not on the knowledge itself. The culmination of understanding these roles is clarity of the knowledge creation process, which is the key to knowledge working, future knowledge models, and to the convergence/singularity. But as knowledge continues to advance logarithmically, it is putting pressure on social systems and industry. As such, the term "Transformation" is being popularized and is a reaction to increasing knowledge advance.

He feels that social transformation implies a complete rework of social systems to help them keep pace with advancing knowledge. In the process, a new form of community, governance, and leadership is emerging. Industry is also being battered by change and volatility stemming from knowledge advance. Industrial transformation will demand the integration or converging of industrial disciplines and practices. Industrial integration, because it is more efficient and effective and because it enables swift transformation, will become a requirement for success within industry.

Mr. LaDuke concludes that strategic foresight is rooted in sound decision making and requires four components. Holistic decisions must be based on exhaustive information gathering and structuring of questions, have clear triggers for communication or performance, be transformational as needed, and be socially-balanced.

Dr. William Perry, in his essay, "Security Sensitive Technologies in Academia," outlines a model that can be used to identify emerging threats that can combine with the intrinsic vulnerabilities of our open

system. He notes that we live in an asymmetric threat environment. Among the threats is the active targeting of our universities and research institutes by foreign intelligence services. Unfortunately the means for identifying vulnerabilities and threats associated with students, faculty, and researchers are lacking. Yet, the information needed to identify the potential threat vectors that seek to exploit our vulnerabilities is publicly available. Agencies of the federal government may be limited by statute or other sensitivities from actively fusing or developing a knowledge base that can be used to recognize over-the-horizon threats and vulnerabilities. University or State employees, however, are able to collect, assemble, and analyze open source information without legal restriction.

Dr. Perry describes the role of a university professor as a "three-legged stool": teaching, service, and research. A tenured university professor would be able to use publicly available information associated with sensitive on-campus research for the purpose of risk analysis. He believes that such an effort may be considered as either service or research. It would facilitate the work of professional analysts if this rich source of information could be crystallized and made available for query to assess threats and vulnerabilities. Weak signals that are detected early could be weighted and then elevated as the fusion of additional data becomes available. He describes the nature of the open source information that is publicly available for analysis in universities and research institutes and demonstrates how such information might be fused and weighted for use as an analytical tool.

Mr. Timothy Smith in his essay, "Predictive, Network-Centric Intelligence: Toward a Total-Systems Transformation of Analysis and Assessment," argues that intelligence assessment could achieve substantial predictive power to a degree that greatly exceeds today's standards. In his essay, he demonstrates both the need for such a revolution in capability and the feasibility of achieving it, and he outlines a strategic program plan to do so. He examines ways to modernize and transform U.S. intelligence analysis and assessment capabilities, and to integrate the intelligence community (IC) into a seamless distributed architecture of analytic collaboration based on shared tools and data. He argues that there are highly practical and affordable means available that substantially to reduce the risk, rate, and severity of intelligence failures. No new technology is required, nor any vast new collection capability. Intelligence failure has been shown to arise primarily in the analytic phase of the intelligence cycle, and in decision-makers' use of the analytic product. Here, both the problems and the solutions are largely cognitive and methodological. Intelligence failure arises from inadequate organizational processes for both creative and critical thinking—the "right- and left-brain" functions. He reasons that what is required for reliable warning and maximally effective decision support is a simultaneous improvement in capabilities at opposite ends of the spectrum: in imaginative hypothesis generation, on the one hand, and in rigorous hypothesis-testing on the other. There is no mechanical formula for enhancing creativity. However, modern business has found a highly fruitful technique of "off-site" events that involve collaborative teaming and facilitated brainstorming. He believes this interdisciplinary teaming breaks the hold of groupthink and stimulates dynamic interchanges as participants learn new perspectives on old problems. Brainstorming frees people from fear of criticism, and professional facilitation energizes the team and propels high tempos. He notes that the result is a fertile environment for "thinking outside the box" and exploring possible new connections among "dots."

Mr. Smith notes that team collaboration would offer rich benefits in expanding the range of adversary actions and alternative futures that are considered. However, it cannot subject hypotheses to truly rigorous tests. He believes that the only method for that lies in scientific experimentation. The

scientific tool for experimentation where one cannot run real-world tests is modeling and simulation (M&S). Formal models demand that we specify all our assumptions and beliefs about actors, groups, environments, relationships, and behaviors. Simulation explores the implications of these assumptions, comparing the outputs with theoretical predictions and real-world data. Discrepancies dictate that something has to give; there is an error in our assumptions. This then forces re-analysis. In his opinion, it is, in fact, the only way to compel a strategic re-assessment short of actual warfare. Team collaboration and computational M&S could be combined into a mutually reinforcing cycle that would operate not as a circle but as a spiral—an organizational learning spiral. Both processes can be combined in an all-source fusion analysis laboratory built around two rooms. The "right hemisphere" of the lab would be an 'electronic meeting room' for interagency off-sites by IC analysts (regional and functional subject-matter experts.

Mr. Smith proposes that this lab be called the Intelligence Training, Assessment and Simulation Center (ITASC), and that the entire learning spiral be called 'computational collaboration.' This ITASC would constitute the core node for what could become an IC-wide architecture of such labs, one in every all-source and single-source agency and command. Computational collaboration could enable wide-ranging and highly dynamic intelligence preparation of the battlespace that explores multiple alternative contingencies and responses in the years and months leading up to hostilities, and then surges to rapid optempo in the weeks and days just before and during conflict. He notes that this capability would provide the kind of planning foresight the armed services have not seen since the renowned predictive assessments produced through tabletop wargaming at the Naval War College in the 1920s-30s. 21st-century computational collaboration, however, can provide predictive power superior to that of the 1930s by at least an order of magnitude.

The New Strategy: Using the Operational Level Differently

Commander (Ret.) Alfred Elkins

An analyst makes a case for revising how to think, how to plan and execute, and how the operational-level forces should organize.

Hint: it's not componency.

Americans tend to lavish praise on grit in combat (and well they might), but do not as often admire the winner who employs other national means. Think of the transport pilot, the salvage diver, the treasury agent who's really a CPA. Quick—if you're over fifty, name five quarterbacks from 1966. Most of you can. Now, name five linemen. And Jerry Kramer doesn't count—he had that book we all read.

"When you subdue your enemy without fighting, who will pronounce you valorous?" Sun Tzu wrote two thousand years ago. How true. Under Napoleon, hundreds of thousands died. While copious writings make vivid every detail of his life, the memory of French General Hubert Lyautey is distant at best. Lyautey, of course, was a lineman. Lyautey organized his forces to accomplish the mission of serving France's interests: as a colonial enforcer in the early 1900s, he reduced his fighters' footprint, organized liaisons with local tribal leaders, and used superior intelligence, effective strategic communications, and economic dealings with locals to successfully establish Casablanca as a seaport. Lyautey, a somewhat disillusioned veteran of the Great War, recognized that better firepower is effective versus a "cooperative" like-kind enemy only—***and at the right time only—that is, during outright combat.***

Not only is it less glamorous, it is much more difficult to consider even *how* to organize or what that organization would do for ill-defined or open-ended objectives during periods of non-combat. With retrospective insights, historians may identify pathways and causal logic for success in organizational design, but most research into organizations and decision making overestimates the coherence of decision-making processes.

I grouped the concepts limned here under the somewhat hubris-laden title *The New Strategy* because they are designed to change the character of strategic thinking. The Nobel Prize winning economist Herb Simon pointed out an aphorism in a lecture he once gave: "There is a saying in politics that 'you can't beat something with nothing.' You can't defeat a measure or a candidate simply by pointing to defects and inadequacies. You must offer an alternative." The New Strategy (a set of concepts) offers an alternative—in the way of an addition—to the current operational-level Joint force approach, execution, and decision making. It is an alternative that is not a substitute for today's approach, but which is integrated into the existing approach, execution, and decision making. The hypothesis presented is that sole existing approach can be made more efficient and more effective by incorporating the New Strategy.

Before I delve into the constituent parts of the New Strategy, I offer this as a value proposition. By making changes to our philosophical approach to the world, to how we make decisions, and to our

operational-level organizational structure, we can increase efficiency and effectiveness of the force—and of the entire national government—over a much wider timeline that would improve the force's ability to influence, its ability to cope with uncertainty, and its ability to exert control if necessary. These changes would allow the operational-level force to operate in any environment in ways that make the things it does more accessible for exploitation. Not adding these concepts means less efficiency during non-combat periods and less effectiveness during combat. The New Strategy, therefore, is like joinery when considered with our present way of doing business—whether it ends up as a dovetail, a rabbet, or a dado, the pieces fit together and provide synergistic strength.

SETTING CONDITIONS: AN APPROACH

The first element is an approach. The notion of setting conditions is to routinely and continually make purposeful decisions about the environment, and explore or exploit the conditions you set ***long before a context arises that makes the need for such action obvious.*** It is the approach of setting conditions, as opposed to an effects-based approach, that encourages decision makers to explore and exploit the non-linearity that is inherent not only when the future is murky and dark, but perhaps even when it is pleasant-seeming. This approach is different, fundamentally different from the concept of "achieving effects." Working to achieve an effect is an appropriate approach when there is a problem to be solved. Achieving effects also is appropriate when an evolving context is maturing, but when there's still some sugar to be converted to alcohol.

Studying mathematics is setting conditions. Studying economics is an effects-based approach. Mathematics allows a student to pursue myriad careers. Economics is a focused specialty. Mathematicians can become economists, or sociologists, or physicists, or botanists. It is a tautology, but an economist is, well, an economist.

The predominant approach by the operational-level force, that of being world-class problem solvers, may be dangerous when applied to distant and uncertain futures. The solve-the-problem approach can logically lead decision makers to view uncertainty in a binary way—to assume that the world is either certain, and therefore open to precise predictions...or uncertain, and therefore completely unpredictable. Either may lead to option closeout or to historically viewed blunders. But we neither are seers nor passive actors in the world—in fact, we wish to mold the future, or, at least, meddle in such undertakings. This idea, that we want to involve ourselves in the future, which has at least some of its roots in the study of complex adaptive systems, forms the basis for what I am calling the concept of setting conditions. By employing a conditions-setting approach, we explicitly recognize that the complex system of world events is a system that is sensitive to initial conditions and that there are no independent actions or events. We will try to "set" conditions as a continuous process, and do so with capabilities that link those conditions to the exploration, exploitation, or abandonment of subsequent contexts.

While this may seem to be a tacitly held belief, most of the activities of the admirably integrated U.S. armed forces are not directly involved in setting conditions that can be exploited in the future. This is not a new phenomenon. A RAND Corporation report in 1989 identified that this idea was "nowhere to be found in the typical DoD [Department of Defense] planning study." Today's operational-level force asks: "what do you want me to do with the assets I have in my assigned physical domain?" The New Strategy-oriented force asks: "what do I need to do to set conditions?"

Today, the U.S. military organization design at the operational level, which has become increasingly Joint and function-oriented since 1986, is based principally on expertise in assets and spatial domains. The actions of our forces in time and space—the operational paradigm—primarily are to measure asset performance and to attempt to ***control*** the physical and information environments.

For the strategic decision makers that those at the operational level serve, however, it is not about black and white control. Decisions are the human component of a system of systems with inputs, processes, outputs, feedback, chance, and controls—all with dynamic, multiple-path interdependencies. We never know the totality of those interdependencies nor the values between them. Can we simply continue, then, to use previously winning, control-based, operational-level execution in support of loose strategic goals in uncertain futures? Said another way, this sounds worse:

> *How can we make decisions in advance of when the interdependencies of all the actors* ***have yet to happen?***

So, here's where we are: complex systems are sensitive to initial conditions in the physical world, that is, end states are highly dependent on the starting conditions of a system. (Keep in mind that the point at which "starting conditions" is determined to be, especially when applied to social systems and their intra- and interactions, is arbitrary.) Moreover, just as the scale of victory does not increase proportionately with the size of a military force, knowing how a complex system functions at any moment is no guarantee that there can be predictions about the future of the system. Inputs may be imperceptibly small, depending on the scale of encounter with those inputs, but may create large systematic changes recognizable by most that come into contact with the system. These complex mechanisms are of many kinds: some include additional control mechanisms that stabilize their dynamics, such as the feedback loops in human muscles or in aircraft control surfaces. In systems that involve ***human behavior and free will***, setting conditions postulates that continued, cumulative-based decisions can introduce changes—our own ripples into the pond—and that those changes can be more accessibly explored or exploited as they develop and interact with other induced or natural changes by other elements in the social and natural systems.

The Joint Force should engage in setting conditions *today*, rather than at the precipitating point of crisis. The Joint Force would continually assess the sets of conditions in play, as part of its daily routine. Because of this continual interaction, a conditions-setting approach is a moderating influence on simply "more data" or on making attempts to predict effects beyond tactical effects. The Joint Force would then put conditions to work in the operational environment. Such an approach would use locally optimized behavior that could be aligned later in time in a non-linear, approximate way to exploit conditions. What's a locally optimized behavior we're very familiar with? Tactical expertise. Sortie rates. Search plans. Sensor deployment and optimization. Four-dimensional (three physical plus time) deconfliction. Suppression of enemy air defenses. Logistics planning. Covert and clandestine efforts. Among scores of others. And non-linear approximate exploitation later in time? BODYGUARD and OVERLORD. The "left hook" of DESERT STORM. The Spartans at Aegospotami. The silicon microchip and Amazon.com. Greg LeMond, after being shot in a hunting accident, loses three-quarters of his blood, but comes back to win the Tour de France two more times—he was able to exploit his locally optimized behavior in a non-linear way.

The locally optimized behavior shows that our force today is, in fact, good at what it has to do when it is faced with tasking or a developing problem. American forces are action-oriented. The trenchant

terminology—"rapid, decisive operations," "shock and awe," "effects-based operations,"—certainly does more than hint at an appreciation for unambiguous, resolute military solutions. In fact, decision makers that exhibit patience, which is not a particularly American trait, might be perceived (both up and down the chain of command) as having a lack of initiative or a lack of decisiveness. But many challenges in the future are likely to be marginal to U.S. interests, and might not have a tidy, durable resolution before American political staying power dissolves. Under such conditions, political micromanagement and "fine tuning" are likely to dominate, as administrations respond to outcries for fewer casualties, fewer mistakes, no loss of national (or party) credibility, and, absent a near-threat, less U.S. involvement.

So, today's operational level actions—the execution of the force's experience and expertise—are about controlling. The New Strategy takes a different tack; it leverages the force's experience and expertise to include *coping*...all day, every day. There are times when "controlling" should be regnant, but the force that operates outside of combat should have "coping" at center stage.

VAST: A DECISION-MAKING FRAMEWORK

How do we know what conditions to set? A decision-making framework must be designed to help decision makers of all stripes have a better idea of *what conditions to set and when*. This framework employs a comprehensive approach that can work in all decision environments, from solving problems to dealing with evolving contexts to setting conditions. It is different than today's decision-aid and decision-support thinking and systems because of how it is entwined with the concept of setting conditions.

Decision makers who are vexed with combinatorially near-infinite contexts or opportunities might consider what and how to set conditions in a strategic framework of four elements—vantage point, aperture, scale and timeframe. These four elements will be particularly important in making decisions that can be closely coupled with feedback as events evolve, and feedback is essential in crafting *today's* decisions that will be able to stand up to complex, highly uncertain *future* periods. "Standing up" to complex, uncertain periods means that VAST helps decision makers choose options that are oriented around exploring or exploiting conditions that the decision maker explicitly sets, as opposed to options designed to control processes or to measure designated "effects."

How would this be done? Think about the range of options for, say, 10 or 20 years hence. Not just the range of options for what the world will look like, but what the United States might want as goals and what options the United States might design approaches around. Think about what the United States would think are its centers of gravity, or its critical capabilities, or its critical requirements—and what investments in all resources—and home and abroad; cognitive, informational, physical—that it might employ.

Now, what orders do you give the force to execute tomorrow at 0900 in support of those goals?

What rules do you follow? Are you a data collector? Under the uncertain period we are discussing—where the range of possibilities is seemingly endless—acquiring and making sense of data would be a daily, important activity for decision makers at many levels. This feedback is both produced by decisions and produces more decisions. But gathering and creating meaning from feedback does not directly lead to accurate predictions about the future. For not only can we NOT collect all the "right"

information, but we still need to know what all the "right" decisions are for the conditions in play, or what wild cards could and would be played and when. Maybe you're a targeteer. You'll have a different set of rules. Or a logistician. And so on.

Okay, let's break it down into something simpler. What do you tell your people to train to? What do you buy? What do you think you should anticipate? How do you sense the environment? ***Make sense of it?*** Are you following trends? Thinking counter-trend? Do you know what U.S. policies will be? Or the strategy? What level of conflict are you thinking at right now?

Most of you—admit it—are thinking at the strategic level in your well-educated, well-read, and cutting edge-analytical minds.

I suggest that thinking ***at the operational level***—the executional and intellectual *middle*—should be the first step, because people, stuff, and information always will need to move in time and space. Always. Even in uncertain futures. And to those computer and data scientists who believe that war is fought in darkened room by fellow digital travelers, cyberwar is no exception, because cyberwar, like any element in small "w" warfare, requires time and space to create value.

But what's the significance of the term "uncertain future"? Think of decision space as a cone. During far future periods—the wide end of the cone—data has less fidelity and less importance in the sense of planning for that future than a range of goals a decision maker desires to set, because of the unreliability of predicting how the data, its combinations, and its later consequences will "play out." The decision maker thinking about the far future context is more interested in making ***investment decisions***, and how those investments might be diversified, how to prevent option close out, and how those investments can be explored, exploited or abandoned. At the smaller end of the cone, or near-term events, decisions also have to be made. Here, exploration or exploitation of previous, current, or incoming data can be either responded to, or driven toward a scenario requires a comprehensively-thinking decision maker. Another way of expressing this: when the set of desired outcomes or consequences are relatively finite (normally in the near term) we want to prevent solutions that are predicated on single points of failure.

I used the term earlier: "long before the context makes the need for such action obvious." That might sound like a claim for a system that predicts and recommends. VAST is neither such a concept nor a system. VAST takes the concept of emergence—novel, correlative context that arises from a set of initial conditions or properties, with the novel context not irreducible to its constituent parts—and applies it to a decision-making framework. VAST is overtly goals-based, rather than capabilities-based or analysis-based. It does ***not exclude*** the decision maker's capabilities of resources, personnel skills, physical domains, organizational hierarchies, and specific tasking. ***VAST subordinates those aspects.***

VAST is employable in three types of decision environments:

- Solving a problem
- Dealing with an evolving context
- Setting conditions for later exploration and/or exploitation

While the VAST method is at its highest utility in the setting-conditions environment, it is useful for the first two because of its comprehensiveness and ability to help decision makers see the accumulation of historical context.

THE ELEMENTS OF VAST AND DEFINITIONS

Vantage Point: Vantage Point is the ***set of points of view***, in addition to their own, that the decision-makers will take into consideration in making decisions; it is the observer's point of departure for weighing decisions. Is the objective or conditions to be set seen from the point of view of an adversary? From one's own? From an ally? Multiple vantage points? Vantage point consideration would include heuristics, normative decision making and prospect theory.[1] Deploying, managing, exploiting, reprovisioning, repositioning, recovering, replacing and redeploying (DMER5) remote-controlled or autonomous systems, for example, could be considered as a "decision-support system" from the vantage point of the commander, a "means to inject nodes, weapons, or deception" from the adversary's, and a "roadblock to interdependent decision making" from a coalition partner. As a result of thinking about vantage points, new insights may be gained into how to make (in the above example) DMER5 work, why it has problems, or how changes made to one element in the system may impact other elements (or users).

Aperture: Aperture is the ***range of feedback*** the decision maker is prepared to consider. Analogous to a lens, it's an indication of the decision maker's approach to leadership at any given time. A narrow aperture suggests a decision maker who attempts to seek clarity on a longer view of a situation, perhaps with a clearly-identified end state. A narrow aperture indicates a macro or command-approach, focusing on relatively few details while maintaining a clear focus on the future objective. A wide aperture points to a micro or control-approach, concentrating on a wide range of details and on the short-term paths, with less concentration on the long-term objective. A wide aperture evokes a decision maker who seeks clarity in the short view and who understands that an end state is not necessarily known, but that understanding (possible even controlling) current decisions, actions, and feedback are essential. Thus, aperture is a function of the consequences and impacts of decisions and concomitant system changes. Decision makers must choose a lens in which to understand the contextual complexity.

Scale: Scale is the ***level of examination*** of the decision's influential dynamics and behaviors. Scale may be thought of as the "size" of influence points: the breadth and depth of the operation. It could encompass the number of forces, partners, missions; how large an area; whether examining at tactical, operational, or strategic levels. It might be essential for decision makers to examine different scales of

1. Prospect theory addresses people's *attitudes* toward risk—and how those attitudes may be quite different when considering gains and losses. In an experiment by Richard Thaler, students were told to assume they had just won $30 and were offered a coin-flip upon which they would win or lose $9. Seventy percent of the students opted for the coin-flip. When other students were offered $30 for certain versus a coin-flip in which they got either $21 or $39, only 43% opted for the coin-flip. The issue for VAST is the application of "framing" in Prospect Theory, where mathematically equivalent issues can be misread based on how they are framed. For example, the inventors of the theory, in an experiment, told people to assume there was disease affecting 600 people and they had two choices:

   *Program A, where 200 of the 600 people will be saved.

   *Program B, where there is a 33% chance that all 600 people will be saved, and 66% chance that nobody will be saved.

   The majority of people selected A, showing a preference for certainty. They then offered them another choice:

   *Program C, where 400 people will die.

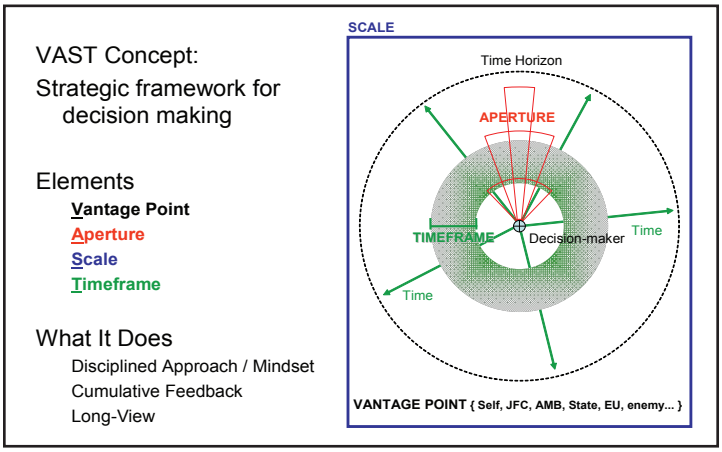
   *Program D, where there is a 33% chance that nobody will die, and 66% chance that all 600 people will die.

   Most people now selected D, seeking to avoid the loss of 400 people. Yet A and C are equivalent, and B and D also are equivalent. Vantage Point, in decision making, must account for framing and attitudes toward risk, especially when considering decisions now for investments (actions, acquisition, threat analysis, etc.) to deal with future uncertainties.

behavior for decisions in scenarios where complex behaviors are not immediately evident, in systems where events are infrequent, or where friction and fog dampen disturbances.

Timeframe: Timeframe is a ***window of time*** that represents the period of execution that results from a decision, or set of decisions. It includes three measurements: the distance (in time) to the time horizon that will encompass the decision, the starting point on that timeline for the decision, and how large a slice of time the decision and its impact will encompass. Consider it graphically: the decision maker is at the origin. The time horizon is the farthest time in the future the decision maker considers relevant to the process. Time then radiates outward toward the time horizon (away from the decision maker). The space within the time horizon can be thought of as the set of possible feedback the decision maker could consider or react to in making decisions.

VAST provides a way to formalize a disciplined approach to planning and execution in an uncertain environment, and helps maintain a mindset of planning for success, instead of planning in case something goes wrong. VAST points decision makers to consider the cumulative effects of decisions. This is essential for recognizing, coping with, and possibly anticipating the emergence of complex or chaotic conditions, as well as recognizing the transitions to new states. Finally, it helps to teach the habits of the "long view" in planning and execution, and to teach how the force might blend the need for setting conditions with its desire for controlling events.



THEMATIC COMMAND: EXECUTING THE SETTING OF CONDITIONS

At the business end of the system: execution via the organizational structure. Thematic Command—so named because it is based on four themes common to every human endeavor—is an operational-level organizational structure that can be better aligned with all elements of national power. A thematically commanded force can not only serve to help marshal other government agencies, but it is explicitly designed to integrate with *any* other group, government or non-government, at any time.

Today at the operational level, the services (with some niche exceptions) are organized for two principal actions: to train for combat operations or to conduct combat operations. Also known as "contingency operations" in Title X of the U.S. Code, combat operations can be thought of as the U.S. focusing its effort on the various applications of military power. Nation states have other instruments for engaging: political, economic, social, informational, legal, geographical. Historically, civilian and military leaders have placed strong value in the *latent* capability of military power. In the years, months, weeks, days, and hours leading to a contingency, funding an expensive military that is predominately focused on preparing for contingency operations (sometimes called D-90 scenarios) is perceived as good insurance and a smart investment hedge against threats from other nations, to honor treaty obligations, or to provide defense from non-state adversaries. I use the term D-90 to refer to the preparation period that takes place nominally 90 days prior to the commencement of combat

operations. It succinctly describes the point on a timeline that is explicitly established by planners: 90 days before the anticipated and normally unnamed day of commencing a particular combat operation. D-90 is part of the time-respected traditional timeline that is used in war plans and many ad hoc operations. It is frequently preceded immediately by "unambiguous warning," which itself is ushered in by "ambiguous warning," terms that reflect leadership's level of understanding of and commitment to dangers implicit in a wide spectrum of activities by potential opponents. These dangers range from routine defense measures to substantial increases in readiness and force preparedness. Those who want even more doctrine training on this topic can read the DoD Dictionary of Military and Associated Terms, or Joint Publication 1-02. I recommend starting with page 542 and reading outward from that page.

But there are problems with employing the "D-90 organization design" in periods of no conflict. First, we do not know for certain when the D-day for a conflict will occur. D-90 is established at a nominal 90 days prior to an expected D-day. D-90 is the trigger point for certain equipment and personnel flows, but the Commander does not, on a daily, routine basis, know when a particular day will be designated as D-day. It may be tomorrow. It may not be for several years.

Second, organizational structuring by component commander is neither efficient nor effective when it comes to the uncertainty of, the large number of, and largely interdependent issues that are outside of the timeframe of D-90, namely, almost all other timeframes! The D-90, one-size-fits-all approach of componency is inadequate—over time, most organizations in most endeavors will face strategy problems that have varying levels of residual uncertainty. (Residual uncertainty is the uncertainty that remains after the best possible analysis has been done. Examples include the outcome of an in-progress negotiation, the likelihood of a terror attack after intelligence assessments, or the performance of technology that is still in development.)

At the operational level, policy and strategy are executed by balancing planning for statistical uncertainty (that is, quantifiable risk) and state-of-the-world uncertainty (where probabilities are not known and where subjective considerations such as context, experience, expertise, and uncertainty about competitors' actions abound). But here at the operational level, i.e., at the crux of the "why" of strategy and the "how" of tactics, the design of today's organization is not overtly about what the operational level commander's actual goals are. ***The current organizational design, where the "art" and science of the operational level should coincide, emphasizes expert performance by similar assets in spatial domains.*** Given the longstanding nature of the current operational level design, a proposal to structure the Joint three-star's team around complicated and uncertain, synthesized goals seems anachronistic in the systems- and acronym-riddled military environment.

The way to approach the anachronism is to make use of the aforementioned themes—specifically, themes that are common to all periods and all decision domains: access, information, persistence and projection. Each "thematic commander" develops a plan that supports the operational level commander. One of the thematic commanders is supported; the other three are supporting. Nothing new here. This would even offer an immediate incentive against empire building, the tendency to want to acquire and maintain control over forces, information and real estate, even when it's inefficient or counterproductive. Because the supported commander "turns over" to another commander when his part of the overall plan is accomplished, ***he has an active incentive to complete his mission and***

relinquish being the alpha dog, at least until he is reassigned as supported commander by mutual decision, by plan, or by fiat.

Operational commanders are not able to control the wind, but are expected to trim the sails to keep the force on a steady course. Functional Component Commanders adjust the sails for one type of wind only—***combat wind.*** Thematic Commanders, operating well before D-90 periods, would be responsible for adjusting the sails continually and observing which sail captured the wind for micro-adjustments to meet their needs (in this analogy—course, speed, economy) over longer time periods. Such activity is a metaphor for perturbing natural and social systems and seeking feedback.

The themes—access, information, persistence and projection—are focused on what commanders would want, not about what their hardware or humans do, or where they do it. Access refers not to kicking in the door, but to continually and routinely developing methods, systems, networks, and knowledge to make inaccessible places, things or actors accessible on demand. Information is, of course, gathering, moving, processing, and protecting data on its way to becoming knowledge and understanding, but it is also the ability to act upon it and to associate it in ways that merge the decision maker, the decision, the context and the system of systems collecting and moving the information. Persistence is an interesting case. Today, the operational-level force is logistics-oriented—a condition since Admiral Raymond Spruance saw it as a necessity from Guadalcanal to Tarawa to Okinawa. The term persistence as one of the themes is used not only in its traditional sense (it does capture the essence of today's logistics, but it also adds value by additional means). These means are methods used today by the best global businesses.

Logistics today for the force is either based on Time-Phased Force Deployment Data (TPFDD) or the Navy method (that is, the Navy brings it onboard ships). Persistence would entail three other methods: first, the operator with the little black book, the Milo Minderbinder with knowledge of and an avenue into sources for everything: a netted communications expert in Kurdistan, a telemedicine specialist in South Africa, a runway in the Seychelles, a fjord expert in Norway; second, things that are hidden (or hidden in plain sight), such as food, fuel, water purification, weapons or other necessities in caches on land and under the sea, using new technologies for concealment, storage, and longevity; and third, making your own, or the ability to use nano-technology and materials to make a host of small parts, ammunition, and other supplies. Lubricants become not completely obsolete, but dependency on lubricants and on their delivery and transport is reduced because of the ease and speed of on-site manufacturing—and the materials for make-your-own are lighter and more easily transportable than lubricants. The last theme is projection—and I refer to physical, informational, and cognitive projection. The projection might be power projection, but it more often will be influence projection, deception projection, perception projection. It would take the finest of Dudley Clark's work and morph it for use in uncertain futures, using deception as a strategic metronome for the future as Brigadier Clark did in his finest work during WW II.[2]

The thematic force would help to enable three strategic postures: exploring and exploiting, where entities play a leadership role in setting conditions or standards, or by creating demand; adapting to

2. During World War II, Brigadier Dudley Clark devised and implemented deception operations for the British Army in the Middle East. He also played a role in deception operations in Europe, including perhaps his greatest triumph, FORTITUDE, which persuaded the Germans to believe that the Normandy landings were a diversion to draw their troops away for a later assault on beaches south of Boulogne. For an excellent treatment of his work and background, see Thaddeus Holt's *The Deceivers: Allied Military Deception in the Second World War* (Weidenfeld & Nicolson, 2004).

the future by using speed, agility and flexibility in recognizing and capturing opportunities in existing contexts; and reserving the right to play in combat by investing sufficiently in the game, but avoiding premature commitments. The "right" strategy might be a blend of these three postures, and would be based on the feedback that the commanders received on the operational playing field as contexts dynamically evolve.

There are some twelve assumptions to be considered for a force that would *add* the structure of Thematic Command to its operational toolbox:

1. Humans continue to be central to decision making
2. Joint and Interagency cooperation continues to improve, and may even be institutionalized from top down and bottom up
3. A powerful, force-wide computing scheme and associated network exist
4. Applications help us associate massive amounts of data
5. Cumulative decision making, action, and feedback begin well in advance of combat operations
6. We cannot *control* the types of people we have or will recruit and grow, nor can we *control* their abilities (native and learned)
7. We cannot synchronize technology to the setting of conditions—even if we manage this, it's not enough to call *this* effort alone, "complete"
8. Nearly all other organizations are designed in different ways than the Joint force
9. Other organizations have different languages (including *foreign* languages!)
10. Organizations learn, innovate, and invent at different rates
11. Organizations have different cultures/customs/sanctions/belief systems
12. There is no "quick" way to develop and sustain trust—which is essential to relationships—*even if we do have interoperability*

Thematic Command would both compensate for and leverage the dynamic quality of key interdependent variables, all of which have unpredictably varying distributions. Those variables include technologies, people, methods and process, tasking, context, and the vastly different organizational designs of groups with which the operational-level force must integrate and work. Thematic Command is crafted to be adaptable under conditions of increased uncertainty and to diffuse into componency as more "control" is required in the environment—e.g., during near-term events, especially D-90 or emergent tasking, with a smaller *range* of goals or contexts. Because of its inherent ability to integrate with other structures, Thematic Command troops would be ready to segue into the Component Command structure during D-90 periods. The relationships established among those who served in Thematic Command would serve as trust-enablers for the individual troops who would move into Component Commander organizations, and build cross-pollination advantage across the components. As componency is a structure that is eminently appropriate for the lead in and for actual combat operations, this may be the most valuable advantage of Thematic Command over other potential organizational designs—its ability to create value as it morphs into a structure that is better suited for combat.

Such an organizational design has a parallel in the business world, that of cross-functional collaboration, or product teams. Drawing on familiar concepts such as the matrixed organization

and small business units, the product-team structure seeks to allocate people across all functions onto teams that manage a particular product or process. The product-team assigns functional managers and specialists to a new product, project or process team that is empowered to make major decisions about the product. Instead of being assigned temporarily, as in the matrix structure, in most cases team members are permanent. This results in lower coordination costs, and with every function represented, it usually shrinks the number of management levels that are needed to approve decisions. Research suggests that product teams formed at the beginning of product development generate functional understanding across functions, which smoothes out early design or process problems. They also reduce costs associated with design, manufacturing, and marketing, and typically they speed up innovation and customer responsiveness (because responsibility is resident on the team). Companies that are learning the secrets of creating such cross-functional teams are winning the battle for global market share and profits—General Motors lost to Ford and Chrysler for this reason, and all three have lost to Toyota.

Thematic Command, with a product-team structure, seeks early and continuous intervention at the operational level, in ways that are not inconsistent with policy, strategy, and tactics. Think, for a moment about a principal measure of effectiveness for an aircraft carrier: sortie generation rate. If we change the scale of the problem, to that of a goal higher than sortie rates, say, to that of ensuring access to a chokepoint during crisis, then the sortie rate becomes a measure of performance, subordinated to the measure of effectiveness. In other words, we could say we were using sortie rate as a contributing factor to gaining access. This is an analogy to Thematic Command. It is explicitly thinking about the design—at a different scale (and timeframe, as previously discussed) from D-90 contingency operations. The functions of what today's **Component Commanders** do, as compared to what **Thematic Commanders** would do is analogous to (component) widgets in the (thematic) toolbox. Thematic Command is an organization that examines what goals the force needs in all cases. During ***not*** D-90 timeframes, this approach offers efficiency because the force can set conditions not only for diplomacy and economic tempos, but for the quiet and persistent preparation that would long precede possible conflict. Force success should be measured by how well it is setting (present metrics) and how well it set (retrospective metrics) the stage for transition to D-90, rather than how good it is at hunting notional submarines or arriving in exercise ballistic missile defense baskets or how many awards for marksmanship it earned or increased sorties from the runway or flight deck. All good things, and appropriate measures for a force that is in combat, but a mere measure of skill sets for a force in the long run.

Historical insight provides another answer why organization structure has been examined at the level only of "moving the boxes around" (on the org chart). Organizations formed during one period typically differ in structure from those formed during another time, and an organization's original structural characteristics appear to persist. One familiar example of a pyramidal structure is the hierarchy of the railroad companies in the nineteenth century—compare it with the flattened dotcom firm, or the social democratization created by ubiquitous, portable, mobile networking and hardware.

A COUPLE OF FINAL POINTS

The New Strategy approaches "what to do" not only horizontally in the organization, but it also stresses that the force sets conditions ***when there are no imperatives or explicit tasking.*** Several questions arise: is the operational level force able to create present ***and future*** value by exploring and

exploiting feedback it receives? Is the force able, on a daily basis, to create opportunities to even get that feedback? Does the force understand—even think about—the cumulative aggregation of context?

While there are no concise, black-and-white answers, I offer eight considerations for employing The New Strategy:

1. Because along a timeline, existing U.S. capability to set conditions is predominately aligned around pre-optimized solutions for pre-selected problem sets, an insufficient paradigm.
2. Because the input of the U.S. is disproportionate to other actors in world events, and it can leverage this fact.
3. Because the U.S. can introduce weak signals by probing, perturbing, or changing existing conditions that it may find unfavorable, not exploitable, or not conducive to further exploration.
4. Because it might be advantageous to abandon existing conditions.
5. Because, as in actuarial science, it is desirable to have certain levels of preparation for a range of uncertain futures.
6. Because response only is inefficient and ineffective over time (not robust). The essentially one-size-fits-all response that the operational-level force can deliver during periods of war is a less than efficient way to operate during periods when there's no war and because it is less efficient, it has net less effectiveness for periods when there is war.
7. Because interoperability and relationships are driven by trust and trust requires time—and this aspect of time cannot be compressed when no clear self-defense imperative exists (a paradox). Setting conditions not only builds relationships, it identifies ways they can be employed. Conducting occasional military exercises or exchanging war college students builds relationships, too, but neither sustained nor sustaining relationships.
8. Because of a desire to design the context tempo, rather than be driven by it.

The changes recommended would take from ten to twenty years of commitment and money. To its credit, the Quadrennial Defense Review recognizes that developing this kind of capacity will require a mental and programmatic shift from a Defense-centric to a National Security focus—a shift in thinking from military combined arms to multi-agency combined capabilities. The executional element—the force—will need a real ability to integrate with all elements, and all functions of national power. These functions, especially as practiced today in places like Iraq and Afghanistan, could be characterized as activities carried out by military actors that are 75% political and only 25% military—at most. Effective policy (and the strategy and operational execution upon which it depends) doesn't just need extra resources and greater political commitment. It also requires a better understanding of global and regional security trends—and of why some conflict prevention and mitigation strategies succeed while others fail.

Here's what is important, after all this: even if the "why" – that is, the policy and strategy—are wrong, incomplete, imprecise, inappropriate, poorly timed, irrelevant...or are based on deception, wrong conclusions, poor analysis, insufficient information…or are complicated beyond belief, or subsumed by friction, chaos, mistakes, negligence, training flaws or mis-coordination…***then setting conditions, using VAST to frame thinking at the operational level, and being organized around themes common to every human endeavor makes for a more efficient and more effective force.*** More efficient because the force, during not D-90 timeframes, has been involved in probing and perturbing

all social and natural systems, instead of simply training for combat. And more effective because the force that must become the Component Commander-driven force during D-90 and into combat has gained understanding through its routine exploration and exploitation of the conditions that it set.

Counterfactual Reasoning, Structured Scenario Fusion, and Futures Analysis

Dr. Noel Hendrickson

1. Preface

What if Iran had nuclear weapons? What if the leftward turn in Venezuela and Bolivia spreads throughout the region? Questions like these pose a major challenge to intelligence analysts, for they involve mapping out multiple alternate futures. But as difficult as that task may be, there is an even more daunting problem: how can the answers to distinct futures assessments be integrated a single analysis? This is the challenge of "scenario fusion." It is a frequent task for senior analysts, since they have to inform policy makers about the larger picture and not only a single area of interest. To make matters more complicated, one cannot simply conjoin individual estimates in order to achieve a reasonable holistic assessment. Instead, one needs to have a formalized method for doing this, a means of *structured* scenario fusion.

In this paper, I describe the purpose of structured scenario fusion by showing its essential need in intelligence analysis. Then, I develop one of the first formal accounts of the process of structured scenario fusion. To do so, I draw an analogy between the challenge of structured scenario fusion and the problem of selecting intermediate states in counterfactual reasoning. I then discuss a theory of how to select intermediate states in counterfactual reasoning and describe its application in the form of nine major principles of structured scenario fusion. And finally, I delineate the promise of structured scenario fusion. In particular, I show how it might lead to a new kind of approach to futures analysis in general.

Since this is not a paper in formal analytic philosophy, I have simplified some of the technical matters to make the ideas accessible to a broader audience. In addition, while I strived to be as rigorous and innovative as possible, I have adopted an additional constraint: the proposals must be "true" to the real-life problems of intelligence analysis. This constraint results in significant restrictions on the time and effort that can be applied to the methods I propose. Thus, I have pared back much of the discussion to provide only what is essential for that context. Readers who have a purpose other than the theory and practice of futures analysis in real-life intelligence analysis should keep this in mind.

2. Purpose of Structured Scenario Fusion

Decision making is ultimately holistic. While we face choices on distinct fronts, the choices made on one front always have the potential to affect another. Forging a new alliance with one nation may antagonize another with whom we have good relations. The consequences of our decisions are rarely confined to the single area for which they were intended. Thus, the sort of understanding required for successful decision making must be *comprehensive*. It has to take into account all subjects that might

potentially influence the outcomes in question. Therefore, it is essential that high-level intelligence analysts (who directly report to decision makers) provide holistic futures assessments. For just as any one of the decision-makers' choices may determine consequences *on any* front, so too, every one of the decision-makers' choices must derive from conclusions *about every* front.

Since high-level intelligence analysts must provide holistic futures assessments, it would be ideal if the lower-level analysts provided them with reasonably holistic assessments with which to form the final estimates. However, the real-life practicalities of the intelligence community prohibit this. Limited time and resources require lower-level analysts to specialize. As a result, they produce analytic products of limited scope. First, lower-level assessments are frequently on single subjects. Analysts typically specialize in a specific area (geographic, topical, etc.) and, hence, offer assessments that view potential decisions in terms of the consequences that might follow for that area. One analyst might work Iran, another Venezuela, and a third China. But, it would be very unusual to have a true specialist in all three. Second, lower-level assessments are done by smaller groups of analysts. Some may ultimately derive from a single analyst (or agency). This also leads to a third, on the scope of lower-level assessments: they often have different purposes. One may focus on a specific source (SIGINT, IMINT, etc.), or emphasize a particular aspect of the issue at hand (military, economic, social, etc.) Thus, while high-level analysts would ideally receive united assessments, *the realities of intelligence analysis require that they instead form holistic assessments from lower-level ones that are on different (single) subjects by different analysts (and agencies) for different purposes.*

High-level analysts have to provide comprehensive assessments for decision makers, but they cannot possibly do the ground-up analysis necessary for such a project themselves. Instead, they have to rely upon the work of others at that ground-level. Since they will receive assessments that are not holistic, ranging over a disparate set of topics, assumptions, and purposes, an essential task for the high-level analyst is to unify and refine disparate assessments. They must take the scenarios for each individual area and topic and fuse them into a single unified assessment (or set of single unified assessments). This is the challenge of "scenario fusion."

The most natural and intuitive method for scenario fusion would be simply to conjoin individual estimates. That is, if one has an analysis for Iran and an analysis for Venezuela, then a holistic analysis combines the two individual assessments. There are two obvious problems with this approach. The first is length. High-level assessments will become exponentially larger than lower-level ones. The second problem is that such a product would be an "analysis" in name only. The high-level analysis would not have actually contributed anything beyond mere conjoining of the lower-level results. Thus, if one were going to try to conjoin individual estimates, one would (at least) have to refine the individual ones and unify those assessments. That is, one conjoins the most critical defining features of all the individual assessments.

Unfortunately, this method of scenario fusion is still catastrophically flawed. First and foremost, it commits a substantial logical fallacy. Each of the individual assessments will have made assumptions. However, these assumptions may conflict with one another. For example, an assessment of our future relationship with Iran if we pursue a more aggressive stance with them may have presumed an uninterrupted supply of oil to the United States from Venezuela, and an assessment of our future relationship with Venezuela if we pursue a more aggressive stance with them may have presumed an uninterrupted supply of oil to the United States from Iran. Each of these assumptions (arguably) makes

sense when taken on their own, but, when they are taken together, they do not. An aggressive stance towards both Iran and Venezuela does not seem to allow us to assume an uninterrupted supply of oil to the United States from either country. As such, any aspect of the individual Iran and Venezuela scenarios that flowed from the reliance on a supply of oil from the other country cannot be included in the unified scenario. Thus, if one were to simply combine the individual results, one would reach a disastrously unjustified set of conclusions.

More generally, this may be termed the "conjunction of consequents" fallacy. If one takes two assumptions A1 & A2 and outcomes O1 and O2 about which it is true that "if A1 were the case, then O1 would be the case" and "if A2 were the case, then O2 would be the case," it *does not* follow that "if A1 and A2 were the case, then O1 and O2 would be the case." The Iran and Venezuela case is a prime example of this. For a more mundane instance, suppose that "if John were to take Jane out dancing Friday night, then Jane would feel very special," and suppose that "if John were to take Mary out dancing Friday night, then Mary would feel very special." John should not be surprised if it turns out to be false that "if John were to take both Jane and Mary out dancing Friday night, then Jane and Mary would feel very special." Like the Iran and Venezuela case, each individual assessment makes an assumption that undermines what is concluded in the other assessment. (Jane's feeling special is dependent on John not taking out Mary, and Mary's feeling special is dependent on John not taking out Jane.) Therefore, scenario fusion by simply conjoining individual assessments (even refined and shortened ones) is a fundamentally misguided approach.

There is a second reason that conjoining individual estimates for scenario fusion is catastrophically flawed. It will not reveal any emergent properties. Some events are such that their concurrence results in more than merely those two events. There are certain consequences when a rival country holds an election, and there are certain consequences when one threatens a rival country with possible military action. But, when one threatens a rival country with possible military action during an election there may be further new consequences that go beyond what is present separately. In a sense, this is the flip side of the previous problem. Not only can one (as in the previous problem) conclude falsely that something will occur in the unified scenario because of what occurred in the individual scenarios, one can also fail to conclude (falsely) that something will occur in the unified scenario because of what happened in the individual scenarios. Some phenomena require a series of separate causal forces to be present, and if only part of them are present (as in individual scenarios), the phenomena will not occur. But, when they are all present (as in the unified scenario), the phenomena will occur. These emergent phenomena can often prove to be critical to decision makers. Therefore, again, scenario fusion by simply conjoining individual assessments (even refined and shortened ones) is a fundamentally misguided approach.

High-level analysts have to provide holistic future assessments for decision makers, but they cannot simply conjoin the individual assessments they receive from lower-level analysts (even if they throw in some shortening and refining). They must form holistic futures assessments in a way that removes conflicting assumptions at the lower-level and exposes emergent properties. Since these tasks (especially the first) are not easily done in the time-compressed context of intelligence analysis, a more formalized procedure seems in order. Therefore, high-level intelligence analysts need not only to engage in scenario fusion, but in "*structured* scenario fusion." It has a critical purpose in intelligence analysis.

3. The Process of Structured Scenario Fusion

To construct a model of structure scenario fusion, I begin by first drawing an analogy with the problem of selecting intermediate states, which is the key challenge of the second stage of counterfactual reasoning. Then, I develop an account of selecting intermediate states. And finally, I demonstrate the applicability of this account to structured scenario fusion and propose a series of principles for integrating multiple independent estimates into a single projection.

3.1. Counterfactual Reasoning's Analogy with Structured Scenario Fusion

A "counterfactual" is a statement about a particular possibility and its consequences. Counterfactuals have the form "If it were/had been the case that X, then it would be/have been the case that Y." While the term "counterfactual" might seem to imply that they are always "counter to fact," a counterfactual can be any kind of subjunctive conditional.

There are four different academic approaches to exploring counterfactuals. The first is the "counterfactual *semantics* project," which derives from philosophical attempts to offer an account of the concept of a counterfactual.[1] This is often part of a larger project of developing a formal logic of the relationships between counterfactual statements, but may also be part of an analytic ontology. The second approach is the "counterfactual *thought experiments* project," which derives from social scientific attempts to determine the plausibility of specific counterfactuals. Many social scientists contend that counterfactual arguments are the best way to support causal claims or to overcome "hindsight bias."[2] This approach focuses much more heavily on specific cases than does the semantics project, and much less on providing specific principles for assessing counterfactuals (although some "rough and ready" principles are often offered). The third approach is the "counterfactual *thinking* project," which derives from psychological attempts to explain the actual process of human counterfactual thinking. This is sometimes part of a broader project of showing how counterfactual thinking helps humans make decisions or cope with negative situations.[3] It is purely descriptive. It explores how and why humans think counterfactually. These three projects have received considerable attention in the last few decades, and they continue to increase in importance in their respective disciplines (especially in the social sciences).

In addition, I am in the process of developing a fourth project that both draws from, and transcends, the other three. This fourth approach is the "counterfactual *reasoning* project," which brings together a each of the disciplines (with some special affinity for philosophy and application to intelligence analysis) to formulate a *prescriptive/normative account of counterfactual reasoning.* That is, the goal is to determine what are the conditions for rational counterfactual thinking. How *should* humans reason about counterfactuals? What are the proper principles of counterfactual reasoning?

There are three major stages of counterfactual reasoning. Prior to these stages, one must have a particular possibility in mind that will form the antecedent of the counterfactual. Examples might

1. For examples of this approach, see Bennett 2003; Goodman 1983; Kvart 1986, 1992, 1994; Lewis 1973, 1979, 1986; Stalnaker 1968.
2. For examples of this approach, see Elster 1978; Fearon 1991, 1996; Ferguson 1999; Hawthorn 1991; Lebow 2000, 2001; Tetlock and Belkin 1996; Tetlock and Parker 2006a, 2006b; Weber 1949.
3. For examples of this approach, see Kahneman and Miller 1986; Kahneman 1995; McMullen, Markman and Gavanski 1995; Roese and Olson 1995a, 1995b.

include "Chamberlain does not appease Hitler at Munich in 1938" or "Archduke Ferdinand is not assassinated in 1914." With an antecedent, one begins the first stage, which is *selecting antecedent scenarios.* There are many ways that a particular antecedent could have come to be. For example, Chamberlain might fail to appease Hitler because 1) he simply has a completely out of character last-minute change of mind and issues an ultimatum, 2) he has a different Cabinet that urges him to stand against the dictator, 3) he is not Prime Minister at all, and so on. One must select (from among these possibilities) a particular path to the antecedent. One must form a complete antecedent scenario that begins with a particular break from past history and then evolves towards the antecedent becoming true. This constitutes a kind of "backstory" for the antecedent.

The second stage of counterfactual reasoning is *selecting intermediate states.* There will typically be a time gap between the counterfactual's antecedent becoming true and the counterfactual's consequent becoming true. For example, one might ponder the five year consequences of not appeasing Hitler at Munich. The events that occur (or fail to occur) during that time are critical to the truth or falsity of the counterfactual. So, in the second stage, one considers the events that were known to occur during that time period and determines which among them should also be included in the counterfactual history and used to determine the consequent scenario. For example, should the Japanese attack at Pearl Harbor still be assumed to occur even if Hitler is not appeased? Should FDR's reelection still be assumed to occur? What of Churchill's election to British Prime Minister? Some of these events seem reasonable to still include (FDR's reelection). Others seem not appropriate or at least unclear (Japanese attack, Churchill's election).

The third stage of counterfactual reasoning is *selecting consequent scenarios.* Once one has the antecedent scenario as well as all the intermediate states to occupy the time prior to the consequent, one then considers all the possible ways that things might develop forward. One then selects the scenarios that most fit with the antecedent scenario and intermediate states. This could be a single scenario or a range of scenarios (with probabilities). The elements that are in the consequent scenario form the consequent of a true counterfactual.

Even though counterfactuals are (strictly speaking) any sort of subjunctive conditional, they are often presented purely in terms of imagining some different past alternative having come to be. However, there are some obvious parallels between future-directed conditionals and counterfactuals. Consider, in particular, the second stage of counterfactual reasoning. The goal is to determine what events from the actual history of the world are appropriately included in the counterfactual history that would follow if the antecedent had occurred. Some elements of the actual history should be included in the counterfactual history, and other elements should be left out. To accomplish this, there has to be a very precise formalized mechanism for selecting these intermediate states. This is much like what occurs in structure scenario fusion. In that case, one has a series of individual projections or estimates about the future and has to determine which elements of them are appropriately included (or not) in a combined futures assessment. The problem of structured scenario fusion is parallel to the problem of intermediate states. Instead of asking what past known events should be included in the counterfactual scenario, the issue is what independently projected events should be included in the unified scenario. I propose that this analogy provides a major source for an account of structured scenario fusion. One may begin forming a model of structured scenario fusion with an adequate approach to selecting intermediate states.

3.2. Counterfactual Reasoning's Account for Structured Scenario Fusion

Much of the discussion of selecting intermediate states derives from philosophical attempts to assess counterfactual semantics. There are three major theories of intermediate state selection. I briefly describe these approaches and then develop a fourth approach that will be applied (in section 3.3.) to structured scenario fusion.

All accounts of selecting intermediate states agree that, if one is able to independently support the claim that "if it were the case that X, then it would be the case that Z," then it makes sense to include Z as an intermediate state. In this case, one is relying on a "supporting counterfactual" (i.e. a counterfactual with the same antecedent as the one under consideration, but whose consequent obtains earlier). In addition, any event that did not actually obtain in the world can only be included as an intermediate state by means of a supporting counterfactual. Thus, the three accounts differ in terms of how they treat events that actually occurred in the time between the antecedent and consequent but are not part of true supporting counterfactuals.

The first account is the similarity theory.[4] On it, counterfactuals are assessed primarily in terms of what is true in the possible worlds that are most similar to the actual world. As such, an event is included as an intermediate state if and only if consistent with the antecedent scenario (and all prior intermediate states). That is to say, the counterfactual history will be as similar to the actual history as possible. Thus, if one can consistently include an actual event in the counterfactual history, then one should do so. The second account is the probability theory.[5] On it, potential intermediate states are assessed in terms of their probability, given the antecedent scenario and prior intermediate states. An event is included as an intermediate state if and only if its probability (given the antecedent scenario and prior intermediate states) is the same as, or greater than, it was in the actual world. In other words, appropriate intermediate states are those to which the antecedent scenario (and prior intermediate states) is probabilistically irrelevant, or purely positively relevant. The third account is the causal sequence theory.[6] On it, potential intermediate states are evaluated in terms of whether they could occur (in the counterfactual history) by means of the exactly same causal sequence. If they could, then they are to be included. But, if there would have to be any change whatsoever to the sequence of events that lead to them, then they should not be included in the counterfactual history.

All three accounts agree (in effect) that an event to which the antecedent (and prior intermediate states) is probabilistically irrelevant should be included. The similarity and probability theories agree (against the causal sequence theory) that an event to which the antecedent (and prior intermediate states) is purely positively probabilistically relevant should be included. And, the similarity theory holds (against the probability and causal sequence theories) that an event to which the antecedent scenarios (and prior intermediate states) are of mixed or negative probabilistic relevance should be included (so long as it is still consistent with the antecedent scenario and intermediate states). Thus, the critical issues to be resolved are 1) whether the probabilistic relationship between the antecedent scenario and possible intermediate state matters, and 2) what sort of relationship must be present for an event to qualify as an intermediate state (irrelevance, purely positive relevance, etc.)

4. This most famous theory can be found in Lewis 1973, 1979, 1986; Stalnaker 1968.
5. This under-appreciated theory has been developed by Kvart 1986, 1992, 1994. Despite my disagreements, it represents the most sophisticated account of intermediate state selection done by a philosopher/logician.
6. This account is proposed in Bennett 2003.

All three accounts recognize a core intuition behind their accounts: things should differ in the counterfactual history only if there is reason for them to do so. If some event occurred on the opposite end of the world right after Chamberlain appeased Hitler and had nothing to do with his appeasing Hitler, there is no reason it should not have still occurred even if Hitler was not appeased. The similarity theory takes this intuition to its extreme by keeping everything the same that it possibly can (and only excluding an event if it is actually inconsistent with the antecedent scenario or prior intermediate states). This is the central problem with the similarity theory. It fails to acknowledge a second equally important intuition guiding our account of counterfactuals: a counterfactual history is always, at least in some sense, a "replay" of history in which things could go differently even though they do not have to do so. Any event whose probability is less than 1 has some chance not to occur, and any event whose probability is greater than 0 has some change to occur *even though there is no guarantee of either of these.* This is how "replays" work. They are not mechanistic processes any more than the actual world is mechanistic. *A real alternative history should not be any more deterministic than the real world*. There should be just as much potential for indeterminacy (i.e., a lot). As such, if an event's history is altered by the antecedent scenario, then it is possible it might not happen in the counterfactual history. Its mere consistency with the antecedent scenario is not enough. More seems necessary.

If the similarity theory allows intermediate states into the counterfactual history too easily, the probability and causal sequence theories make it too difficult. Both allow that, for example, one should not include an event whose probability is very high if its history was in some small way adversely affected by the antecedent scenario. Something that was virtually inevitable, but slightly decreased in probability, should not be thrown out altogether. The small chance that it no longer will occur ought not to be enough to banish it from the counterfactual history. Also, an event with a low probability that occurred, but whose probability was (net) increased dramatically with some decreases along the way also seems fair to include. While the decrease in the probability of one or more of the events in its history could lead to its nonoccurrence, if the net affect of all the changes in the counterfactual history is a dramatic increase, then it seems reasonable to keep that event in the counterfactual history. Thus, the absence of any negative change in the probability of some event in the history of a potential intermediate state is not necessary for including that event as an intermediate state. Less seems adequate.

The problem of intermediate states is philosophically complex, and since this is not primarily a philosophy paper, I will set aside many of the relevant issues and simplify matters. Since my primary goal is to apply an account of intermediate state selection to the issue of structured scenario fusion—and eventually futures analysis in general—I will turn directly to my fourth approach to intermediate states.

Since the similarity theory leaves too few opportunities for things to change in the counterfactual history, and the probability and causal sequence theories make this too easy, my fourth approach attempts to mediate between them. It does this by introducing a second factor for inclusion as an intermediate state. The probability and causal sequence theories only consider the affect on the intermediate state's probability by the antecedent scenario (and prior intermediate states). I propose that we also consider the probability of the potential intermediate state on its own. That is, an event can be included in two ways. First, an event is to be included if the antecedent scenario (and prior intermediate states) have no affect on it or sufficiently increase its probability. Second, an event is to be included if its probability (given the antecedent scenario) is sufficiently high (whether or not it was affected by the antecedent scenario and prior intermediate states).

A shortened version of my argument for doing this is as follows. Why do we care about the affect (if any) that the antecedent scenario has on the potential intermediate state? It can only be because it might make a difference to the probability of the potential intermediate state. In other words, *the probability of the intermediate state itself matters*. But, if the probability of the intermediate state itself matters, then it is possible that if that probability is sufficiently high then negative affects by the antecedent scenario are not sufficient to render it no longer an intermediate state. That is, the concern over the antecedent scenario/intermediate state relationship is actually parasitic upon a more fundamental (often unrecognized) concern for the probability of the intermediate state itself. But, the latter has a life beyond whatever connection it has to the antecedent scenario. Thus, there is a second way that an event could be included as an intermediate state.

Therefore, this "multi-dimensional" theory of intermediate state selection runs as follows: first, include as an intermediate state any event that is the consequent of a supporting counterfactual (one with the same antecedent as the one in question but with a consequent that occurs earlier); second, include as an intermediate state any event (that actually occurred) to which the antecedent scenario and prior intermediate states are probabilistically irrelevant; third, include as an intermediate state any event (that actually occurred) whose probability was (net) sufficiently increased by the antecedent scenario (and prior intermediate states); and fourth, include as an intermediate state any event (that actually occurred) whose probability (given the antecedent scenario) is sufficiently high (regardless of whether it was increased or decreased by the antecedent scenario and prior intermediate states). Obviously I have left the concept of "sufficiently increased" and "sufficiently high" without a more precise definition. Ultimately, I leave that matter for another occasion as it is not important to the ultimate issue at hand, which is applying this account to structured scenario fusion.

3.3. Counterfactual Reasoning's Application to Structured Scenario Fusion

I have drawn a strong analogy between the problem of selecting intermediate states in counterfactual reasoning and the problem of structured scenario fusion in futures analysis. I have also developed (albeit very briefly) an account of intermediate state selection. I now describe an account of structured scenario fusion that results from applying this account to futures analysis. For the sake of space, simplicity, and ease of use to the reader, I will set the account out in terms of a series of eight principles to apply in fusing scenarios.

3.3.1. Principles of Structured Scenario Fusion Preparation

In an ideal world, intelligence analysts would never need to do structured scenario fusion. Instead, they would do comprehensive analysis of all subjects (with full expertise) from the outset. However, the nature of the intelligence community (as well as perhaps even human limitations) requires lower-level analysts to specialize and have a much narrower focus. As a result, structured scenario fusion becomes necessary for the higher-level analysts. It is important to note, however, that because structure scenario fusion is an attempt to address a situation that is less than ideal, it cannot be a perfect solution. The only way for structured scenario fusion to work flawlessly would be for it to require (in effect) a completely new analysis of all the information from the ground up in a comprehensive fashion by the high-level analysts. However, this is impossible from a practical point of view. As such, some compromises have to be made in order for the process to be applicable within the limitations of time that senior analysts face. Hence, the first principle of structured scenario fusion is *P1, Humility:*

Acknowledge the limits of structured scenario fusion. One cannot possibly replicate the quality of analysis that would be possible if all analysts were experts on all subjects and worked comprehensively from the outset. But, since that is itself (practically) impossible, this is a compromise to improve analytic quality when one is forced to integrated multiple independent estimates by different analysts with different assumptions for different purposes. The appropriate goal of structured scenario fusion is to achieve a more holistic vision of the future by bringing diverse assessments together. It is meant to help discover emergent properties and reflect some of the actual complexity of the problem. There are, however, cases where one might try to integrate scenarios not for a more comprehensive picture, but instead because one is specifically interested in the conjunction of those two cases. That is not an appropriate goal for structure scenario fusion. For example, one might integrate a scenario in which the United States takes a more aggressive stance towards the left-leaning Venezuelan government with a future analysis of a more aggressive stance towards Hezbollah. That would be very different from, for example, trying to integrate a scenario with a more aggressive stance towards Hezbollah with a scenario of a more aggressive stance towards Iran. In the latter case, one might really be interested in a conjunctive scenario of a more aggressive stance towards both Iran and Hezbollah. And, the complexities of such scenarios are not revealed by structured scenario fusion. Instead, one has to go back and assess that conjunctive scenario from the outset. Structured scenario fusion is for more holistic visions and not for cases where there is a specific conjunction that is at issue.

To effectively fuse scenarios (based on the analogy with counterfactual reasoning), one has to describe the scenario in terms of the various elements of counterfactual reasoning. So, the next principle is *P2, Elements: Identify the major components of each scenario to be fused.* That is, one should delineate the antecedent scenario (i.e. the backstory of how it came to be). One should set aside the major intermediate states (the key events that run from the antecedent scenario to the conclusion), and one should recognize the consequent scenario (what follows from the combination of the antecedent scenario and intermediate states). For this process to be done most effectively, it would help if the lower-level analysts themselves provided the high-level analysts with this sort of taxonomy. But, that may be an unrealistic expectation, as most intelligence analysts are not educated in this sort of counterfactual reasoning.

Even if one recognizes the limitations of structured scenario fusion and strives to only employ it for the right purpose (more holistic unified analyses), it is still possible for one's scenarios to be inappropriate for fusion. Thus, the final preparatory principle is *P3, Consistency: Verify that the scenarios are proper candidates for structured scenario fusion.* To do this, one takes each of the antecedent scenarios (backstories) and establishes that they are all mutually consistent and not mutually undermining. That is, what happens in one of them should not preclude (or make highly implausible) what happens in any of the others. For an extreme example, suppose one has a scenario in which the United States invades North Korea, and another in which it invades Iran. There is a huge risk that these will be mutually undermining. The way in which a lower-level analyst would (likely) describe an invasion of North Korea would assume no other invasion lead-ups (and the same for Iran). As such, there is significant potential for the scenarios to be unfusible. In such cases, one has to do a new analysis that is conjunctive (considers both from the beginning). In most cases, however, this sort of inconsistency or mutual undermining by antecedent scenarios will not be present and structured scenario fusion will be possible.

3.3.2. Principles of Structured Scenario Fusion Proper

Structured scenario fusion itself takes the conjunction of all the antecedent scenarios and then works through each major event in the intermediate states and consequent scenarios of all assessments to determine whether they belong in the fused scenario or not. The order is important here, and it leads to the next principle, which is *P4, Chronology: Test each event by order of time not scenario.* Begin with the earliest intermediate state from any of the assessments and work forward to the next earliest, etc. Do not do all the events in one assessment, and then the next. This is important as each event that is added to the fused scenario will be taken into account in considering each possible later one.

There are three possible ways that an event that is an intermediate state or part of the consequent scenario can end up in a fused scenario, and the next three principles reflect those possibilities. The principles are framed so that an event only has to satisfy one of them to be included. The first is *P5, Independence: Include any event whose probability is completely unaffected by other antecedent scenarios (and prior events already included in the fused scenario).* An event in one assessment whose probability is not affected at all by any of the other antecedent scenarios should be included. It is important to note that this is very strong statement. This is not merely saying that the probability of the event E is the same, conditioned on the other antecedent scenarios as it is on their negation, but also that, for all events relevant to the probability of E between the antecedent scenario and the event, *their probability is also so unaffected.* It is not merely that the net probability of E is the same, but that the other antecedent scenarios have no affect on the event or any part of E's prior history. To qualify under this principle, the other antecedent scenarios (and any events included in the fused scenario thus far) cannot have any affect (direct *or indirect*) on the event.

If an event's probability is affected by the other antecedent scenarios, there is still a chance it should be included in the fused scenarios. The next principle is *P6, Improvement: Include any event whose probability is increased by other antecedent scenarios (and prior events included in the fused scenario).* This is a question of the net probability of the event. If it is more probable conditioned on the other antecedent scenarios (and other events in the fused scenario) than it is without them, then it should be included in the fused scenario. The probability of some of the events in its history may have been decreased (and they might end up being excluded from the fused scenario) but as long as the probability of the event in question is net increased, then it should be included.

Events whose probability is either (net) decreased or (net) unchanged but otherwise affected so as not to qualify under *P5* or *P6* may still be appropriately included. They might fall under *P7, Resilience: Include any event whose probability given all antecedent scenarios is high.* Even if an event's probability is negatively affected, if it is still high enough (given all the antecedent scenarios) it should still be included. It simply does not make sense to exclude an event if there is a reasonably high probability that it will occur, even if it is less likely to do so in the fused scenario than in the individual scenario.

Principles *P6–P7* only allow us to include events in the fused scenario that appeared in the individual scenarios. But, there are other events that did not appear in any of the individual scenarios that should appear in the fused scenario. This leads to *P8, Emergence: Identify new events that are now probable given conjunction of antecedent scenarios.* Search through the events that are in all the (now conjoined) antecedent scenarios as well as the events in the fused scenario. Are there any new events that are now probable enough to include? There will almost always be some. It is better to assume emergence than set the standard so high as to miss it. Presume that some new events will appear and try to see what

they might be. Even if their probability is not high enough to include officially in the scenario, they might be worth mentioning as possible occurrences.

4. The Promise of Structured Scenario Fusion

The process of structured scenario fusion serves a critical purpose within intelligence analysis. It offers a more formalized strategy for integrating distinct assessments of the future into a single more holistic analysis. This alone makes it a promising reasoning tool. However, I propose that there is a greater promise in structured scenario fusion, *a possible new approach to futures analysis in general.*

There are two prominent extant approaches to futures analysis: forecasting and futuring. Forecasting takes a variable and extrapolates it forward according to mathematical models that assume a continuation of its current trend (or, sometimes, a particular change in its rate of increase or decrease). The result is a single estimate of that variable in the future (or, alternatively, a hierarchy of possible values of the variable.) Forecasting works best with a variable that can be given a precise quantification, and whose behavior lends itself to mathematical formulation. As such, it has traditionally worked best for things like short-term economic projections or population growth.

Futuring takes a series of underlying (usually unquantifiable) "drivers" relevant to some possible outcome and selects several key ones that are most uncertain. Then it explores ways in which those drivers could evolve. The results are several different "scenarios."[7] These scenarios are not estimates, and they are not specific quantifiable values or predictions. Instead they are especially significant possibilities that decision makers should reflect on and be able to respond to. Unlike forecasting, futuring is less about predicting the future and more about preparing oneself to influence the future. It attempts to focus decision makers on the big picture (rather than a specific trend or extrapolation). It emphasizes that uncertainty cannot be avoided and so (typically at least) refuses to assess which of the scenarios is more/less probable. Instead, it attempts to encourage decision makers to become more adaptable and versatile so that they can handle the future regardless of which scenario comes to pass.[8]

Forecasting and futuring are not necessarily exclusive approaches. One can use forecasting within the process of developing scenarios.[9] And, forecasting and futuring might seem to be exhaustive. That is, forecasting represents the approach that employs quantitative methods to achieve a unitary and/or hierarchical analysis (selects a single future, or ranks futures in terms of probability). By contrast, futuring represents the approach that employs qualitative methods to achieve a pluralist and nonhierarchical analysis (does not select or rank futures). So, it might seem that these two approaches are the full range of possible methods. However, there is a further strategy that could be employed. Both forecasting and futuring are *categorical.* They each assess *what will or might (probably or plausibly) occur*. Even though futuring (typically) does not purport to predict what will occur, it does still think in terms of the categorical future, it simply does so in a pluralistic and nonhierarchical manner. There is

7. For major examples of this approach, consider Cornish 2004; Schwartz 1991.
8. Futuring is not identical to what is called "scenario-based planning," but they are strongly related, for it is the scenario technique that serves as the primary distinguishing feature of futuring versus forecasting. And, there is no question that any survey of the scenario-based planning literature will reveal major crossovers. Consider, for example: Georgantzas and Acar 1995; Ringland 1998; Van Der Heijden 2005.
9. It strikes me that interesting examples of a futuring approach that employs forecasting could be Canton 2006; Naisbatt 1982; and of course, Toffler 1970; 1980.

another possible approach that is *conditional.* This approach would assess what will or might (probably or possibly occur) *if a particular set of events occurs.* Instead of extrapolating (or building scenarios) into the future based solely on the past, this approach would postulate a specific interesting future possibility (sequence of events from the past into the future) and then assess what would or might follow from it.

A conditional approach to futures analysis would employ counterfactual reasoning to address key questions. That is, it would take a particular possible future event and develop a backstory that leads from the present to its occurrence (antecedent scenario), then explore the intermediate states between that antecedent scenario and the time of interest, and then use a well-understood antecedent scenario and set of intermediate states to determine the most probable consequent scenario. From a structural point of view, this is significantly different from the forecasting or futuring frameworks. Forecasting structures questions about the future in terms of a single scenario or hierarchy of scenarios (or sets of events and/or trends). Futuring structures questions about the future in terms of a nonhierarchical plurality of scenarios (or sets of events and/or trends). By contrast, the conditional/counterfactual reasoning framework structures questions about the future in terms of the conditional relationship between scenarios (that is, as composite scenarios, a scenario composed of interrelationships between scenarios).[10]

For the sake of space, the counterfactual reasoning/conditional approach has only been described in fairly general terms, but there are some good reasons for thinking that it is a useful approach, especially in intelligence analysis. There are two major arguments. The first is a "small picture" argument. The assessments of high-level analysts are critical in intelligence analysis, and a major challenge they face is integrating multiple independent assessments on different subjects from different perspectives into a single analysis. However, as section 2 described, there is significant potential for logical errors in this endeavor, as one cannot simply conjoin individual estimates. Instead, a more formalized procedure is needed to guide analysts through the process of untangling the potentially conflicting assumptions of lower-level analysis. Structured scenario fusion is one such strategy. It offers a method for sorting through each individual piece of an individual assessment and integrating the appropriate ones into an overall assessment (or excluding others when necessary). This approach, in turn, is based upon an analogy with the second stage of counterfactual reasoning: selecting intermediate states. In that stage, one determines whether an event that is independently known (or projected) to occur during a timeframe can be taken to do so in an alternate possible scenario. The proposed theory of structure scenario fusion is based upon a similar theory of selecting intermediate states. Now, since selecting indeterminate states works for assessing conditional (i.e. counterfactual) statements, so too, structured scenario fusion works (at least at its best) in assessing statements similarly formulated. In other words, structured scenario fusion is ideally suited for approaching futures analysis in terms of counterfactual reasoning. In addition, since structured scenario fusion is of great utility to futures analysis, it would seem that there is reason to prefer an approach to futures analysis that is also done in terms of

10. Ironically, there is a famous medieval view about God's foreknowledge on which God knows the future by means of knowledge of *conditional/counterfactual statements.* Originally developed by Luis de Molina in the 16th Century, the view (known as Molinism or "Middle Knowledge") offers both an explanation of how God foreknows (He infers it by combining counterfactual statements with His self-knowledge of what world He will create). Even more ironically, I have long believed that this view is mistaken as an explanation of Divine foreknowledge. However, a conditional framework for our "foreknowledge" of the future turns out to fare far better (in my mind). Even more interestingly, the literature on Molinism almost has no relation to other discussions of counterfactuals, thus this view was not a (conscious) inspiration for the present proposal.

counterfactual reasoning. Therefore, there is some reason to employ the conditional/counterfactual reasoning framework to futures analysis.

The "small picture" argument for the conditional/counterfactual reasoning framework contends that it betters solves one key problem in futures analysis, namely that of integrating multiple independent estimates into a single assessment (i.e. it can use structured scenario fusion at its best). There is, however, a second "big picture" argument for this approach. The conditional/counterfactual reasoning perspective more directly addresses some core challenges of intelligence analysis *by enabling much greater event specificity.* Forecasting can provide specific numerical assessments, but it is limited in its scope to cases where the factors are quantifiable and it can plausibly be assumed that they will continue to evolve at their present rate (or in some other well-defined manner). Futuring has almost no limits in its scope, as it does not purport to predict anything per se. Instead, its goal is to help decision makers think more creatively about the future so that they can develop the versatility to respond effectively to, as well as influence, that future. The scenarios that are developed on the futuring approach are more instructive than predictive, they are more mental exercises and idea generators than specific sets of events that will or might (probably or plausibly) occur. That opens up the range of things that can be considered in futuring, but it also creates its own limitation that is not often recognized. Futuring draws the analyst away from event-level descriptions to more general or trend-level descriptions. This more open-ended approach risks being too broad to provide the sort of analysis on which intelligence analysis depends. By contrast, since the conditional/counterfactual reasoning framework begins by postulating a specific set of events of interest in the future and then working from them, it has much greater potential to deliver the advantages of both approaches. It can provide specific results (as does forecasting), but on a much broader range of topics without assumptions that things will continue as they are now (as on futuring).

The fundamental reason why this is possible with the conditional/counterfactual reasoning framework is that it focuses on conditional statements about the future rather than categorical ones. And, conditional statements are (generally) less uncertain than categorical ones. By their nature, conditional statements are easier to show to be true. Even if we have no idea if X itself will occur, we might be able to establish that if Y occurred, X would occur. This does not mean the conditional approach avoids all uncertainty, as one still has the issue of whether the antecedent of the conditional will be true. That uncertainty remains central. It does, however, allow us to minimize all the uncertainties that can be minimized. Thus, the approach permits on to draw much more precise conclusions and have much greater event specificity than the other frameworks.

The greater event specificity of the conditional/counterfactual reasoning framework has several advantages. First, it enables more rigorous reasoning methods. One cannot develop rigorous strategies of thought if the target of one's thinking is itself heavily open ended. A "means" cannot (typically) be more precise than the "end" to which it is directed. Forecasting and futuring begin with the past and present and then immediately encounter uncertainty as they begin developing their account of the future. But the conditional/counterfactual reasoning framework also has specific postulated events in the future to work from, that decreases (or at least delays) the amount of uncertainty, and thereby increases the potential for precise results. Rigorous methods are essential in intelligence analysis and (especially) futures assessment. The more clear and obvious something is, the less rigorous our reasoning methods have to be. In such cases, the facts are so evident that one does not have to be as precise to get them right. But, in a case like this, where the facts are so difficult to see at all, *the reasoning methods are*

almost all that we have to go on. And, if they are not sufficiently precise, then we will either have nothing to say, or will be left only to rely upon our preconceived biases or assumptions.

Second, the greater event specificity of the conditional/counterfactual reasoning framework has the advantage of allowing one to focus on particular possibilities of interest. In intelligence analysis, there are particular futures that are more significant to consider than others. Analysts are not simply interested in the future as an intellectual exercise. There are specific future possibilities that are important and others that are of little or no interest. Possible conflicts, wars, and catastrophes are especially significant, and it would be very useful for analysts to be able to employ a futures analysis method that focused specifically on such possibilities. The conditional/counterfactual reasoning framework does just that. In fact, it encourages analysts to see the future in terms of various specific possible sets of events and their consequences. It encourages the intelligence community to define particular possibilities that are of interest to analysts and their customers.

Third, the greater event specificity of the conditional/counterfactual reasoning framework has the advantage of allowing analysts to develop more detail to pass on to high-level analysts in constructing their final products for consumers. One feature of the intelligence community that is not taken into account by futuring is that most analysts do not directly report to the decision makers. One of the major purposes of the standard scenario-based approaches (like futuring) is to inform the thinking of the decision maker. Such approaches work best when the decision maker is the direct consumer of those scenarios (if not themselves involved in the process of forming them). This is simply not plausible with much of intelligence analysis. Many analysts report to more senior analysts who, in turn, report up the chain, eventually to the decision maker. The majority of analysts working on futures analysis need a different approach that is appropriate when one is not necessarily directly informing the decision maker but is instead reporting to someone else whose job is to form products for the decision maker. The lower-level analysts do not necessarily need to think creatively about the future for decision-making versatility *because they are not making the decisions*. That is not to say that versatility is not worthwhile for them, but only that it is not as important for them as for the decision maker. They need something that can better mine the precise details and subject expertise that are contained at their level. They are the closest to the information and possess the most domain sensitivity. The conditional/counterfactual reasoning framework taps into that by having them postulate possible specific sets of events in the future (of interest to the decision maker) and working through their implications in great detail. That detail will then give the high-level analysts much more to work with when they turn to the high-level futures analysis (and techniques like futuring).

Fourth, the greater event specificity of the conditional/counterfactual reasoning framework has the advantage of allowing analysts to develop more precise and actionable assessments for the ultimate decision-making customer. At the end of the day, intelligence decision makers need analyses that they can do something about. They need assessments that are "actionable." Open-ended sets of possibilities have a valuable role, but are simply not precise enough to recommend specific courses of action. Naturally, this is always going to be an incredibly difficult challenge when the subject is the future, as there is no way to know with certainty (or even with great probability in most cases) what will occur. However, if one moves away from the categorical question of "What will occur?" to the conditional question of "What would occur *if X*?" there are much more precise details to work with and, hence, the potential for more actionable intelligence. One must always approach the future with great care and versatility, and futuring and its scenario methods are critical for teaching this to decision makers,

but there are also critical practical questions that have to be addressed. And, ultimately, methods for futures analysis have to be able to handle the intelligence process as it is actually practiced.

Futuring is not intended to replace forecasting altogether as a futures analysis method. Instead, it is meant to supplement it in contexts where forecasting is not able to address the problem at hand. In a similar way, the conditional/counterfactual reasoning framework is not meant to replace futuring either. Instead, it is proposed as a way to fill a "blind spot" in futures analysis. Forecasting and futuring are somewhat polar opposites (predictive, quantitative, hierarchical, unitary versus preparatory, qualitative, nonhierarchical, pluralist). As such, there is a significant amount of unoccupied conceptual terrain between them. The conditional/counterfactual reasoning framework is meant to cover some of that space. By narrowing the scope down from futuring (to the future if X) it allows for more precise methods and results, but it still has a much broader longer-term scope than forecasting (since X could be anything one wants and not simply quantities extrapolated forward).

In addition, forecasting and futuring derive (primarily) from an economic/business context. One heavily draws from economic trend extrapolation and the other from scenario-based business planning. The fact that they began in business does not in itself imply any sort of limitation to their application, but one can identify some business-specific features that remain in forecasting and futuring. In forecasting, this is easy to see in the heavily quantitative aspect that is appropriate for profits, costs, units of production, etc. While much interesting work is being done in trying to quantify the traditional objects of intelligence analysis, such as the beliefs, desires, intentions, and plans of other people and nations, there is (probably) always going to be something missing in purely quantitative approaches to these kinds of issues. Therefore, despite an important role in particular problems, forecasting is not a perfect fit for intelligence analysis.

The business-specific origins of futuring can be seen in how it is designed to develop creative and versatile thinking in decision makers. As noted earlier, much of intelligence analysis is not done directly for a decision maker, but for a more senior analyst who, in turn, reports to the decision maker. In addition, decision makers in intelligence have somewhat less leeway in the decisions they make. Even if one deals with the president and senior senators, it is much more difficult to apply a new creative decision than it would be in a business world where, at best, one has to deal with a recalcitrant Board of Directors. Thus, despite an important role for particular challenges, futuring is not a perfect fit for intelligence analysis either.

The conditional/counterfactual reasoning framework has neither of these drawbacks. In fact, part of the driving force behind developing this approach is to find one that more perfectly fits with the real-life world of intelligence analysis. This is not meant to supplant other approaches, but to supplement them. More generally, it just seems right that somewhere a specific approach to futures analysis is developed for intelligence analysis. Perhaps the conditional/counterfactual reasoning framework is not the best such approach, but it is at least an attempt, and that is, itself, progress.

5. Conclusion

High-level intelligence analysts have to bring together multiple independent futures assessments into a single analysis. However, there is significant potential for error, as these assessments may stem from different assumptions and purposes. In response, I have described a method of structured scenario fusion to guide analysts through this process. This fusion method is based on an analogy with the

problem of selecting intermediate states in counterfactual reasoning. The success of this method (or at least the promise of success) suggests the usefulness of a more general counterfactual reasoning framework for futures analysis in general.

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Rethinking Thinking: Three Methods for Achieving More Creative, Responsive Strategic Intelligence Analysis

Dr. Barton Kunstler

The Challenge

Intelligence services are knowledge networks in which knowledge workers use thought as their medium of expression. A department, agency, or government's ability to utilize fully the collective intelligence (Levy, 1997) available to it depends on a network of perception, cognition, and communication that both reflects and determines its character and *is*, in fact, the substance of the organization itself. Intelligence agencies need to determine whether their networks can keep pace with the accelerating rate of change in the global socio-political environment and with the new types of threats that the future holds. These networks, and the models informing their development, directly determine the quality of thought, i.e., intelligence analysis, produced by the agencies.

Many "Protean" thinkers recognize that traditional organizational structures and modes of operation are under great pressure to adapt to conditions very different from those that once determined their form and function. A key question as intelligence organizations undergo internal change is whether there exists a set of organizational conditions that, by their very nature, can liberate the full range of their latent cognitive and creative energies. I suggest that there is and that strategic intelligence analysis is ideally suited to take advantage of these strategies. As Professor Leon Fuerth (Proteus, 2006) has suggested, "current strategy and management systems must be significantly readjusted" as they are too dependent on such older models as the deliberative governance model that underlies our Constitution and the "point-source" adversarial model held over from the Cold War. A host of analysts agree that the structure of modern conflict, especially in regards to terrorism, is not simply a matter of facing a new kind of "enemy," but part of a sea-change in the modern world's core institutions. This, in turn, occasions significant shifts in how we analyze threats and collect data and frame these into coherent scenarios that maximize our ability to cope with potential dangers.

Networks as a Useful Model

The science of networks enables us to schematize systems clearly without compromising their complexities. Every organization functions as a network comprising 1) hubs, or nodes, (individuals, departments, divisions, agencies, etc.) within which ideas and information are processed and generated; 2) links or channels along which ideas and information are transmitted; and 3) a gestalt, or culture, defined in large part by how ideas and information are transmitted, exchanged, and processed. One can view organizations not merely as a series of boxes on an org chart, but as a network with a flow of energy based on an exchange of cognitive events. Networks of all sorts—biological, digital, social—display mathematical consistencies that offer objective criteria for assessing their efficiency. Thus,

almost any proposed improvement to any system can be described and evaluated according to whether it enhances the

- Conductivity of the links between the hubs, i.e., the signal-to-noise ratio
- Speed of transmission along the links
- Efficiency of information processing by each hub
- Structural agility of the system
- Actual quality of the content—ideas, information, actions (an oft-neglected aspect of systems thinking)

Three Approaches to Organizational Change

This paper describes three approaches to organizational change: the Hothouse Effect (THHE), the Cleisthenian Model (CM), and the Converging Uni-Modal Approach (CUMA). The first is the subject of a book (Kunstler, 2004) that proposes thirty-six variables common to highly creative groups, including historical communities and modern corporations. THHE's agenda is to restructure an organization so that its internal dynamics cannot help but encourage a high level of creative activity. The CM suggests that integrating an organization via interlocking working relationships among its members enriches world views, analytic perspectives, and individual and collective understanding (Kunstler, 2004). CUMA streamlines the process by which multiple sources of foresight or outstanding analytic insight produce synergy by overriding established organizational boundaries and cultural strictures (Kunstler and Tita, 2007).

The discussion of these models is suggestive rather than prescriptive, meant to stimulate new ways of thinking about existing challenges, procedures, and organizational strategies—in effect, to rethink how thinking is done in strategic intelligence analysis. The three models are not intended as prescriptive templates to be adopted whole-cloth, but as broadly conceived maps that point the way to the kind of analytic and creative organizations that we will need to meet the demands of the 21st century.

A Rationale Via Analogy

The need for such reform in intelligence analysis is thrown into relief when we consider similarities between terrorist organizations and drug cartels. The "war on drugs," as an abject failure, provides clear evidence of the need to upgrade the cognitive tools used to combat terrorism. Both groups in question are marked by:

1. Quick coalescence around specific projects
2. Hydra-headed leadership
3. Independent, anonymous cells
4. An endless supply of expendable human resources
5. Communications networks capable of operating below the intelligence radar
6. Funding as removed from the "street" as is Kafka's fictional "Castle"
7. "Selling" a product for which there is a perpetual, self-feeding demand (drugs on one hand, hatred and frustration on the other)
8. The ability to disappear into the background noise of everyday life
9. An ability to absorb any number of setbacks while continuing to pursue their goals

There is a difference as well: with drugs, we can absorb many defeats. We know that shipments are going to get through and that addicts will always be with us, but dramatically reducing drug use represents a victory. We certainly cannot afford a merely "low" hit rate in terms of terrorist attacks, which underscores the need for anti-terrorist strategies to operate even more effectively than a successful drug policy might.

Unhappily, the government's responses to both "wars" have been marked by flawed assumptions about the nature of the threat. These flawed assumptions have led, in turn, to a misunderstanding of the cultures in which both cartels and terrorists are rooted. The result has been a lack of clear strategic objectives, an over-reliance on military solutions, and gross misapplications of resources. Moreover, a lack of proper analysis has enabled the worst kind of political grandstanding in justifying policy: the conflating of minor and major threats (marijuana versus methamphetamine; "eco-terrorists" versus al Qaeda) and the resort to messages of fear that stifle public debate and undermine, rather than encourage, public trust and support.

The Hothouse Effect

Why did ancient Athens, a mere backwater in 600 B.C. when dozens of other Greek city-states were flourishing, become not only a leader in ancient Greece, but the scene of a cultural revolution that utterly transformed world history? Why did 15th century Florence become the main engine of the European Renaissance? Why did the U.S. jazz community from 1915-1970 prove an endless source of brilliant, highly accomplished artists who transformed not only music, but society itself? And when a modern corporation places creativity at the center of its strategic development, why does it prove a highly effective way to run a company? Ultimately, such questions lead us to another double-barreled inquiry: what do we mean by "highly creative groups" and is there a consistent pattern in their emergence that can inform organizational development and behavior?

The Hothouse Effect (Kunstler, 2004) addresses these questions in detail; here we will take up their relevance to the issues at hand. First, the term "creativity" does not refer to an "add-on" or enrichment factor, but represents a means of re-thinking how organizations operate. The business world, for all the lip-service it gives to creativity, generally treats it like a soft skill that just needs some brainstorming or a half-day workshop to infuse into the normal routine. However, when viewed as the core element in the development of cultures and civilizations, and as the source of all that—invention, art, reflection, science, cities, complex language, the ability to problem solve and create alternative modes of being in the world, etc.—which separates us from other forms of life, creativity shows itself at the heart of human consciousness and thus as the source-blood of organizational life, not the gravy.

THHE identifies thirty-six factors that lead to an exceptionally high level of creative performance within a group; these are categorized under four dimensions of cultural life: Values/Mission, Ideas/Exchange, Perception/Learning, and Social/Play. The following is a brief précis of a few Hothouse factors from each dimension, with indications of how they might be applied to intelligence analysis.

Values/Mission: Hothouse communities conduct in-depth research into the core disciplines of their work, and members continually challenge and re-create the fundamental assumptions of those disciplines. In strategic intelligence analysis, these activities extend far beyond simply refining the tools of the trade or seeking new analytic instruments. It means that the various agencies would

- Identify key operating assumptions and their impact on analytic, strategic, and tactical thinking, and then rethink the identified path-dependencies and the conclusions to which they lead.
- Identify and challenge the political assumptions driving intelligence analysis. One technique involves a values-neutral systems approach, which disdains value judgments in the analytic phase and views the system as producing the behaviors that it desires and requires in order to maintain its current configuration. Thus, one can view terrorism as simply one manifestation of a global network that *requires* terrorist activity in much the same way a therapist views a patient's neurotic system as a necessary part of their personality, however much pain it may cause. While we might recoil from this emotionally or morally, analytically it produces a creative shift from the usual knee-jerk response to attack or suppress an adversary to a more systems-oriented approach that might well focus on underlying forces and support structures that feed the adversary's strength.
- Inquiry depends on the quality of questions one poses, and too often practitioners neglect the core concepts of their own disciplines. What is "intelligence"? Do intelligence analysts really know, or is it, to most, simply a bounded domain of assumptions, protocols, and practices that one navigates according to the rules of the game? What does the mind actually *do* when it engages in strategic intelligence analysis? How well do practitioners even understand the concepts of "strategy" and "analysis"? How will we know how strategic analysis will evolve if we do not have a clear, working understanding of its innermost processes? Such questions lead us into the core elements not just of theory or research, but of practice as well. This is especially important given the culture of the younger generations entering intelligence and government work. The IM, texting, and "gaming" generation—especially many of those drawn to purely analytic pursuits—has a tendency to view conflict and problem solving in terms of the digital environment. For a generation enamored of gadgets and not grounded in the legacies of World War II, the Cold War, and traditional American notions of citizenship, life contains different challenges, anxieties, and options than for earlier generations. Basic notions of self, career, knowledge, communication, technology, and citizenship are changing rapidly and irrevocably. What are the implications for intelligence gathering and analysis given fundamental generational shifts? Given that these shifts are occurring throughout the world among the nations that provide a reservoir of potential terrorists, do we need new analytic models that reflect the new conditions and challenges that face the intelligence industry?

It is crucial that strategic intelligence reconceive itself for the current era. Decades of Cold War thinking and polarized political equations, the influence of a more aggressive national religiosity on notions of good and evil, friend and enemy, undue political influence, and the natural inertia of bureaucracies have imposed limitations on the practice of intelligence analysis that have undermined not only the public trust, but the morale and efficacy of the intelligence agencies themselves.

The concern with research and self-reflection comes under the "Values/Mission" dimension because the motivation to turn one's "intelligence" upon oneself is a primary value in both intellectual and spiritual behavior. The scholar and philosopher are always posing challenges and objections to their own arguments. Spiritual seekers from all traditions tend to doubt themselves above all; indeed, it is this self-doubt that often determines their particular paths of inquiry.

It is not simply that these activities will enrich the "content" of each hub in the intelligence network, although that is the primary aim. There is a powerful secondary effect as well: it is impossible to retain

a traditional organizational hierarchy in the face of such activities. The active, challenging, dialectic nature of the process empowers participants all down the vertical chain of command. In effect, new hubs and links proliferate and new network efficiencies emerge and the quality of work done *within* the hubs improves.

Two examples of current practice illustrate these two hothouse factors in action. The Defense Science Board (2003) advocated the use of Red Teams "to challenge aspects of that very enterprise's plans, programs, assumptions, etc… Our usage of the term red team includes not only 'playing' adversaries or competitors, but also serving as devil's advocates, offering alternative interpretations (team B) and otherwise challenging established thinking within an enterprise." The report suggests that red-teaming be used on strategic, operational, and tactical levels and as a hedge "against the accepted assumptions and the accepted solutions." Another instance of such practice involves the use of hackers to test the vulnerability of digital networks. THHE seeks to institute such challenge and inquiry into every project throughout the development arc. Red-teaming and hackers are the domain of specialists hired to pierce specified perimeters, be they theoretical, conceptual, digital, or physical; in THHE, the perimeters themselves are constructed out of an ongoing process of testing, challenging, and researching the core dynamics of each discipline involved in the overall mission.

Ideas/Exchange: One key factor in the second dimension suggests that peripheral functions and operations be implanted within the center of a group (or lower-level within the upper decision-making levels). Ancient Athens provides a startling instance of the creative power of linking together normally polarized cultural elements. The archaic rustic cult of Dionysus, with its intoxicated ecstatic celebrations, was given a place of honor in the heart of the ancient city around the mid-6th century B.C.E. The mingling of abstract civic functions, language, and modes of thought that derived from the law courts, commerce, and political debate, and the city's relative cosmopolitanism, with the vital cultural impulses at the core of Dionysian ritual, triggered a creative explosion culminating in the rapid emergence of Greek drama. Greek plays addressed issues of civic and philosophical importance, but the underpinnings of theme and plot were driven by the deep structure of the primeval cult. Out of their mutual impact and integration developed a cultural form more vital today than ever as the source of all the narrative arts: theater, cinema, the novel, etc.

Organizationally, this contrasts with a "reformist" approach that seeks the same ends. The executive who "visits the lower floors" or "talks with the guys on the line" and even encourages the adoption of their ideas, is an example of a "reformist" leader, just as honoring Dionysus with a temple somewhere in the city would have acknowledged the importance of the cult to its adherents without it truly engaging the pulse of civic life. THHE— like the Athenians—goes further, since the goal is exceptional creative performance beyond the usual metrics of success. At Sequent Computers, a company discussed in *The Hothouse Effect,* any employee had the power to solve a customer problem without consulting their boss if the latter were unavailable. Whether the outcome worked or not, each person need only say "Casey [Powell, the founder and CEO] said it was okay," and their efforts could not be gainsaid (unless of course they violated basic quality standards that anyone might be evaluated on) (Kunstler, 53-60). Thus, lower level insights and perceptions were constantly being circulated throughout the entire system with the CEO's blessings. Sequent managers were not allowed to cluster around the same lunch table in the cafeteria, but had to eat with staff (not necessarily their own). "Ideas moving upward come out of a different realm from those that travel down…the latter come from the canopy while

the former come up from the roots." (Kunstler, 72). Simply put, the energy from the roots needs to constantly feed the canopy, and vice versa.

A potential objection to this approach holds that in a defense-oriented organization the last thing one needs is a high-level manager having to constantly huddle with hosts of lower-level employees, as this would undermine responsiveness and authority. The counter to this view, however, is several-fold: 1) the typical corporate hierarchy, as Robert Jackall (1988) points out in his classic study of ethical decision-making in corporations, *Moral Mazes,* is heavily influenced by military conceptions of rank that may not really be suitable for a corporation; 2) defense and intelligence agencies do not require the immediate response time that gave rise to the rigid command structures and protocols of armed services; and 3) the intelligence community comprises knowledge networks that require fluidity across the usual organizational boundaries. Even in military settings, a good commander will tap into his or her soldiers' observations, although in a suitably limited way. In sum, a knowledge network will benefit mightily by utilizing all the cognitive and creative resources available to it rather than being limited by the organizational chart.

In business terms, this model could include establishing links to tap into the insights of delivery people who regularly talk with customers, janitors who might observe how expensive equipment is under-utilized during off-hours, or production workers who often have productive insights into manufacturing, technology, and materials. It also applies to integrating lower and mid-level managers into higher-level discussions. The notion that the full force of their insights will naturally make its way up the organizational chart is belied by practical experience.

Who are the parallel figures in any given intelligence organization? Select civilian focus groups can provide intelligence services with an important understanding of all sorts of issues, from security at shopping malls to public perception of the national intelligence apparatus, and a host of ideas derived from their expertise in their own industries. Field operatives are often frustrated with permissions and protocols stemming from headquarters, where events are not generally addressed in real time but rather in the context of much more slowly moving trends. The most significant step, however, is creating forums and other opportunities for talented lower level staff to participate in decision making both in regard to the operational mission of the organization and its internal protocols and procedures. It is simply not enough to add a position intended to collate or integrate data from numerous sources. It can be difficult to make this transition within any organization, and the organization can certainly survive and even perform well without it. But it will not achieve the sort of high-level creative performance that is the goal of the Hothouse Effect and that is required of our intelligence function in the world of the 21st century.

Perception/Learning: Our connection to reality is mediated by the electrical signals coursing along the nervous system to the great information processor of the human brain, which translates impressions into signs or code and links them together into narrative strings, be they as short as "Cross at the green" or as long as our own autobiographies. These stories do not simply shape reality, they *are* our reality. We employ language and thought to develop new narratives in a complex, ongoing dialog with our prior narratives, and from this web we construct the network of reality. Our most intimate neuronal perceptions define the character of our thought processes and our view of reality. Thus it is no surprise that every creative hothouse exhibits an intensive attention to both perception itself and the way perception shapes its approach to its intellectual and creative tasks. In concert with this concern,

hothouses always produce innovative learning formats, for learning itself is a concentrated form of actively reconfiguring and transforming the narrative strings that reflect our psyche's emergence from, and engagement with, the digital impulses of the nervous system. In turn, we act to influence the external environment's interface with our own personal mental and physical systems. The new forms of learning—Plato's academy, England's Elizabethan-era public schools, the Bauhaus design institute, in-house salons on work time in one of the hothouse companies examined in *The Hothouse Effect*—seem almost a way for systems with high-level creative demands to assure the enriched fuel they need to sustain themselves, much as the brain, 2-3% of our body weight, utilizes 20% of the oxygen we inhale into our bodies.

The learning process in creative hothouses often involves total immersion in a rich medium of ideas, materials, and information that saturate the mind. Thus at Thomas Edison's laboratories in Menlo Park and West Orange, New Jersey, his staff—whom he called "muckers" because they "mucked about" with materials—was immersed in materials to which they had unlimited access. Everywhere people tinkered and mucked about, and the lab had storehouses of every type of chemical, animal hair and fur (the first experimental phonograph needle was made of badger hair), glass, metal, wood, etc. Everyone was immersed in the activity and stuff of invention and in one another's specialties, and learning was continuous, unpredictable, and opportunistic (Millard, 1990). It wasn't just that they thought outside of the box; at Edison's lab, there *was* no box. This aspect of the lab's culture co-existed with the demanding, hierarchical, and competitive qualities of the lab; these methods are not utopian nor do they necessarily run counter to norms of human behavior. At the same time, Edison's lab was definitively *not* a place where each person worked on their own projects apart from everyone else, one's expertise was closely guarded, or loyalty was departmental rather than dedicated to the greater mission at hand. Nor was it a place where each department's work was siphoned upward to a supervisor who evaluated it only in its—or his—own terms, without it being circulated among other practitioners. Another aspect of the creative hothouse is this regular practice of circulating ideas, of creating networks whose hubs are linked far beyond the necessities of efficiency. But to achieve this, the organization must have a design that supports it.

Currently, terrorist organizations have, in effect, immersion-based learning labs available to them all over the world. The traditional terrorist training camp represents the old paradigm of training, let us say, the classroom model. People learn certain skills in a simulated setting and then are sent out into the world to apply those skills. Terrorists, however, experienced the immersion paradigm in Afghanistan, where they learned the benefits of on-site training in terms of tactics and radicalization of militias. Every new technological and strategic advance applied by the United States in Iraq is absorbed by our adversaries, whether home-grown insurgents who view themselves as patriots in their own land and who pose little long-term threat to U.S. security, or actual terrorist organizations constantly in a learning mode. The leaders in charge of policy among terrorists and insurgents are immersed in practical on-site logistics and tactics, while the greater mass of our policy-making apparatus is back inside the Beltway. As Frank Hoffman noted last year, "Defeating 4GW [Fourth Generation Warfare] threats will require changes in the way our national security organizations educate their leaders. It will require commanders throughout the military who can work without positional authority, across organizational boundaries…" (Proteus, 2006).

History offers an analogy: the monks of the medieval monasteries were among the best educated people of their time, yet they engaged in physical labor in monastery gardens, farms, and on the physical

plant itself. Therefore, the best minds of their generations had a stake in improving the technology of labor, and despite its intellectual shortcomings, medieval Europe witnessed tremendous leaps in technology. This contrasted sharply with ancient practice, in which intellect flourished on a curve well ahead of technology. The Classical world, so dazzling in its cultural and intellectual achievements, relied upon slaves for its labor, and land- and factory-owners had no stake in relieving the drudgery of labor and hence no stake in technological innovation. Carried over to our present case, policy makers and strategists who are, predominantly, removed from an *immediate* stake in the battle, will always be a step behind the smaller, more desperate fighters whose organizational structures are already far more fluid and responsive than even our smaller on-field units (with the usual exceptions). The difference is, to a large extent, one of *education* and *perception*; that is, the adversary is immersed with all senses in a desperate situation and with the power to adapt tactics and strategies on the run. Our own people are straight-jacketed by bureaucratic legacy systems in which significant change takes years to implement and whose resulting configurations rarely depart radically from those of the very systems they are seeking to improve.

Social/Play: The social dimension of THHE comprises several major categories of human life, such as response to crisis, leadership, language, beauty, and the festive spirit. We will address this area briefly by focusing on leadership. One of the striking aspects of hothouse groups is their ability to produce highly effective leaders as needed. For example, from about 590 B.C.E. to 430 B.C.E., Athens generated one leader after another who differed dramatically from his predecessor in terms of policy, talents, and career path. The city-state simply produced precisely what it needed at any given time during an era rife with crisis. Was this an accident of birth? Obviously not. Rather, it indicated the strength of a system whose leaders emerged out of the dynamic creative processes that defined the system. The intelligence of such systems is unfailing and inevitably superior to that of systems driven by personal and political agendas, or even such common engines of ambition as profit. The creative hothouse is above all a "smart system," and this collective intelligence, distributed throughout the many hubs of the hothouse network more thoroughly than in typical networks, produces precisely the sort of leadership required by circumstance. A Department of Homeland Security (DHS) whose efforts are devoted mostly to Internet stings and immigration issues is highly politicized, has an unclear mandate vis-à-vis the agencies under its umbrella, and is isolated from the society it seeks to protect, will not produce the leaders its mission requires. Leadership is a social construct, not only in the expectations we have of it but in how it emerges from, and is expressed within, a given system. The Hothouse Effect points the way to establishing systems that produce precisely what they need to continue their success. To an extent, the exhilaration of a group humming along smoothly on 12 or 16 cylinders is its own reward, and imbues the group with an uncompromising attitude towards leadership, i.e., it will select the leader best able to fulfill its pleasure principle, best able to sustain the collective creative surge that is unforgettable to anyone who has ever experienced it for a sustained period. That is, in fact, one of the hallmarks of a creative hothouse: a transformative exhilaration and the desire to retain that feeling, which then gives the community a stake in producing leadership in accord with its highest standards.

The Cleisthenian Model

Let us next examine the Cleisthenian Model (CM), named for the ancient Athenian politician Cleisthenes, who in 506 B.C., devised a new Athenian constitution radical in its democratic and integrative character. Cleisthenes assigned all Athenians to membership in ten new civic associations, or tribes. One third of each tribe was drawn from the three main geographic regions of Attica, Athens'

	City	Coast	Hills
Tribes 1–10	1	1	1
	2	2	2
	3	3	3
	4	4	4
	5	5	5
	6	6	6
	7	7	7
	8	8	8
	9	9	9
	10	10	10

Table 1. Cleisthenes' Innovative Political Structure

home region: Tribe 1, for instance, took one third of its members from the City, one third from the Coast, and one third from the Hills. This held for each of the ten tribes, as shown in Table 1.

At once, each person was exposed to the interests of people from all over Attica, thus unifying what was an extremely large citizen body for a Greek city-state. At its height, Athens boasted some 43,000 citizens. The other great city-states, such as Sparta, Corinth, and Thebes, topped out at about 9,000 full citizens, although they contained larger numbers of partially or un-enfranchised folk. It was only through the integrating effects of Cleisthenes' system that Athens' large contingent of full citizens overcame the internal tensions that beset almost every Greek city-state and provided an immense competitive advantage, both culturally and militarily, over other states in which power and prerogatives were concentrated in an elite class.

Still, Cleisthenes' system would stand as incomplete, missing a sustaining and animating power, unless the artificially constructed tribes exercised functions that established meaningful grounds for tribal loyalty. Herein lay another facet of Cleisthenes' political genius: he reformed the Athenian government so that the tribes played a crucial role in its procedures.

The Athenian legislative function was carried out by two houses. The "lower" house was the Assembly, open to all citizens. The "upper" house, the *Boule,* or Council, comprised 500 members—50 representatives from each tribe—and, as noted, each tribal contingent represented the three geographic regions. The importance of the tribes lay in the vital role they played in the Council. For one-tenth of each year, a different tribe presided over the Council so that each tribe had its turn in the rotation. To advance legislation and policies, members of the three regions belonging to the presiding tribe had to work closely together. For each *day* that the tribe presided over the Council, a *different* member of that tribe served as president of the entire Council. Council members were not elected, but chosen by an even more democratic method, sortition, randomly selected lots, as was the Council president-for-a-day. A new Council was chosen by lot every year. Other key political positions were rotated via sortition as well.

Figure 1 illustrates the typical organization chart in highly simplified form. It replicates more complicated traditional models in that they generally consist of various stems converging on the top of the pyramid, however many offshoots each of those stems contain. We shall not address the matrix organization here other than to note that it often brings improvements, and just as often new problems, but it rarely makes a clean break from traditional hierarchies and often offers a muddled, half-hearted step towards a truly integrated knowledge network.

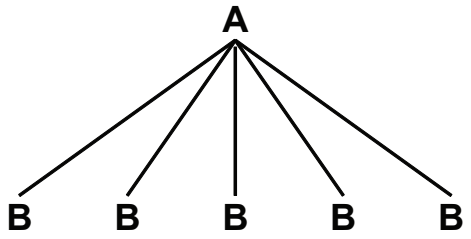

Figure 1. Typical Organization Chart (Simplified)

In this scheme, let us assume the "Bs" represent five intelligence agencies, and "A" is Homeland Security. Several flaws beset this common structure, flaws defined strictly by structure rather than performance or personnel, although structural flaws frequently erode both performance and the ability to attract and retain talented personnel. "A" inevitably has less proximity to and engagement with inflowing information and its sources than do the "B" agencies. While the various agencies, including Homeland Security, have different cultures and even different mandates, they all address similar issues at a similar level of complexity. DHS, as the "A" agency, must coordinate sixteen "B" agencies, but has no CEO-like authority to govern the operations of those agencies. To maximize its effectiveness, it is critical that "A" receive information unfiltered by organizational biases, yet this is unlikely if "A" has only limited connection to the data flowing from the agencies or the data's sources.

One apparent strength of the orthodox model is that "A" (Homeland Security) theoretically started afresh without being unduly influenced by the norms and prior assumptions that every organization possesses. Nonetheless, "A" will be unable to affect those norms except by imposing its own perspective on the input it receives from the very agencies guided by those norms. As a result, "A's" position is inherently passive. Each "B" communicates directly upward to "A." That means "A" receives its input from five distinctly different frameworks; in the case of Homeland Security, the number is over three times that. It is not only five data sets that "A" must integrate and coordinate, but five different sets of assumptions about what is important, how information is organized, who should respond to it, etc. On top of that, there is a lot of informational "noise" generated by each of the "B's" as it monitors its relationship to "A" vis-à-vis the other "B's." Thus, *there is no inherent integrative mechanism governing or guiding the relationships among agencies.* This is not to say there are no procedures to promote inter-agency cooperation. However, without an intrinsic dynamic driving these agencies to coordinate and integrate their activities, prescribed solutions usually result in superficial administrative coordination that in turn triggers new inter-agency disconnects.

The Second Stage Review (2SR) initiated by Secretary Chertoff did have, as one of its six-point agenda items, the goal of "enhance[ing] information sharing with our partners." (DHS, 2005). As Representative Mark Souder of Indiana pointed out in his questioning of Secretary Chertoff, "The stove-piping has gotten worse, not better, and it's (less coordinated?) [*sic*] than it was before" (Souder, 2005). This daunting barrier will not be resolved by a liaison office or centralizing policy development and coordination, key steps resulting from the 2SR. It is not a question of whether the establishment of an Office of Intelligence and Analysis charged with gathering information "from all relevant field operations and other parts of the intelligence community" that "draw[s] on expertise of other DHS components with intelligence collection and analysis operations" marks an improvement over previous practice; it very likely does. The same holds for the new Directorate of Policy, whose mandate includes "creat[ing] a single point of contact for internal and external stakeholders by consolidating or co-locating similar activities from across the department," and for the Directorate of Operations Coordination charged with "conduct[ing] joint operations across all organizational elements; coordinat[ing] incident management activities and utiliz[ing] all resources within the Department to translate intelligence and policy into immediate action." (DHS, 2005). Figure 2 schematizes the "reformist," integrative approach when new organizational entities are inserted to integrate operations and analysis. The problem is that this alleviates the upward siphoning effect but does not overcome it. "X" and "Y" simply play the role held by "A," and then there's an *additional* distillation of the material as it makes its way to "A."

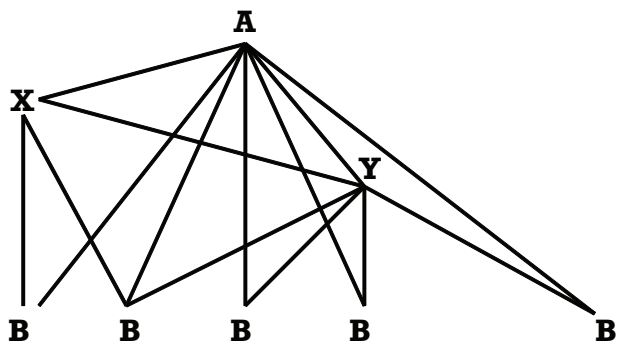

Figure 2. Integrative Reformist Organizational Chart (Simplified)

The aims expressed by DHS are laudable and forward thinking. It is difficult to argue with new directorates and offices to centralize the flow of data and analysis, coordinate action, and establish direct lines of communication with the Secretariat. The catch, however, is in just that comfortable quality. As Stephen Wolfram points out, most efforts in science are geared "not [to] developing new models but rather accumulating experimental data or working out consequences of existing models." (Wolfram, 368). I believe Wolfram identifies a basic trait in all human affairs: the operating models that we regularly rely on to fulfill complex tasks tend to be "protected" by the assumptions and operating protocols that are actually *guided* by the model. In other words, models—and systems—tend to protect themselves because 1) most systemic energy is directed towards deriving new implications from the essential patterns and logic of the system, and 2) the systems themselves are the source for most of the data and insight that *is* applied to reforming them. By nature, we tend not to challenge the underlying guiding forces behind any system. If science, with its rigorous epistemology and method, falls into that trap, we cannot be surprised that bureaucracies, so bound to procedure and beholden to higher authority and not enamored of self-reflection, should prove obedient to more orthodox, tried-and-true methods of self-organization.

Each of DHS's new offices mimics the basic function of Homeland Security itself: acting as a hub to concentrate and analyze information. The reforms fail, however, to effect a shift in the fundamental topology of the network's hubs and links, which will do little to alleviate the lack of integration of the agencies' efforts. Instead, for example, the Directorate of Policy will likely play the same centralizing role that the DHS has played, with the same pitfalls arising from its position as a central hub in the traditional model. The Directorate functions as an extension of the Secretariat itself, and as such will inherit the same problems of distance, isolation, politics, lack of internal oversight, and lack of coordination *among* intelligence-gathering entities that the Department has been subject to since its foundation.

Data shock represents another problem for "A," because no single agency can effectively monitor, much less thoroughly process and interpret, the flow of information from so many diverse sources. Again, this is as true for subordinate directorates charged with the task as it was for the offices that had been responsible for it. DHS and its subordinate directorates have relatively little control over incoming information and analysis from other agencies, yet they depend upon that information and the assumptions that guide its gathering and selection. "A" as overseer will face difficulties in accurately evaluating the relative quality of the work done by each "B" group, as it does not experience that group in action except along a relatively thin administrative interface.

Once each agency knows that the task of collating and coordinating belongs to an oversight agency, its proactive, entrepreneurial spirit will likely suffer because of the reduction in its responsibilities and the exclusion of its cognitive culture from "A's" operations. (The cognitive culture can be described as the sum of the methods, informal channels of communication, protocols, and analytic style of a

group, as well as its morale, values, sense of purpose, and grounding in its own historical narrative. It is precisely in sharing these within the Cleisthenian Model that so much learning and enriched analysis can take place). One can argue that "A" will, in fact, be well placed to assure that the groups do collaborate with one another, but again, this runs up against A's centralizing tendencies and the fact that "A's" authority over the internal operations of the "B" groups is limited. The solution lies in creating a structure whose innate logic compels the various agencies to work with one another. Relying on good intentions and encouragement or makeshift structural additions does not adequately provide such integration.

The orthodox model inhibits the strength of stand-alone B groups, cramping their ability to operate as independent parallel processors of data with the potential for synergies of effort. This parallel processing *can* create redundancies of effort and firewalls between groups, but the CM counters such tendencies. With "A" at the hub, however, information flow will tend to bottle-neck on its way to delivery from the "B" agencies to "A." Instead of the potential for cross-fertilization and richness of insight, the final analysis is narrowed and homogenized by the synthesizing effects of the *uber*-agency. This holds true whether the destination in the Secretariat is the old Information Analysis and Infrastructure Protection office or the newer additions to DHS.

The most fundamental means of processing information are inhibited by the traditional organization chart, whose drawbacks are scarcely over-ridden by members of each group sitting in on occasional meetings, sharing consultants, reporting to authorities above the "A"-level, or establishing special channels for emergencies. There is no reason to assume that an oversight agency can be effective. It is easy and seemingly natural to add a new management box to improve coordination among the other boxes. Yet, if the goal is quick, responsive, effective action in response to vast amounts of raw data and competing analyses and interpretations, the traditional structure makes no sense. Efforts made in the direction of agency coordination, such as the CIA sending twenty-five of its analysts over to the FBI, "enhancing not only the FBI's analytic capabilities but also the relationship between these two entities" (White House, 2007) make good sense but do not provide the intensive cross-pollination of perspectives and understanding that a more comprehensively integrative plan would accomplish. *Coordination among "B" agencies must be well underway before data ever reaches the "A" level, whatever the provisions for coordination and information-sharing built into the "A"-level secretariat*. The CM makes coordination and collaboration inevitable from the start.

Table 2 illustrates the application of CM to the problem of integrating intelligence agencies in a more effective manner than DHS currently provides by recourse to a chart in which the "geographic regions" are the agencies B1-B5. The "Tribes" in this case will be functions that each agency fulfills:

	B1	**B2**	**B3**	**B4**	**B5**	**A_1**
1. Research						
2. Analysis/Application						
3. Strategic Planning						
4. Field Operations						
5. Resources/Logistics						

Table 2: Cleisthenian Integration of Intelligence Agencies

The five categories ("Research," etc.) are chosen for the sake of illustration; other possibilities would work. The "B" agencies represent the "geographic" areas of natural mutual interest and responsibility as defined by the home agency. The functional groups are the "tribes," across which are distributed the "geographically" based members of the agencies. Each individual comes from B1, B2, etc., but works with members of the other "B" agencies within one of the five functional groups. In addition, the groups can include staff from "A," or DHS, as well. The scheme would accommodate selected members of each agency at any one time, while the rest work in their home agencies as usual (the point is not to dissolve the home agencies). Workgroups' activities would be integrated into daily work schedules.

The first practical objection, as any manager knows, is "I can't afford to let that many people go for that much time." The answer, however, is that they are not being "let go"—they will be performing their job duties in another context. In fact, the efficiencies will more than make up for time lost to the home agency. A second objection is that any set of functional categories will fail to adequately define many people's positions, nor will every agency fulfill all five functional tasks. However, it would be possible to engineer a reasonably close fit between actual job functions and "tribal" categories, and the groups will be enriched by those whose duties lie outside the purview of the defined function.

Members of each "region" (B1-B5, A_1) are distributed across each function-based "tribe," at least for a portion of their work time, and each "tribe" is a collection of individuals drawn from each agency or "region." Every step of the analytic and strategic process would operate in an integrated and integrative way, maximizing perspectives and insights *as an inevitable result of the established structure.* Each agency is informed and cross-fertilized by insights from all other groups. It is far less likely for information or analytic insights to get lost under this model, and the culture of each agency is exposed to the best practices—and foibles—of the others.

As in the Athenian Council, with its rotating presidents and presiding tribes, membership in the inter-agency groups would rotate in several ways:

1. Each home agency rotates its members on and off the functional groups, thus exposing as many individuals as possible to the experience and the Cleisthenian groups to as many perspectives as possible. Rotation can be staggered so as to balance fluidity with continuity.
2. At least one member of each agency is assigned to a group that he or she would not normally be a part of. This provides a new level of integration to the groups' perspectives and cross-fertilizes ideas between agencies and among those with different functional tasks.
3. The chair of each group rotates from a member of one agency to another, so that each agency holds the chair in rotation.

Each home agency will be relieved of a portion of its tasks because the integrated groups are addressing them. Nonetheless, the latter operate with very different perspectives from those of the home agencies. The five functional "tribes" enhance the value of data and analysis by working together. The home agencies' perspectives provide important input. There is an inherent managerial challenge to coordinating this scheme, but it would be alleviated by the new energy and dynamics coursing through the system.

The benefits would be felt in the sharing of perspectives, agency experience, and data, the learning available to participants, and the checks and balances applied to analytic conclusions and recommendations. It would also stimulate the entire intelligence system by circulating intellectual

capital, unleashing creativity, and challenging each person to think outside usual agency habits. It is a guaranteed safeguard against stagnation. The CM also provides a safety net against political interference because each individual and each agency has a host of potential allies who not only can provide support, but can take up an idea or policy and pass it on rather than having it squelched by a narrowly vertical chain of command.

The Converging Uni-Modal Approach

CUMA grew out of a study of state foresight as exercised in an outsourcing and education project in Uganda. In writing about it, my co-author and I (Tita and Kunstler, 2007) addressed the complexity of foresight models that often do not capture the way that foresight occurs or the processes by which it is turned into action. Many foresight events occur outside of institutional processes. CUMA draws upon a basic element of human dynamics: great ideas often emerge from individuals with the greatest immersion and stake in those ideas. A quick response often occurs when individuals with high mutual trust operate together, and ideas can gain more rapid acceptance when developed by decision makers rather than emerging from institutional channels.

Leaders often provide the vision and initiative for an organization, and it is they who possess the mandate to cross institutional barriers to fulfill a vision. In CUMA, the idea's the thing, and CUMA provides the institutional flexibility necessary to create a network capable of advancing powerful ideas at a highly accelerated pace and harnessing ideas whose combined momentum is greater than that of the parts. CUMA's advantages include flexibility, responsiveness, freedom from the diluting impact of bureaucracies, and liberation of the energy of high-quality players.

Violating the Power Laws

As noted earlier, social networks are governed by the same mathematical laws that govern electronic networks designed to maximize efficiency. The underlying structure of a network can be described according to the number of hubs that have a given number of links. Mathematicians have found that "power laws" govern the ratio of hubs of any given size within a network (Barabasi, 2002; Buchanan, 2002). A power law governs distribution of events for which there are a few "large" events and an increasing ratio of smaller ones. In a network, this means there will be many hubs with only a few links and a few hubs with a very large number of links. This ratio will be consistent throughout a given network. For instance, within a given network, there may be five times as many hubs with a given number of links as there are hubs with twice as many of those links. Thus, if there are 20 hubs with 100 links, there will be 100 with 50 links, and 500 with 25, etc. This ratio will hold for any hub and its given number of links within the network.

From one perspective, our three organizational models are all based on violating networks' power laws. THHE cultivates methods for enriching the output of all hubs within a network, and in effect, increases the signal output and signal-to-noise ratio of messages traveling along the links. In promoting a web of connections among all members of the group, a creative hothouse, in effect, takes the great majority of hubs with fewer links and links them up to the more connected ones, thus intensifying the group's "neuronal" activity. In fact, one of the signal markers of a creative hothouse is the extraordinary number of superstar performers that it produces. Most communities boast a few highly creative people at one end of a power law curve, and many, many more at the less creative end. Florence, as one

example, boasts as natives or residents a simply unbelievable number of the greatest names of the Renaissance: Dante, Cimabue, Giotto, Donatello, Ghiberti, Brunelleschi, Masaccio, Verrocchio, Leonardo, Botticelli, Perugino, Machiavelli, Michelangelo, Galileo, and so on. One can see Florence at the extreme end of a power law curve, but the network of creativity within the city itself shows a heavy concentration at the "large" hub end of the curve, which violates the proportion of creative superstars one would normally expect. Thus THHE is predicated on creating conditions that will lead to a violation of the power laws as they would normally apply to the distribution of highly creative performers within a social network.

The CM provides for intensive cross-linking of hubs so that the sustained inter-penetration of perspectives stemming from each hub also violates power laws. In a normal "network of influence," certain players will be placed at the highly influential end of the curve—for example, the number of U.S. Senators who can be considered party leaders with significant sway over their fellows. In the Cleisthenian model, the use of rotation and the arbitrary interweaving of links clusters more influential hubs towards the middle, squeezing the power law curve closer to a bell curve, with less drastic leaps in relative influence between leaders and their colleagues. CUMA focuses on linking hubs (leaders and "thought-leaders") to establish a new network whose potential energy can only be galvanized by that specific partnership. Often, in CUMA, the goal is to link an isolated hub with strong potential to a large hub, such as linking Uganda with the global market system, so that the isolated hub rapidly—and "unnaturally" from the point of view of normal network behavior—spins off new links both to the larger system and to new hubs that sprout up along the linkage between the two primary CUMA hubs.

There is no question that the organizational substrate that determines the structure of the U.S. intelligence system needs to change. All other arguments aside, as we have noted, major transformations in global society demand such changes. Again, it is worth mentioning the generational argument. The younger generations—let us say, everyone under 30 years—are adept at using social networking programs, which seem to generate a new Internet start-up every day. The gaming culture draws millions of young people into a near-virtual reality in which they are closely interconnected. They will expect their own workplaces to provide them with a level of freedom, autonomy, creativity, and free-wheeling and immediate response that reflects their digital social environments. These are the people who will be entering the intelligence and security fields, and the task of orienting, training, and managing them will require an uncommon level of adaptation on the part of those currently in control of those fields if they are going to attract and retain the best talent and utilize it to its fullest capability.

The three approaches all have complementary qualities; as in so many organizational initiatives, multiple parallel processes, each able to provide coverage of the gaps left by the others, will have a more enduring impact than a single program of sweeping culture change. Table 3 (on the next page) shows the varied cultural characteristics each model would bring to a situation of cultural or organizational change.

One example suffices to demonstrate the flexibility of this scheme and the fact that it does not conform to the usual organizational patterns. CM is cross-functional and low in hierarchy, traits often associated with "open systems." At the same time, it is highly procedural and promotes a convergent decision-making process. The three models rarely overlap in these important systemic characteristics, yet they do reinforce one another, providing for the redundancy and back-up so important to effective

CM	THHE	CUMA
Multiple allegiances	Allegiance to creativity, project	Allegiance to vision
Rotating duties	Skills dictate duties (can be multiple)	Duties as needed
Process-driven	Content-driven	Vision-driven
Cross-functional	Multi-functional	Mono-functional
Low hierarchical	Low hierarchical	High hierarchical
High procedural	Anti-procedural – whatever works/ technique	Anti-procedural
Convergent decision making	Divergent decision making	Convergent
Integrated but controlled discourse	Multiple synchronous discourses	Highly focused discourse
Shared leadership	Strong but dispersive leadership	Concentrated leadership
Moderate tolerance for other views	High tolerance for alternative views	Low tolerance
Moderate individuality	High individuality	High/Low individuality

Table 3. Cultural Characteristics of the Three Models

strategies and tactics. Given their differences, however, an organization or one of its units might want to assess which techniques to apply according to its circumstances. CUMA can be injected into any group, although a true creative hothouse will probably not have much need of it except as a means of discerning opportunities for unanticipated partnerships. A young, energetic start-up could decide to use THHE as a central approach to its organizational strategy and development. A more sedate organization might implement a small, pilot version of the Cleisthenian Model, or cultivate selected Hothouse factors. The approaches are suggestive as well as prescriptive, and can be used in tandem, as general guidelines, or as a repertoire of tools and techniques to create more successful intelligence organizations.

Following is a brief explanation of the eleven characteristics.

Allegiance: In none of these approaches is the primary allegiance to one's superiors or bureaucracy. In CM, the allegiance is to the two or more administrative categories to which one belongs, which promotes multi-faceted perspectives. In THHE, allegiance is to one's creative mandate within the project, while in CUMA, to the mission; procedure is minimally important.

Duties: In CM, duties rotate. In THHE, skills determine duties, although in the creative universe, multiple skills are common, which leads to multiple duties. In CUMA, the task is the thing, and one does whatever it takes to complete it.

Systemic Drivers: Process drives the CM, while content is what fascinates the creative hothouse. CUMA is driven by the vision of the two or more leaders (or thought-leaders) whose ideas converge.

Functionality: CM is cross-functional by design—that is its whole purpose—but the cross-functionality is purposeful and limited by the rules of the system. THHE is multi- and synchronically functional—each individual generally has many links to other hubs, and links proliferate as needed or as the creative winds blow. CUMA is mono-functional, everyone working their end to make the project work.

Hierarchy: CM is low in regard to hierarchy because the assumption is that everyone can fulfill most roles, or, in specialist contexts, their own expertise can illuminate issues pertaining to another's. THHE is also low hierarchy because that is the way it is in the universe of creativity, except insofar as one is respected by one's peers. CM is hierarchical because it depends on the initiative and momentum of leadership, but it is so in relation to its own needs, not for the sake of position power.

Procedure: CM requires a high level of procedure to keep the rotations and cross-functional operations working properly, while THHE is anti-procedural and highly experimental, utilizing whatever works and always willing to adjust procedure to accommodate technique. CM is anti-procedural, with leaders having the power to override normal behaviors, protocols, and processes in order to achieve a given end.

Decision Making: CM is convergent, given that the formality of the structure is geared towards making decisions in a coherent, purposeful way. THHE is divergent, with outcomes often undefined, while CUMA is inherently convergent.

Discourse: CM's discourse is integrated and across boundaries, but it is controlled. THHE's discourse is multiple and synchronous, and it dissolves boundaries, while in CUMA the discourse is focused and task-oriented.

Leadership: Leadership is shared in CM, as people operate outside their usual departments; rotation and sortition, if utilized, further disperse the leadership function. In THHE, leadership can be strong but advisory and dispersive, that is, creative types often give away or downplay their own leadership. One might think of Duke Ellington leading his band of superstars with a light but firm touch. CUMA's leadership is concentrated, and the process's very nature requires strong, entrepreneurial leadership coming from at least two sources.

Tolerance: CM is moderately tolerant because, despite the integration and sharing of duties and loyalties, formal structures enable one to block, sandbag, or otherwise act disputatiously in response to another point of view. In THHE, tolerance is high because creativity requires constant testing of new ideas and people rarely care about the source; if something works, use it, and welcome the originator into the fold. CUMA's level of tolerance is relatively low because the objective is primary and nothing can stand in its way,

Individuality: Moderate within CM because of the structural allegiances required by the plan. It is high in THHE due to the nature of creativity, as noted in previous paragraphs, and it is also high in CUMA, from the perspective of those driving the process, and low in regard to those whose efforts are suborned to achieve its ends.

Conclusion

Taken together, the three models can radically transform the internal culture of a knowledge-based organization, be it Homeland Security, think tanks, analytic groups within entities such as the Defense and State Departments, or groups—such as interim governments—charged with fusing a new governing entity out of widely disparate interests. For instance, in the last case, the notion that governing bodies need to be proportionately representative is a typical mistake that the CM approach would ameliorate. All three models rest, to an extent, on the general notion of galvanizing systems' latent intellectual

capital, and all represent a challenge to standard operating procedures (SOPs) in most organizations. Their value lies not only in the opportunities for implementing suggestions derived from the models, but from the inherent critiques they engender of SOPs, wherever they may be identified.

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Future Decision

Bruce LaDuke

The Three Dynamics of Society

Figure 1 shows the three dynamics that contribute to the current state of any society or social division:

1. Knowledge Advance – The Center is Knowledge Creation.
2. Social Context – The Center is the Balance of Interests.
3. Economy (Includes education as a feeder pool for industry and industry itself) – The Center is Supply and Demand.

It is the combination of these three dynamics that creates the local, regional, national, or international state of any society.

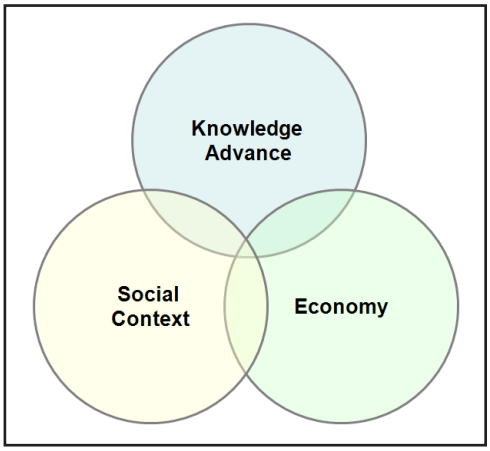

Figure 1. The Three Dynamics of Society

Social Imbalances

Societies that are weak in any one area or that are "out of balance" across areas will absolutely have conflict. Examples include the following:

- A society with an economic thrust (economy) without regard to environmental factors (social context)
- A society that advances knowledge (knowledge advance) faster than education (economy) can keep up and education is unable to supply industry with a feeder pool
- Industry (economy) that ignores work/life balance (social context)
- Knowledge advance (knowledge advance) is frustrated by information overload and the resulting knowledge chaos negatively affects society (social context), industry, and education (economy)
- A national recession (economy) impedes the ability of industry (economy) to produce
- A society has a strong economy (economy), a high rate of knowledge advance (knowledge advance), and a weak social context. Resulting conflicts ripple into economy and then a lack of funds impedes knowledge advance
- Resources, water for example, are in short supply in some areas, affecting economy (economy) and rippling into other areas

Knowledge Advance as Driver

At present, knowledge advance is the driver of social transformation in our world. As driver, it is beginning to lead the other two social dynamics. Whereas in the last century economy was the social driver, knowledge advance is beginning to usurp economy and new knowledge is leading society into the future. For example, today a new computer chip has the potential to create an economy.

In the context of futuring, knowledge advance has been expounded in two frames:

1. **Singularity** - The exponential advance of knowledge that is reflected in concepts like Moore's law. Moore's law states that the capacity of transistors doubles roughly every two years. Knowledge advance fuels these kinds of technological advances. Knowledge advance across all categories of society (e.g., environmental, socio-political, food and agriculture, energy, etc.) is advancing on a roughly exponential curve toward Singularity, which is a theoretical point in time when the entire social paradigm will shift.
2. **Convergence** - The Nano/Bio/Info/Cognitive (NBIC) convergence, which describe converging human performance technologies.[1] The fundamental nature of knowledge is to exist in a single logical structure that can be represented using three-dimensional triadic logic. When seen and worked as such, complex knowledge can be intensely simplified. The convergence is the natural 'coming together' of all human knowledge into its simplest form.

These two seem paradoxical, but they are actually occurring simultaneously. Singularity will be realized after knowledge is converged into one logical structure. At first humans will learn to work this knowledge cooperatively, but at Singularity the computer will take over this process and with it the task of knowledge creation. Artificial knowledge creation (artificial intelligence is a misnomer) is the mechanization of the knowledge creation process. Singularity is the point in time that artificial knowledge creation is realized.

The Evolution of our Knowledge Model

Several scenarios will intensify as we move toward a single knowledge model:

1. The fragmentation and trivialization of knowledge will pressure social systems. The fragmentation and trivialization of knowledge leads to information overload, or an inability to process knowledge. This fragmentation will become more evident as computing power increases our ability to realize it.
2. There will be a battle between public domain knowledge and the concept of intellectual property. Knowledge is one, and as such, ownership of knowledge can conflict with its own integration and the social balance. Knowledge has a far lesser value when it stands alone than when it is incorporated into the social knowledge base. In a certain sense, it is actually erroneous by virtue of not being integrated into the social knowledge base. Knowledge cannot be compartmentalized and still remain fully logical, because the logical structure of knowledge is one structure, not many.
3. In particular, when industrial knowledge is managed in a way that makes it inaccessible to society, industry will begin to be seen as a hindrance to society. The future demands an

1. *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science*, NSF/DOC Sponsored Report, http://www.wtec.org/ConvergingTechnologies/.

approach that will both reward the efforts of industry and reward knowledge sharing. The key to success of future industrial approaches will be to gain an awareness of, and subsequently reward, the act of knowledge creation, while assigning the knowledge itself to the public domain, where it can remain one logical structure and thereby reach its greatest potential for society as a whole.

4. For the same reasons named in number 2 above, cooperative knowledge working processes will continue to evolve. The opposing force to information overload is cooperative knowledge working, which is reflected in wikis and other collaborative technologies popularized today.
5. Knowledge creators will continue to be unfairly compensated for new knowledge. Today knowledge is created in an unconscious manner in that individuals don't really realize they are working a process to create it—but that said, individuals do recognize the product of its creation, which is an idea, or new knowledge itself.
6. The concept of expertise will be challenged and will eventually be supplanted. At some juncture, society will realize that this term is purely political and ill-defined. A new concept of knowledge-working responsibilities will emerge out of this new understanding.
7. The search engine will morph into a knowledge numerical classification or structuring tool, combined with search capabilities. This will give way to a differentiation between a search for learning, a search for new or cutting edge knowledge, and a tool for knowledge creation. An emerging technology that is headed in this direction is the Cirilab® product suite.[2]
8. Rising individual capabilities and power, as knowledge advances, power is transferred from the group to the individual. Technology that was once held by nations can now be leveraged by individuals and small groups. This power can be positive (e.g., Wikipedia) or negative (e.g., nanotech weaponry).

   In this context, the ideologies and beliefs of nations and large groups become less relevant and those of individuals become more relevant. As this situation matures, a scenario of individual or small group versus nation becomes quite plausible. Indeed, one person will literally have the capacity to solve or create/propagate intense social issues.

The Emergence of a Single Knowledge Model

Michael Polanyi's view of knowledge dominates academia and industry. In Polanyi's view, we know more than we are able to express. This view is entirely erroneous, and unfortunately, much of our social systems and industry are built upon this understanding.

The progression toward Singularity is quite simply the progression of our understanding of how to work knowledge as a society. As knowledge models and roles evolve, so does a society.

Contrary to Polanyi's view, knowledge does not simply need to be extracted from the hidden places in the mind of the individual. Instead, the individual plays a number of knowledge-working roles within society. These knowledge interactions are

- Knowledge storage—memory, recollection, and physical storage
- Learning
- Ignorance

2. Cirilab® Inc. http://www.cirilab.com/

- Knowledge creation
- Social acceptance
- Instruction
- Exposure
- Compilation
- Language design
- Collaboration, sharing and connectivity
- Expression and non-expression
- Questions, anti-knowledge, and theory

Social knowledge is stored external to the individual mind. The individual mind interacts with the social mind. It extracts knowledge through learning and adds new knowledge by creating and then expressing that new knowledge to society. Upon social acceptance of the new knowledge, it is incorporated into the social knowledge base.

Knowledge creation is the conversion of questions to knowledge, and this is the driver of all knowledge advance, which is as follows:

1. Definition/Solution/Structure (Knowledge Context)
2. Question/Problem
3. Logical Operation (connects/structures/defines)
4. Result: Advanced Definition/Solution/Structure
5. Return to step 1

Collaboration is how individuals leverage these interactions as a social group, and it is enhanced by sharing (knowledge) and connectivity (physical or virtual connections).

Knowledge conflicts will force new understanding on Polanyi's model, and a new understanding will emerge on the path to Singularity.

Industrial and Social Transformation Meet Knowledge Advance

As knowledge advances logarithmically, the stability of social context and economy are substantially threatened. Keeping pace in either of these dynamics will require an integrative and transformative approach to change. The word "transformation" is popping up in many different circles as a reaction to the increasing pace of knowledge advance.

Social Transformation

According to Rick Smyre, president of Communities of the Future, *reformation* is an adjustment to the existing paradigm while *transformation* is a complete paradigm shift. Smyre states that a new type of leader is emerging in response to the need for transformation:

> *In a world of constant change, this new type of leader will complement the traditional action, outcomes based project leader so important to Industrial Society. Known as a "master capacity builder," this transformative leader will need to be able to seed "capacities for*

transformation" among diverse people and organizations in a newly emerging Conceptual Age, will need broad knowledge in many areas, process design skills, emotional maturity, a willingness to take risks for the common good and a compassion for others.

Six areas of transformative leadership need to be developed:

1. Ecoplanning and Emergence (adaptive planning) are fundamental principles for adapting to a constantly changing society
2. Transformational Process Skills able to create a culture of transformation
3. Transformational Attitudes that are consistent with a constantly changing society
4. Transformational Capabilities that are consistent with a constantly changing society
5. Spotting Trends and Weak Signals that are consistent with a constantly changing society
6. Connecting Ideas, People, and Institutions are at the core of the ecology principle for transformative leadership[3]

The article *Researchers Explore Scrapping Internet* is a perfect example of such transformation. As knowledge of the Internet advances, the initial assumptions made at its inception no longer support the technology.[4] As such, certain individuals have begun to press for a transformation: "scrapping" the old paradigm while simultaneously building the new paradigm.

Business/Industrial Transformation

Likewise, industry will continue to see a need for transformation. Industry lies at the heart of life for the individual and is the heartbeat of economy. A simple definition for industry is the "science of making things." Our present state of industry is a product of the industrial and information age. Here we have learned to make things in a competitive manner that incorporates knowledge as intellectual "capital" that can be applied to practical application.

The book, *It's Alive: The Coming Convergence of Information, Biology, and Business*, provides insightful statistics into the growing need for transformation within industry as well. According to Christopher Meyer and Stan Davis in this book, we are experiencing simultaneous increases in business change and volatility. They detail this as follows:[5]

Accelerated Change

- The number of Fortune 300 CEOs with six years' tenure in that role has decreased from 57 percent in 1980 to 38 percent in 2001.
- In 1991, the number of new household, health, beauty, food, and beverage products totaled 15,400. In 2001, that number had more than doubled to a record 32,025.
- From 1972 to 1987, the U.S. government deleted 50 industries from its standard industrial classification. From 1987 to 1997, it deleted 500. At the same time, the government added or redefined 200 industries from 1972 to 1987, and almost 1,000 from 1987 to 1997.

3. "Communities of the Future, Future Leaders," http://www.communitiesofthefuture.org/leaders.htm.
4. "Researchers Explore Scrapping Internet," Associated Press, by Anick Jesdanun, AP Internet Writer, http://www.breitbart.com/article.php?id=D8OFTIU00&show_article=1 .
5. "It's Alive: The Coming Convergence of Information, Biology, and Business," Christopher Meyer and Stan Davis, Crown Business, May 2003.

- In 1978, about 10,000 firms were failing annually, and this number had been stable since 1950. By 1986, 60,000 firms were failing annually, and by 1998 that number had risen to roughly 73,000.

Increased Volatility

- From 1950 to 2000, variability in S&P 500 stock prices increased more than tenfold. Through the decades of the 1950s, 1960s, and 1970s, days on which the market fluctuated by three percent or more were rare—it happened less than twice a year. For the past two years, it has happened almost twice a month
- The number of firms that take "special items" in their accounting has grown dramatically. The number of S&P 500 firms declaring "special losses" has grown from 68 in 1982 to 233 in 2000. Special items are, by definition, an admission of being caught flat-footed by change more volatile than the normal course of the business cycle.

We need to stress that our argument here contains two distinct points. The first is that change has accelerated. That means whatever trend you look at will be proceeding more rapidly. Volatility is the degree of variability around a given trend. Our second point is that volatile events are of greater magnitude and occur more frequently. These reinforce each other, but they're not the same thing. [6]

Business/Industrial Integration

Industry is a microcosm of society. It is undergoing the same convergence and rise toward Singularity that society is. As such, future industrial success will demand integrative approaches. With the customer becoming the principle focus, there are four areas of integration within the business/industrial enterprise:

1. Strategy/Futuring
2. Performance
3. Performance Improvement/Change
4. Transformation

Integration will occur across these areas and within each individual area. For example, within the Performance Improvement/Change category, individual disciplines like project management, change management, communications, and training will merge into a single integrative approach in successful enterprises. These integrative approaches to business/industry will usurp many traditional performance improvement methodologies like Six Sigma or Total Quality Management.

It is important to note that transformation in this context is a complete and total paradigm shift that is demanded by radical changes in the external business environment. The roles of 'transformation manager' and even 'chief transformation officer' are just beginning to emerge. Unlike an incremental change, transformational change demands a parallel system of performance—essentially running two enterprises in one. As such, the transformation arm of an enterprise will be distinct from the performance improvement arm (which is incremental). Enterprises that fail to integrate these functions into a single system will find themselves losing to those that do. Not only will the integrative enterprise be more efficient and effective, but these will also be more nimble to transform as needed.

Decision Making and Strategic Foresight

Decisions are the building blocks of strategic foresight and the initiators of thinking and action. In this section, we will expand understanding on what decisions are and how these flow into strategic foresight.

Decision – What is it?

What is a decision? In one sense, a decision is a choice made to achieve some expected result. For example, within industry, the decision guides performance, which is effort aimed at achieving a desired result. There are good decisions—those that produce positive or desired results; and poor decisions—those that produce negative or undesirable results.

Decision – An Informed Choice

A decision is simply a choice among two or more alternatives. An informed decision is one that is based on some level of information about those alternatives. So in terms of information, it is quite possible to make a decision with no information, partial information, complete information, or exhaustively complete information.

As an example, the *Harvard Business Review* article "Evidence-Based Management" is an example of an industrial awareness of how important a good foundation of information is to good business decisions.[6] Regardless of the level of information used to make decisions, any decision is still in its simplest form, a choice among two or more alternatives.

Decision – A Problem Solved

In another sense, decision making is problem solving in that it involves the "discovery" of the best alternative among two or more alternatives. But what is a problem? A problem is simply a collection of questions around a particular knowledge set. By systematically answering a set of questions in a problem set, the problem is solved. This is the foundation of anti-knowledge theory, which states that questions form an antithetical domain to knowledge.[7]

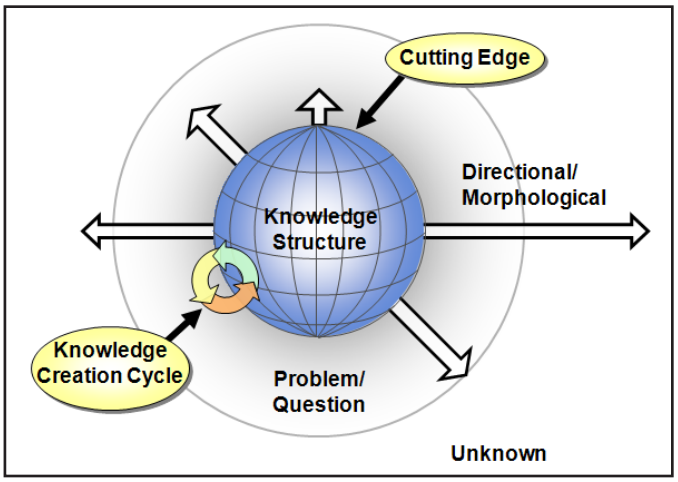

Figure 2. Knowledge creation converting questions into knowledge structure at the cutting edge.

Figure 2 shows a representation of this process of converting the unknown into the known. In this diagram, knowledge that is known is represented in the center as a sphere. The cutting edge, leading edge, or bleeding edge of knowledge is the line between the known and the unknown. And the problems and questions are areas of a perceived lack of

6. "Evidence-Based Management," January 1, 2006, Harvard Business Review, http://harvardbusinessonline.hbsp.harvard.edu/b02/en/common/item_detail.jhtml?id=R0601E
7. "Anti-Knowledge: Mass Questioning," http://www.anti-knowledge.com

structure that exist between the known and the realm of the unknown. The knowledge creation process operates on this cutting edge by converting questions into knowledge. Creative methods like lateral thinking and brainstorming work by changing the direction of this knowledge creation process and thereby allowing unseen connections to also be made.

Problem solving is answering questions that surround some existing knowledge domain. When understood at a deeper level, decision-making utilizes this process.

Decision – Forecasting

Statistics are both the drawing of conclusions from existing data and/or forecasting the future using probability. The weakness in a probability-based forecast is that probability is mathematically projected forward using historical data. This means that factors can be introduced between the time of the initial data gathering and the time of the expected result that change the forecast.

For example, let's assume a company does an annual probability calculation on a certain business market and determines that there is a high probability that some business market will emerge. During the timeframe between this probability assessment and the expected result (typically a 1 to 3-year planning cycle), one or more events occur that are outside of the scope of the initial assessment and that subsequently affect the result.

In times of rapid change, events are occurring faster than historical data can project forward and as such statistical probability analyses are rendered ineffective.

Statistical probability is not the only method of forecasting, but is perhaps the most commonly used method in business. The *forecasting methodology tree* at the *Forecasting Principles* website is a nice visual representation of these methods.[8] Also the Futures Research Methodology contains a comprehensive list of futures research methodologies.[9]

The most important thing to understand related to forecasting is that <u>all</u> forecasting methods, statistical or judgmental, are a form of exhaustive questioning. A forecast is a 'problem' of identifying a certain outcome. As such, the forecast, by various methods, asks questions about 'what will be' and organizes the answers to these questions into a projected outcome. So then, by understanding problem solving in a new light, we can improve both decision-making and forecasting at all levels.

Important Note: Some predictive, psychic, and quantum methods exist or are emerging that really cannot be classified as forecasting. These can also be related to problems/questioning, but that relationship isn't explored in this paper.

Decision – An <u>Exhaustively</u> Informed Choice and a Problem Solved

Is decision making an informed choice or a problem solved? The answer is that good decisions are <u>both</u>. Figure 3 shows a matrix I developed as a creative problem-solving method in my last year of college. At the time, I called this method "Directional Categorization," and I used it to create fresh ideas for advertising. The concept is simple: every problem consists of a set of knowledge, the

8. See http://www.forecastingprinciples.com/methodologytree.html (last accessed 17 July, 2008).
9. Futures Research Methodology, Version 2.0, AC/UNU Millenium Project, Jerome C. Glenn and Theodore J. Gordon, August 2003.

"known," and a set of questions, the "unknown. "By structuring or categorizing the questions or unknown, you effectively create new knowledge. The categories reflected in Figure 3 are universal and can hold all human knowledge.

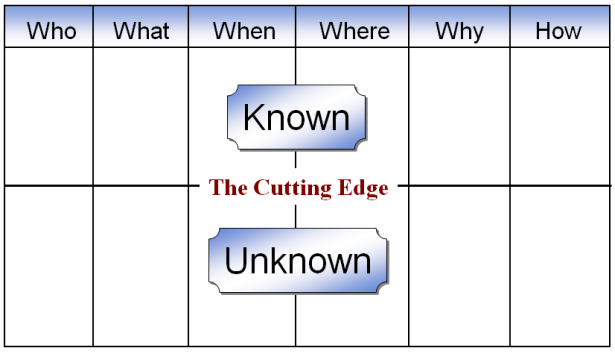

Figure 3. The directional categorization grid—a representation of knowledge working.

This simple method is amazingly effective at illustrating the nature of many mental concepts, including problems, decisions, knowledge creation, questions, knowledge itself, the cutting edge, and taxonomy. The root concept is this: all problems are solved by answering questions tied to existing knowledge. Answering questions in a specific knowledge domain is problem solving *and* knowledge creation.

So let's return again to decision making. A good decision is not only one that gathers strong intelligence or information, but it *also* gathers and categorically structures relevant questions to advance that knowledge context to some desired level.

And volume of data is an imperative. By exhaustive gathering of information and structuring questions, the optimal context for a decision is created. See the following example of the matrix method above that I used to exhaustively categorize and "solve" a problem for which I had very little knowledge context.

In this example, which I drafted around 2002, ideas are solutions/new knowledge to me personally, not necessarily new to all of society (Or, for example, to a NASA scientist). New knowledge to one may not be new to another. What is new to all is newly created for society. The row axis in this diagram does not hold significance other than to show general progression.

Exhaustive categorization of questions and possibilities is the goal. In doing this new knowledge is created.

Key:

Large Bold Text = First Tier Questions

Bold text = Second Tier Questions

(In parenthesis) = Who not, What not, etc.

Plain text = Answers

Italic shaded text = Ideas

Figure 4. Exhaustive Questioning – Example: Deep Space Travel

Who / (Who Not)	What / (What Not)	When / (When Not)	Where / (Where Not)	Why / (Why Not)	How / (How Not)	Emergent Concepts
Who travels?	What is space?	Why now?	Deep space?	To colonize? Learn?	Space-ship?	
Adult, children, old age?	Vacuum	Lack of resources	Under earth/ rock of moon/ planets	**Humans move**	**(Not by spaceship)**	
Men or women?	**What moves in a vacuum?**	Too many people on one planet	*Under ground biosphere/ space station*	**To learn? Discover?**	**How else could one travel?**	
Big/little, tall/short?	**What doesn't move in a vacuum?**	To gain more resources	**What is the temperature far from Sun?**	Machine learning/ discovery. **To discover transport data, not mass?**	*Hitch a ride on a comet. Self-replicating from comet material.* **Buried inside?**	*Comet parasite.*
Intelligent or learning?	**Space/ time continuum Bend space?**	To make money	*Too cold => warm underground*	Humans don't have to physically travel to learn or discover	*Create a comet or man-made orbital object*	*Solar orbital launch.*
Machine without human	Absence of matter. **What is matter?**	Environ-mental concerns	**How to get under-ground?**	**Discovery precedes human travel. Do we know where to go?**	*Probe/ Communications./ telescope/ instruments on orbital object*	*Solar orbital deep space intelligent probe.*
Artificially Intelligent machine? Risk?	**What is anti-force of a vacuum?**	Against plans/ schedules. Metaphor: taking a trip.	**Cave, dig tunnel, blast?**	**Ethics of machine growth?**	**Spaceship: How large?**	*Launch from orbit. Gain speed in vacuum.*
Intelligent probes.	**What attracts an object in a vaccum?**	(Today… not ready)	(Sun) (Heat/cold)	**Should people travel in space? Why? Why Not?**	**Can't take people… Could move resources… Could be a probe**	*Probes at intervals communicate with each other Probe network..*
	Magnetic? Without mass?	(Learn to live here)	**Propelled by sun?**	*Intelligent Nanoprobes*	*Nano-transport of tool parts to station*	*Incremental building of data transport tools.*
Probe => discover/ learn	**What is force?**	**Why soon?**	**Outside solar system?**	*Nanoprobes on launched from comet*	*Solar sail nanoship*	*Solar nanoship/ probe.*
	Something that can force something else	**Colonize too quickly?**	**Where life is sustainable?**	**Raw materials/ resources?**	Smaller and smaller ships piggyback	*Pggyback, nanoprobe***.**
Learning machine/ Discovery machine	**Types of force?**	**Can it wait?**	**Space station? Biosphere?**	**Can we use inter-planetary resources?**	**How to transport material? How much?**	*Nanoswarm Building.*
Self-replicating intelligent probes	Attraction propulsion, repulsion, gravity, solar, wind, orbital, pressure	**What is a planning threshold? E.g., 100 years?**	*Incremental travel? (Biosphere to Biosphere) Can perfect biosphere from earth.*	(Lack of food/ water) (Toxic gases) (Lack oxygen)	**Transport through light?**	*Laser light probes?*

Continue exhaustively questioning and building the structure of knowledge by answering these. This slowly builds a logical knowledge/question base of the topic/question and creates a visual of what you know and what you don't know.

In this example, additional knowledge context would create an even more effective solution/knowledge.

The Execution of Decisions

Within any effort, for example military, business, government, education, or not-for-profit, decisions are always actionable and are made to initiate action toward some result, whether it is a temporary or permanent effort. In this section, I will be using the term *Enterprise* very broadly to include all of these various efforts.

Generally speaking, decisions initially flow into enterprise strategy, an operational plan is developed, and this plan is tactically implemented. In business, the terms tactical implementation and performance are often used interchangeably.

The success or failure of the tactical implementation is then measured and decisions are made relative to what needs to improve. In business, this is known as performance improvement. Various methodologies, like Six Sigma in business, for example, are focused specifically on this performance improvement aspect of the enterprise.

So an enterprise makes decisions to set goals and strategy, it implements strategy through tactical implementation, it makes decisions on how to improve, and then, if needed, it executes those improvements. This is the basic flow of <u>any</u> enterprise effort. Many enterprises confuse strategy with the improvement plan and mix up the implementation of both, but these are two distinct plans and need to be managed as such.

According to the Lykke Model, strategy must answer three questions:

1. What is to be done? (ends)
2. How is it to be done? (ways)
3. What resources are required to do it in this manner? (means)

Lykke then goes on to assert that if there is any imbalance of these three, risks are incurred.[10]

In business, strategic *ends* are what performance objectives are derived from, the *ways* are typically internal methods and processes, and the *means* are human and machine resources and their associated time/cost.

Regardless of how we conceptualize the ways, means, and ends, all enterprises follow the same basic flow: An enterprise makes decisions to set goals and strategy, translates strategy into operational plans, controls tactical implementation, and tactically implements. It then makes decisions on how to improve tactical implementation, and subsequently executes those improvements. So, the four primary categories for execution are

10. U.S. Army War College, Guide to National Security Issues, Volume 1: Theory of War and Strategy. 3rd Edition, Revised and Expanded, Page 46. Edited by J. Boone Bartholomees, Jr., Department of National Security and Strategy, June 2008

1. Strategy
2. Operational planning and control
3. Tactical implementation
4. Performance improvement and/or transformation

Now let's dive a little deeper into these four areas. Each one of these areas needs to change to keep pace with changes happening in our world.

Strategy

A strategy is a formalized set of decisions. The only way to arrive at a strategy is to make decisions. In some enterprises, strategy can become disconnected from tactical implementation. The assessment is made, but the strategy is not converted into actionable and measurable performance objectives. If the strategy is not "real," then it can falter at tactical implementation.

Strategy is a complex decision, and some form of exhaustive questioning is always used to set it. There are scores of methodologies for setting strategy, but these all are intended to understand some problem or opportunity and set a plan for action relative to the problem or opportunity. Decisions are made, and strategy is set to produce some desired result.

The planning window in enterprises varies wildly by enterprise, function, and by culture. In the United States, the planning window is much shorter than in Asian countries. The United States tends to focus on 3 to 5-year plans in most enterprises.

In a world of rapid increases in change, volatility, and complexity, 3 to 5-year plans alone can break down. In terms of long-term strategy, a more thoughtful look at trends and weak signals, perhaps 20 to 50 years out, is likely needed to see change, volatility, and complexity coming in the enterprise external environment. In terms of tactical implementation, the world is changing so fast that 3 to 5-year planning cycles may break down under the weight of change. In addition, efforts in other enterprise ventures impact your own efforts, and social balance must be considered, as discussed earlier in this paper.

To compensate for all of these forces, future strategy needs to have

1. Strong long-term vision and foresight
2. Intense short-term adaptability
3. Purposed balance with other social efforts

This implies a much more complex and fluid decision-making process with a broader scope. In spite of the increased complexity, it is important to remember that this process is still always some form of exhaustive questioning.

Operational Planning and Control

Let's begin this section with a few definitions:

- **A Plan** is a design for what will be done to implement strategy, performance improvement, or transformation. It can also be seen as the elucidation of all decisions related to the implementation.

Note: By this definition, strategy is also a plan, and depending on the size of the tactical implementation, there may be hierarchical levels of strategy and tactics.

- **A Schedule** is specifically what tasks and activities will be done, who and/or what will do them, and when they will be done.
- **Control** is applied to the schedule to ensure that it is done and done on time, and that resources are both motivated and accountable.

With that as a starting point, it is important to realize that terms used to describe operational planning and control conflict both within and across disciplines, industries, and sectors. For example, in business, a temporary effort is a *Project,* while in the military, it is an *Operation* (a campaign, mission, etc.). Then in business, the phrase *Business Operations* refers to the permanent infrastructure used to operate the business. As another example, within business, the term *Task Force* is most often (but not always) used to describe a permanent board of advisors, while in the military, it is a temporary grouping of units under one commander, and in government, it is a temporary group tasked with accomplishing some objective.

To understand operational planning and control in a more generic and integral light, let's step away from these conflicting terms and classify operations and control by function and the level of permanency as it relates to the tactical implementation itself. Here are three categories for what I will generically refer to as *Implementation* that we should consider:

1. Support/Enabler – Any effort, resource, method, tool, group, etc. tasked with solving a specific problem as input to strategy or supporting/enabling tactical implementation
2. Temporary Initiative – Any temporary effort or group that has a defined beginning point and defined endpoint
3. Permanent Initiative – Any effort or group that permanently supports some cyclical delivery of tactical implementation, e.g., execution of annual business plans

The confusion across disciplines, industries, and sectors arises when these three types of efforts are then applied to the several layers of decision execution:

1. Strategy
2. Operational Planning and Control
3. Tactical implementation (outlined below)
4. Performance improvement (outlined below)
5. Transformation (outlined below)

This results in a matrix format for types of implementation that looks something like this:

	Strategy	Operational Planning and Control	Tactical Implementation	Performance Improvement	Transformation
Support/Enabler					
Temporary Initiative					
Permanent Initiative					

If you place an 'X' in any of the cells on this matrix, that's one type of implementation. There are fifteen possible types of efforts—not counting scores of nuances—within these categories alongside potentially several hierarchical or linear levels of strategy and tactics. This complexity is the reason

there is so much confusion related to the terms that describe operational planning and control and why it is so difficult to arrive at consensus on various definitions for all of these relevant terms.

Regardless of the type of effort, all efforts will have objectives to guide tactical performance; those objectives may be derived from either strategy or from performance measurement, which identifies shortcomings that indicate a need for change (discussed below).

Returning now to our decision-making frame, operational planning and control is the destination for, and the elucidation of, all decisions made. If we think of the formulation of strategy and plans as problem solving, then we can also see tactical implementation of these as the "solution." So now let's look specifically at tactical implementation.

Tactical Implementation

At the high level, any tactical implementation has three components:

1. Communications
2. Performance Enablers
3. Performance

Communication is shared comprehension. Within tactical implementation, communication is used to transport decisions, transport knowledge, or to affect perception/sentiment. As such it is a tool for both knowledge and emotion. Communication can be a very powerful tool, and the importance of it should not be understated. Communism uses communication, in the form of propaganda, to almost entirely control a population.

In any strategy, sentiment of the public, or audience, or market should be assessed, and decisions should be embedded within the strategy to change sentiment as needed.

Communication requires both a sender and a recipient—shared comprehension is therefore implied. Because thinking, perception, intelligence, knowledge, etc. can eventually flow into and enable performance, communication can be a very powerful enabler of practical application. It can, for example, create a climate of trust or cooperation that enables some practical application, or provide enabling knowledge.

Communication literally infuses every aspect of the entire enterprise process. Overall, communications need to have:

1. Clearly defined high-level and detailed messages that include a plan for changing sentiment, if needed
2. Clearly defined roles and responsibilities, for example, a RACI model[11]
3. A plan for cascading communications through points of contact (persons conveying messages/knowledge)
4. A content/knowledge plan (where and how to place knowledge coming into and flowing out of the enterprise)

11. The RACI model identifies who is Responsible and Accountable, who must be Consulted, and who must be Informed during an organizational change. For a more in-depth explanation, see "Value Based Management.Net, RACI Model" http://www.valuebasedmanagement.net/methods_raci.html.

5. The same items above for performance improvement execution

In terms of execution, communications is aimed at knowing and feeling, but performance enablers and tactical implementation are aimed at doing.

Performance enablers are things like knowledge, training, and technology. In and of themselves, these do nothing, but they rather exist to enable tactical implementation.

Within enterprises, technology can get out of place as an enabler and become confused with performance objectives. For example, the need to stay with the latest, greatest technology can begin to override performance goals and objectives. Enablers are just that: enablers. They don't do, they enable doing. Knowledge in and of itself does nothing, but is an enabler for everything we humans do. Training a resource enables that resource to perform, but it is not performance itself.[12]

And finally, performance itself is actually doing something. It is the accomplishing of objectives that were derived from strategy. These objectives must clearly state what needs to be done, under what conditions, and they should declare the minimum expectation for success. Enterprises can have difficulty measuring success when objectives are written poorly.

Conditions of performance include things like intrinsic and extrinsic motivation, the regulatory environment, and limitations in the physical environment.

At the end of the day, we make decisions to execute a strategy to produce some result. At the conclusion of any enterprise implementation, we then need to assess or measure success and/or failure against well-written performance objectives.

Performance Improvement/Transformation

There are two main types of decisions: 1) decisions related to tactical implementation and 2) decisions related to performance improvement/transformation. After tactical implementation results are assessed or measured, a new set of decisions is needed to determine what to do to improve or transform the system. These performance improvement/transformation decisions are once again a form of exhaustive questioning.

The confusing aspect of this is that performance improvement is also a form of tactical implementation. However, instead of being aimed at a strategic result, performance improvement actions are aimed at incremental improvement of the system and the processes used for tactical implementation.

If failure occurs in tactical implementation, effective assessment/measurement will show assignable causes. Performance improvement is a stop-gap process for these assignable causes. We conduct performance improvement to incrementally improve the system of tactical implementation.

12. It is important to note that a resource can be human or machine. Machines can function as enablers, for example, a computer assisting in knowledge working, or as doers, for example, a robotic arm on a manufacturing assembly line. It is also important to note that artificial intelligence (AI) includes many disparate efforts that are attempting to understand, specifically, or generally, how machine thinking correlates to human thinking and/or how to produce a thinking machine independent of this correlation. The zenith of AI will be the creation of the capacity of the machine (computer) to create knowledge. This is also the capability of the machine to perform the exhaustive questioning process outlined in this document. The emergence of this one capability will usher in Singularity and full Convergence and will create a veritable knowledge explosion and a new human paradigm.

Based on measures, an enterprise might choose to:

1. Maintain performance at the same level (as is) or…
2. Raise the expectation of performance or…
3. Improve performance or…
4. Transform.

In number 1, if tactical implementation is successful, there is no need for stop-gap measures and tactical implementation is maintained.

In number 2, leaders set a new measure of success, and the next tactical implementation is measured against this new standard.

In number 3, as stated above, performance improvement is any incremental improvement in the system or processes of tactical implementation.

But number 4, transformation, is a very radical change in the system or processes of tactical implementation. When complete, transformation results in an entirely new paradigm.

Transformation is typically needed when the change is so substantial that it renders the current paradigm obsolete. That said, without executing necessary transformation, the entire system can implode under the weight of change in the external environment. Transformation is an extreme reaction to extreme change. It can be executed in any one of the social dynamics in response to an imbalance, but it is typically executed in response to overly aggressive knowledge advance.

Summary

We live in a world that is experiencing simultaneous knowledge advance toward Singularity and convergence of all knowledge working into a single knowledge base and knowledge working model. This world demands balanced and integral approaches across three social dynamics:

1. Knowledge Advance – The Center is Knowledge Creation
2. Social Context – The Center is the Balance of Interests
3. Economy (Includes education as a feeder pool for industry and industry itself) – The Center is Supply and Demand

In this world of exponential increases in change, volatility, and complexity, enterprises must operate in a change-nimble, future-focused, and integral manner. To do this, a new understanding of decision making is required.

All decisions are based on some form of exhausting questioning. The future leader seeks to understand some problem or opportunity and researches the environment of the problem or opportunity to formulate decisions. All decision-making methods in existence are some variant of exhaustive questioning.

There are two primary types of decisions:

1. Decisions related to tactical implementation
2. Decisions related to performance improvement and/or transformation

In number 1, related decisions flow into a strategy, and because of forces at work in our world, future strategy needs to have

1. Strong long-term vision and foresight
2. Intense short-term adaptability
3. Purposed balance with other social efforts across all three social dynamics (knowledge advance, social context, and economy)

Strategy is then translated into operational plans and schedules; the schedule is controlled as it is tactically implemented. Success and/or failure are then measured and assignable causes are identified as needed.

Then, in number 2, decisions are based on assessed or measured results of tactical implementation. An enterprise might then choose to

- Maintain performance at the same level (as is) or…
- Raise the expectation of performance or…
- Improve performance or…
- Transform

An enterprise can have varying levels of strength in decision making, strategy formulation, operational planning, operational control, tactical implementation, and performance improvement/transformation. An integral system with all of these cooperating will be required for future success in any enterprise efforts.

Security Sensitive Technologies in Academia

A Model for Collecting and Analyzing Open Source Information from Universities to Identify and Analyze Over-the-Horizon Threats

Dr. William G. Perry

Introduction

We live and operate in an asymmetric threat environment. Among the threats we face is the active targeting of our universities and research institutes by foreign intelligence services. Unfortunately our capacity for identifying vulnerabilities and threats that are associated with students, faculty, and researchers may be lacking. The information needed, however, to recognize potential threat vectors that seek to exploit our vulnerabilities may be publicly available for analysis.

The purpose of this paper is to outline a model that can be used to identify emerging threats that are already associated with the intrinsic vulnerabilities in our open system. Agencies of the federal government may be limited by statute or other sensitivities from actively fusing or developing a knowledge base that can be used to recognize over-the-horizon threats and vulnerabilities. University or state employees, however, may be in a better position to collect, assemble, and analyze open source information related to institutions, without significant restrictions.

The role of a university professor, for example, is described as a "three-legged stool." The traditional academic career consists of and is built upon teaching, service, and research. A tenured university professor would be able to collect and analyze open source directory information, sensitive on-campus research, and program information for the purpose of conducting research in the field of "risk analysis." Such efforts would be considered as either service-related activities or research.

A college or university generally publishes the manner in which they disclose directory information. A good definition of "directory information" comes from the Family Educational Rights and Privacy Act Regulations (99.3 Authority: 20 U.S.C. 1232g(a)(5)(A). It states: "information contained in an education record of a student that would not generally be considered harmful or an invasion of privacy if disclosed. It includes, but is not limited to, the student's name, address, telephone listing, electronic mail address, photograph, date and PLACE OF BIRTH, major field of study, dates of attendance, grade level, enrollment status, participation in officially recognized activities and sports, weight and height of members of athletic teams, degrees, honors and awards received, and the most recent educational agency or institution attended. RECORDS that relate exclusively to the individual in that individual's capacity as an employee."

Institutions can disclose directory information about students without their knowledge, provided the school has supplied the general public with their policy on disclosing "directory information" (in a

student handbook, or code of conduct, the school or local newspaper or information included in the student registration pack). This information came from the National Academic Advising Association."

The work of professional intelligence analysts would likely be facilitated if rich supplies of open source information could be gathered, crystallized, and made available to combine with classified information to be used to identify threats and vulnerabilities. Weak or moderate signals could be acquired early, weighted, analyzed, fused, and then escalated for resource-intensive scrutiny when a data point reaches a pre-determined criticality. The following paragraph is offered as an instructive real world example.

One state-supported university hired a professor from an aggressive nation that is a strategic competitor of the United States. Information related to the hiring of the professor was publicly available. The professor began to work on a survey to be administered to *each* State Director of Homeland Security. The purpose of the survey was to determine the opinions of the state directors as to the degree of their state's "readiness." The work being done by the professor was also publicly available. Combining the two early signals (country of origin and the sensitive nature of the topic) might have been escalated into a warning and actively monitored by an appropriate law enforcement agency.

The professor in our example gathered the raw data and the results were tabulated. The professor then returned to his country of origin in a time frame closely associated with that of summarizing the results. Information related to the travel request/authorization of the professor would have been contained in an open source. All three of the signals (country of origin, the sensitive nature of the project, and the budget request for travel to his native country), when fused in a model might have been elevated to a critical level for further analysis, monitoring, or action.

Circumstances, such as the one described above, occur routinely throughout our country. Most universities and research institutes actively promote diversity. The lax attitude toward security, along with the relatively small number of American research scientists being produced in most fields, complicates the challenge.

An additional example further illustrates the point. A foreign national completed advanced graduate studies in the United States and applied for a faculty position in which critical research related to the national security of the United States was being conducted. The individual was deemed to be the best qualified person to fill the vacancy after a thorough and open search. The professor now has routine access to the sensitive research. The taxpayers of the state in which the institution is located routinely pay for the professor's return to his country of origin to promote his professional activities or attend or present at conferences. The home country of the professor in this example is well known for conducting industrial and military espionage against the United States.

Any early weak signals, prior to a professors' departure on flights back to the homeland, could have detected an over-the-horizon threat or vulnerability that warranted the immediate attention of an appropriate federal agency. A model to perform the analysis, however, must be in place. In the examples highlighted in the previous paragraphs, potential risks were likely realized.

This researcher believes that an analysis framework can be designed that gathers disparate but freely available information to identify critical over-the-horizon threats and vulnerabilities. The output of such a system could be obtained in a discrete manner and would be perceived in the academic community as dynamic social or service-related research. The information could be used, however, to

counter risks related to the theft of national security or proprietary information by foreign intelligence services that could otherwise harm the United States.

The remainder of this paper expands upon the nature of the open source information in the academic world that is publicly available for analysis in universities and research institutes. The paper will suggest how such information might be fused and weighted for use as an analytical tool for generating probable over-the-horizon threats.

The Need

A report commissioned by the Assistant Deputy Director of National Intelligence, *The Future of Intelligence Analysis*, identified a need to improve analytic techniques used to assess asymmetric threats by the Intelligence Community. The report concluded that if current practices continue, the IC of 2020 would experience an imbalance between the demand for effective overall intelligence analysis and the outputs of the individually oriented elements and outlooks of its various analytic communities.

The report further concludes that the IC must develop capabilities to extract critical information from large quantities of available open source information and to monitor such information in different ways. Specifically, the report mentions that "analysts increasingly must look to discern the emergent behavioral aspects of a series of events." Anticipating and preventing events that would have a negative impact on the national security of the United States must increasingly become the focus of analytical efforts. A need exists to systematically improve the flow of relevant information to analysts. Among the components in a tool set for future analysts might be mechanisms to encourage the outside world (business, academia and research centers around the world) to link with analysts.

The publication, *The National Counterintelligence Strategy of the United States of America (2007)*, further outlines a need to develop electronic systems designed to monitor and discover unexplained patterns of activities or anomalous events. Members of the intelligence community would be able to access such digital resources when needed. Another conclusion of the report lends insight to the need: "*We must assist in the identification and protection of the nation's vital assets that reside in myriad elements of the US government, the private sector, and academia, and whose significance may be unknown even to those that control them.*"

One needs only to consider the vast amount of money supporting critical research in this nation (in areas such as nanotechnology, computing and photonics, infrastructure protection, etc.) to understand the target rich environment in which potential risks become reality.

> *"The private sector and academia are fertile breeding grounds for advanced scientific discovery, cutting-edge technology, and advanced research and development that make them irresistible 'soft targets' for foreign intelligence collectors. It is imperative that the American public understand that the cyber networks that businesses, universities, and ordinary citizens use every day are the object of systematic hostile activities by adversarial intelligence organizations, and that these activities threaten the integrity and safety of the nation's (critical) infrastructure and electronic networks."*
>
> —The National Counterintelligence Strategy of the United States of America, 2007.

We only need to review, also, the risks that have already been realized in our national research laboratories, government institutions, and critical infrastructure to comprehend the scope of the problem. The full range of our national assets that must be protected from outside threats is vast, and America's colleges, universities, and research laboratories are on the front lines. The hypothesis of this paper is that a large amount of the information needed to protect assets in the university and research environment exists as open source information.

The value of illegally acquired technology is huge and the ease with which information can be stolen from automated networks or from data storage is amazing. The payoff for espionage involving the theft of proprietary secrets is higher than ever and the risk of getting caught (due to technology) is as low it has ever been. Collectors of trade secrets and confidential information are after everything that enable or assist an individual, company, corporation, organization or nation to achieve its objectives.

Foreign interests are now seeking to systematize the collection of critical technology. Students who are earning dollars while employed by universities and research institutes are being used to gain and transfer critical knowledge and technology while performing research with first-tier engineers and scientists. The tasking of foreign nationals becomes more intense as the proximity to the technologies that have been targeted for acquisition increases.

The Department of Defense maintains the Military Critical Technologies List (MCTL), a list of technologies that are called "critical" to the national security of the United States. Extensive information is available at www.dtic.mil/mctl. A logical assumption would be that individuals who are hostile toward the United States would attempt to gather information about such technology. The following are among the items listed on the MCTL:

1. Aeronautics Systems Technology
2. Armaments and Energetic Materials Technology
3. Biological Technology
4. Biomedical Technology
5. Chemical Technology
6. Directed Energy systems Technology
7. Energy Systems Technology
8. Electronics Technology
9. Ground Systems Technology
10. Information Systems Technology
11. Lasers, Optics and Sensor Technology
12. Processing & Manufacturing Technology
13. Marine Systems Technology
14. Materials and Processes Technology
15. Nuclear Systems Technology
16. Positioning, Navigation and Time Technology
17. Information Security Technology
18. Signature Control Technology
19. Space Systems Technology
20. Weapons Effects Technology

General Description of the Model

Distinct variables that are associated with threat vectors may be identified from historical databases, selected by professional analysts, or derived from natural associations, and then dynamically fused to gain valuable insights. Much of the data, however, is unstructured for analysis and varied. Raw data, in many cases, would need to be structured.

The FBI's National Security Threat List might be a good place to begin to develop an understanding what should be monitored. Any items relating to terrorism, proliferation, espionage, the national information infrastructure, and threats to the government from foreign intelligence activities should be included as components in the model.

Each element contained in the model would need to be structured. There are four basic issues associated with structuring data, according to David Nobles of Evidence Based Research, Inc. The first relates to quality control for the completeness and clarity of information that is gleaned. A second area of concern is the validity and precision of the abstraction hierarchy (the accuracy of the assumptions that were made). A third concept relates to how the model builder would represent uncertainty (i.e. weights and probability). A final concern centers on how the universe of data or metadata is managed in a manner that establishes an audit trail.

The problem associated with building a valid and reliable model is for the analyst to acquire and provide a structure that is consistent. The data needs to be discrete, labeled, and of an appropriate type. Only then can the information be of value and be depended upon over time. Various analytical tools, such as spreadsheets, database applications, and other programs, can be used if forethought is used in the nature of the model.

An efficient strategy for integrating open source intelligence information for analysis is desirable. Open source information is available to the general public and originates from a number of sources. One of the challenges with open source information is its sheer volume. Analysts can make the best use of information when it is distilled from open sources and blended with classified information. Such information, derived for a purpose, could be used as the basis for *additional* targeting and data collection activities.

Open source information analysis can be used to provide early warning in the form of a probability that an event might occur and can also help to determine where limited counterintelligence resources might best be focused

The Espionage Database maintained by the Defense Personnel Security Research Center contains extremely valuable historical data and information. The database could be used, for example, to discover that most U.S. citizens who commit espionage are foreign-born males between the ages of 25 and 40. Professional analysts, using a current version of the database could enhance the quality of assessments by adding a predictive variable (such as the fact that a specific country has targeted certain technology for acquisition) to the mix. Open source information might be fused and reveal that research on the technology at risk is being conducted at only three or four universities in the United States.

Threat indicators can be selectively branded, dynamically weighted, fused, statistically treated, and used as a lens to focus Intelligence Community resources. Any model, its associated variables, and their

relative importance can be scaled in size, adjustable in scope, and melded with separate sources (i.e. visas) to assign a probability to a possible over-the-horizon threat.

An estimate or judgment can be made on each model based upon a scale used by the Intelligence Communities that consists of "Remote," "Unlikely," "Even chance," "Probably," "Likely," and "Almost certainly." (These were taken from the National Intelligence Estimate, July 2007. This is the scale used by them and represents a sense of the probability of a development or event.)

The Theory

Certain open source information is publicly available in universities and once identified could be gathered. The list of open source information that can be gleaned from colleges, universities and other sources is displayed below. The list is basic rather than inclusive.

1. University's computer security plan
2. Computer security education program for employees
3. Records classification system
4. General student directory information (i. e. name, major, place of birth, etc.)
5. Directory information for personnel
6. List of grants
7. Research programs
8. Academic offerings (majors)
9. Linkage programs with foreign countries
10. Matriculation verification
11. Travel authorizations for foreign travel for employees and students
12. Travel authorization requests by employees and students to U.S. cities with foreign diplomatic facilities
13. Application for a visa

A number of information sources in educational institutions contain considerable amounts of data, such as directory information on students, faculty, and other employees.

Data sets can be combined with other sources both "open" and "classified." The gathering and processing of large quantities of data can be done using a specialized class of software known as neural network software.

A neural network software model (based upon known factors) can be constructed to analyze and process raw data collected or mined from open sources. Weighted independent variables associated with threats can be used to generate output that would identify likely targets and vulnerabilities to help isolate potential threat vectors in order to more effectively deploy limited counterintelligence resources. Neural network software is especially suited to non-linear analysis.

Artificial Neural Network Software

Neural network software mimics the way human neural networks function. Artificial neural networks can be used to build a statistical model using structured data points to predict the probability of future behavior. The more accurate the data sets used to "learn" by the neural network software engine, the

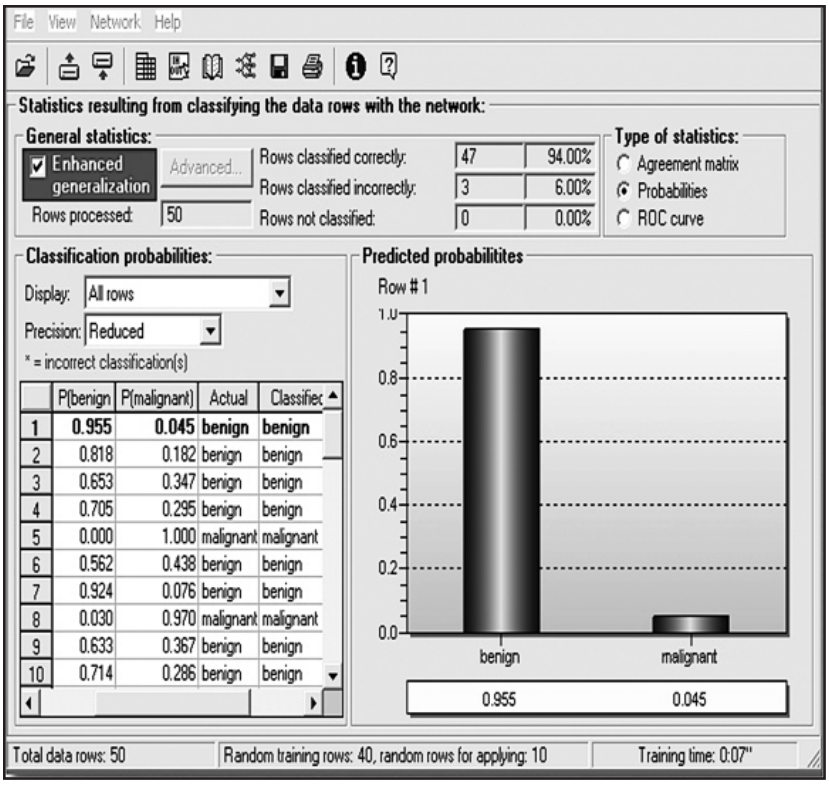

Figure 1. Sample Neural Network Predictive Model. Figure courtesy of Ward Systems Group, Inc. Copyright Ward Systems.

more accurate the projections that can be made. Outcomes can be stated in terms of probability. Figure 1 shows an example of output supplied by a publisher for a neural network application that examined multiple factors associated with a tumor. The model yields the "probability" that a tumor is malignant or benign. (The variables used by a neural network model were skin type (1-3), a physical exam (0.1 – 0.9), and the results of a blood test (1-9)).

The neural network's projection for the first tumor is displayed in row #1. The model (based upon what was learned) yielded a .955 probability that the tumor is "benign" and a .045 probability that the tumor is malignant.

Neural network software works best when used for analysis with complex prediction problems that are associated with non-linear relationships among data or variables. Neural networks excel in classification problems for decision making. The basis for most artificial neural networks is a statistical model for decision making that is derived from data mining activities. Neural networks seek to combine contributors to future outcomes by examining the strengths of connections among contributing components. Some of the computing functions associated with a neural network software model would include classification, pattern and sequence recognition, filtering and further analysis to yield a signal flow that can be used for decision making.

Neural networks must be "taught" their paradigms, or frames of reference. A neural network for the analysis of open source information would need to be trained with structured data and then be used or applied as classifiers of new data. Neural networks are trained with sample data sets and values that are pre-set (even with built-in investigator bias). One publisher of a number of neural network products, Ward Systems, suggests that there are several iterations associated with developing a valid neural net; see figure 2. First, a simple network can be built and then refined as more data is added to the model over time. Using data sets similar to those upon which the training set was derived can test neural networks. This is one way in which the validity of a network can be established. A neural network model could eventually be converted into a "run-time" application that can accept data from multiple data streams.

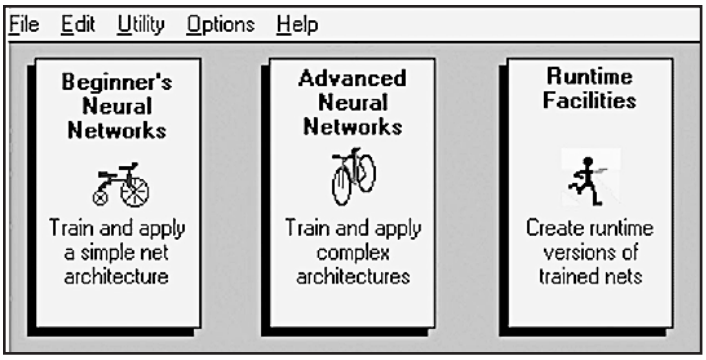

Figure 2. Evolution of Neural Networks. Figure courtesy of Ward Systems Group, Inc. Copyright Ward Systems.

The ultimate outcome would be a computer application that automates data analysis. The output would be a list of individuals who pose potential threats.

The goal of the model discussed in this paper would be to create a neural network software model that would indicate an emerging threat against our nation's critical information assets and technology. The best way to successfully build such a model might be to use what is known as a "genetic training method." It allows the artificial neural network model to "learn" which independent variables are most important (establish synaptic weights) to the model. Without sufficient data sets from which to learn (most of this information would be classified), an investigator would have to build in bias, levels of tolerance, or expected behavior.

The disadvantage of using neural network software is the assumption that the network was "trained" with learning sets that were both valid and relevant. In other words, were the independent variables used to influence the model both valid and reliable? The structure of the data would be key.

Possible Data Set Structures

Each of the basic open source information items listed earlier in this paper can be structured. The following are some limited suggestions:

- A formal computer security plan – An information security specialist can judge the quality of a university or college's computer security plan. Any institution without a robust information security plan is vulnerable.

The published security plan at the University of Texas at Austin would be a good example of a high-quality information system security plan. An examination of information security policies on the web sites of other universities would reflect a wide diversity in quality.

A scale for rating an institution's security plan might be: "1" (none), "2" (weak), "3" (minimal), "4" (strong), and "5" (very robust).

- An information security education plan for employees – The best computer security plan can be published and on-the-record. However, if employees are unaware of the organization's "security best practices," all sensitive data is vulnerable. Mistakes could be made in processing and maintaining the data. Employees, also, should be able to identify an information security breach. The International Security Management Association points out that more than 75% of economic espionage is perpetrated by insiders.

An information security specialist can rank an institution's education plan. A simple assessment of 2 for "Yes," or 1 for "No," might be adequate. Analysts could define the scale to include greater detail using a five-point scale.

- Criticality of the information or technology – A universe of sensitive national security information is the target of foreign espionage. Each unit of vital information or science that is known to be targeted should be rated. The Defense Department's list of critical technologies might be used as a constant in the model. "Nanotechnology," for example, might be rated higher than "Marine Systems Technology." A five point scale might be used, for example: 1 (minimal), 2 (confidential), 3 (secret), 4 (top secret), 5 (compartmented).
- Place of birth – Faculty, staff. or student's place of birth (which may be expressed as 'country of origin') might be a key variable in the model. Colleges and universities are at liberty to disclose "Place of Birth" under federal law. However, an institution may elect to withhold such information. A foreign-born student from a nation known to be unfriendly to the United States would receive a higher threat rating than a student from a trusted ally. The following scale might be useful: 1 (inconsequential), 2 (minimal threat), 3 (moderate threat), 4 (considerable threat), 5 (significantly high threat).
- Grants – Practically all universities and colleges receive grants. A security specialist should assess all grants as to their degree of criticality. For example, a grant designed to determine the best method of teaching students in need of speech therapy would be rated as a lower risk than a grant to assess the readiness of state homeland security directors. The following scale might be used: 1 (inconsequential), 2 (somewhat sensitive), 3 (sensitive), 4 (very sensitive), 5 (critical).
- Research Programs – Some universities and colleges have on-going research programs that fall in critical areas. Concentrated projects, studies, and ties with industry are forged. One example that comes to mind is the University of North Dakota's aviation research orientation. NASA maintains a "National Suborbital Education and Research Center," which is directly affiliated with the Grand Forks Air Force Base. Such a program may be totally separate from UND; however, the university's aviation program operation puts it in close proximity to a U.S. Air Force base and a research facility that is important to our national security. A scale that might be used is: 1 (inconsequential), 2 (somewhat important), 3 (important) 4, (very important), 5 (critical). A research emphasis, such as the North Carolina Center for Teaching Excellence, would be rated as less critical to national security interests than the NSA Center of Excellence for Information Assurance.
- Academic Offerings – Programs and majors (in U.S. colleges and universities) that directly relate to the national security of the United States should be recognized, categorized as to their level of criticalness, and weighted accordingly. A scale that could be used for this purpose might appear as follows: 1 (unrelated), 2 (of little concern), 3 (of concern), 4 (of great concern), 5 (critical). For example, a graduate degree program in microbiology might be rated as "of concern," while a Master's Degree program in secondary school administration would likely be "unrelated."
- Foreign Linkages – Many colleges and universities pride themselves on maintaining international links. Many recruit overseas for the money foreign tuition brings as well as the perceived prestige of attracting foreign students and being "global." Many universities have "links" with foreign countries that are strategic competitors of the United States. The relationships that are forged are used by unfriendly foreign intelligence services to enhance their operations in the United States.

A specialized analyst might have to be called upon to rate the degree of vulnerability of the colleges and universities. A scale provided to weight threat potential might appear as follows: 1 (no foreign links), 2 (informal foreign links), 3 (moderate foreign linkages), 4 (formal and active foreign linkages), 5 (substantial foreign linkages with strategic U.S. competitors).

- Enrollment Status – Students from foreign countries, prior to the terrorist attacks of 9/11, frequently obtained student visas and enrolled in universities and failed to show up. There was little follow-up. Open-source data could be used to verify the continued attendance of each student. The scale used for analysis could be either a "Yes" for attending and a "No" for discontinuing enrollment (or just failing to attend).

When a student, whose country of origin is a strategic competitor, fails to show up for classes and a check of the ICE database fails to indicate that the student has left the United States, the level of concern with regards to the student would be elevated.

- Foreign Travel Authorizations – Requests for travel and budget authorizations (for mainly faculty and some students) to support foreign travel attract significant attention in the universities and colleges. The accountability and expenditures of taxpayer funds for foreign travel are obtained within the line items of a university's budget. The records, in most instances, would be public. However, the task of obtaining the records would likely be tedious. A scale used to evaluate foreign travel authorizations might appear as follows: 1 (of no concern), 2 (of little concern) 3 (of moderate concern), 4 (of significant concern), 5 (of serious concern)
- Domestic Travel Authorizations – Travel requests for both students and staff are among the first line items that are cancelled when funding runs short. Consequently, travel requests receive close scrutiny and are part of the public record. Travel to a city with a diplomatic facility by a faculty member or graduate assistants whose country of origin is a competitor might be of concern. This is particularly true if the faculty member is an information security specialist or computer scientist specializing in encryption technology. The scale for analyzing and weighting domestic travel might appear the same as that for foreign travel.
- Visa Activity – All applications for visas for travel by faculty and staff of colleges and universities should be routinely assessed and analyzed by the model. The intelligence community may wish to limit the scope of what is analyzed (i.e. monitor only visa requests to countries of origin known to engage in espionage). Regardless, some state players are known to use national heritage and pressure on family relationships to enroll foreign nationals in espionage operations.

A scale for analyzing the significance of a visa application by faculty or staff might be: 1 (of no concern) 2 (of little concern), 3 (of moderate concern), 4 (of significant concern), 5 (of serious concern).

Conclusions

We can identify our national security assets. Case studies exist that contain detailed profiles of foreign agents who have operated against the United States and stolen critical information related to U.S. national security. We know many of our universities and colleges have been virtual havens for foreign intelligence service operations. We also know that open source information exists that could, if brought together in a timely and structured manner, be used to represent early "over-the-horizon

threats" to the national security of the United States. The quality of decisions related to how limited counterintelligence resources are deployed can be enhanced.

A neural network software model can be designed and maintained to fuse open source information for the purpose of identifying early over-the-horizon threats. The continued maintenance and operation of such a model would evoke continual improvement in the validity and reliability of the information.

The design, training, and field-testing of a working model is needed.

Predictive Network-Centric Intelligence
Toward a Total-Systems Transformation of Analysis and Assessment

Mr. Timothy J. Smith

The Need for a Revolution in Assessment Capability

The calm that followed the Cold War is over. Today's war-torn world is wracked by discontinuous change and intense struggles over cultural values and regional power. Rogue states, violent extremism, and devious threat tactics combine with potential access to weapons of mass destruction to pose grave and unprecedented challenges. Security has regained its pre-eminence among national policy concerns, and intelligence, as always, must provide the first line of forward defense.

However, notwithstanding substantial progress in recent years, the United States Intelligence Community (IC) is not yet performing up to its full state-of-the-art potential. In addition to the age-old difficulties of penetrating denied areas and ideological movements, we also lack the sophisticated analysis and assessment capability required to convert the extensive information we do collect into prediction and warning that is timely and sufficiently powerful to prevent intelligence failure and surprise. This incapacity in part reflects the real difficulties of intelligence—but only in part. It also reflects deep-seated institutional culture and venerable but increasingly obsolete beliefs about the supposedly insuperable analytic limitations intelligence organizations face.

This essay argues that intelligence assessment could achieve substantial predictive power—to a degree that greatly exceeds today's standards. This paper seeks to demonstrate both the need for such a revolution in capability and the feasibility of achieving it and will outline a strategic program plan to do so. This proposal is designed to implement core elements of the **National Intelligence Strategy**, the **2004 Intelligence Reform Act**, and the recommendations of the **9/11 Commission Report** and related intelligence reform initiatives.[1]

Realistic Predictive Capability

Few commentators claim that man will ever be able to perform long-range point prediction of improbable or unique events. (Even Nostradamus fudged those kinds of "calls"!) **The best predictive capability we can realistically achieve consists in *rational expectation*, the specification of estimates and forecasts based on scientific methodology in both its imaginative and its rigorous dimensions.** Appropriately conceived, planned, and implemented, this objective is feasible and could provide strategic warning capabilities qualitatively superior to anything currently available or planned.

1. *The National Intelligence Strategy of the United States of America: Transformation through Innovation and Integration;* Office of the Director of National Intelligence, October 2005. National Intelligence Reform Act of 2004 (S.2845, 108th Congress, 6 October 2004). *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States,* Washington, D.C., 2004; W.W. Norton & Co., or http://www.9-11commission.gov/report/index.htm. *Report to the President of the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction,* Washington, DC, 2005; http://www.wmd.gov/report/index.html.

Virtually all of the elements of the requisite methodology are mature or maturing rapidly, and they are in use across a wide array of institutions. However, most if not all of the institutions whose missions require the prediction of human behavior appear to employ only subsets of the total required solution, and therefore achieve only imperfect results. What is required is precisely what the National Intelligence Strategy demands: "transformation through integration and innovation," specifically in the form of what Andrew Hargadon has called "recombinant innovation"—invention that integrates disparate extant elements into a new and greater synthesis.[2]

Strategic Vision for Analytic Transformation

Much of official and influential America, including the legislative and executive branches of the federal government, historians, defense analysts, and the informed public, have come increasingly to the conclusion that the IC suffers from systemic deficiencies that must be rectified if warning is to improve. Yet official and unofficial observers have yet to identify and solve the deepest underlying problems.

Edward Waltz, author of a modern classic of intelligence "business process re-engineering, points the way to a solution. He argues that in the information age "[w]inning future intelligence competitions... is becoming dependent on maintaining a *knowledge-centric* advantage," and that "[i]ntelligence superiority will be defined by the ability to make decisions most quickly and effectively.…The key enabling technology...will become *processing* and *cognitive power* to rapidly and accurately convert data into comprehensive explanations of reality—sufficient to make rapid and complex decisions." As such, intelligence must be "the product of an enterprise operation that integrates people and processes in an organizational and networked computing environment."[3]

In a similar vein, Deborah Barger, a senior change leader in the Office of the Director of National Intelligence (ODNI), authored a recent study calling for a revolution in intelligence affairs (RIA). She identified a critical requirement for effective analysis and warning: the need to "bring together people with diverse backgrounds...to contemplate a wide range of solution sets, free from normal bureaucratic constraints," and indicated further that "a revolutionary process could accommodate a structured intellectual debate that allows leaders to anticipate external changes, devise new strategies and paths for innovation, and gain insights into alternative ways of conducting the business of intelligence."[4] She recommends that the IC establish an "activist" group or office to "disturb the system," incubate new ideas, and foster change.[5] The proposal contained herein is designed to fulfill and extend that vision.

Predictive Network-Centric Intelligence

"Predictive network-centric intelligence assessment" offers the ability to foresee and warn of threats, be these strategic or tactical and conventional or asymmetric, and either forestall or stay abreast of rapidly breaking crises and high-speed conflict operations. Such enhanced anticipatory

2. Hargadon, Andrew: *How Breakthroughs Happen: the Surprising Truth About How Companies Innovate;* Harvard Business School Press, 2003. See also Andrew Hargadon and Robert I. Sutton: "Building an Innovation Factory"; *Harvard Business Review,* May-Jun 2000, Vol. 78, Issue 3, pp. 157-166.
3. Waltz, Edward: *Knowledge Management in the Intelligence Enterprise;* Artech House, 2003, pp. 8 & 29 (italics are Waltz's).
4. Barger, Deborah G.: *Toward a Revolution in Intelligence Affairs;* RAND Technical Report TR-242-CMS, 2005, p. 47; http://www.rand.org/publications/TR/TR242/. Barger is Assistant Deputy Director of National Intelligence for Management for Strategy, Plans and Policy (ADDNI/SPP) and sponsors the Galileo essay competition.
5. Ibid., pp 97-99.

power and adaptivity could be achieved through improved analysis and assessment based on current technology and today's collection capabilities. The required methodology and business process involve a structured but adaptive set of procedures involving interagency collaboration, alternative analyses, and the rigorous testing of assumptions and assessments. All three of these elements—community-wide collaboration, expansive creative imagination, and rigorous critical reasoning—are equally vital. In fact, they are interdependent: a quantum leap in predictive power could come, and could only come, as a synergetic effect of their dynamic integration. [6]

Two basic premises underlie this proposal. First, we trust that promulgated ODNI policy on IC collaboration and information sharing (e.g., relaxed need-to-know constraints) will ensure that web-enabled **virtual collaboration** (e.g., analysts' "wikis"and "blogs") will soon become the normal operating mode for analysts sitting at their desks producing daily intelligence across the community. Such baseline collaboration is necessary. The second premise, however, holds that in and of itself such distributed collaboration will not maximize the IC's predictive potential. Much more can and must be done. The IC must also implement powerful new capabilities for **proximate, "synchronous" collaboration** and then build from both of these collaborative advances a radical new capability for IC-wide collaboration that exceeds any plans yet promulgated.

The visible centerpiece of this transformed capability would lie in the creation of a **community-wide system of advanced intelligence assessment laboratories** that would operate according to a formal, documented assessment methodology—specifically, **scientific methodology**.[7] Within these "activist offices" and "enterprise operations," "activist groups" (analytic project teams) would use a wide array of both interdisciplinary and problem-specific methods, tools, and techniques to produce all-source finished intelligence, while simultaneously advancing the state of the analytic art through experience and lessons-learned. A suitable term for such "knowledge factories" might be **"computational collaboratories."**

The premier IC computational collaboratory should be controlled directly by the ODNI, support the national command authority (NCA), and serve as the main engine for fostering interagency teaming on high-level intelligence projects such as National Intelligence Estimates (NIEs).[8] Eventually the IC should be netted together by a multi-agency complex of such laboratories—a "system of systems"—one in each intelligence agency (all-source and single-source), all integrated over a wide-area network at multiple levels of security. The result would be a "boundaryless" architecture of permanent, pervasive collaboration.[9]

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6. This paper amplifies core elements of the proposal presented in the report of the Intelligence Community Analytic Research Network (ARN) to the Director of National Intelligence on the improvement of intelligence analysis. *Analytic Excellence, the Roadmap: Analytic Research Agenda,* July 2005 (unpublished draft, U//FOUO).
7. The present proposal extends and amplifies a seminal study by Isaac Ben-Israel on the application of scientific methodology to intelligence assessment: Ben-Israel, Isaac: "Philosophy and Methodology of Intelligence: the Logic of the Estimate Process"; *Intelligence and National Security,* Vol. 4, No. 4, October 1989, pp. 660-718. Ben-Israel is a Brigadier General in the IAF with degrees in physics and mathematics and a Ph.D in philosophy. Two previous Galileo papers also have called for the application of scientific method to intelligence assessment: Bruce, James: "Dynamic Adaptation: a method to intelligence assessment: Bruce, James: "Dynamic Adaptation: a Twenty-First Century Intelligence Paradigm" (2004); and Pesce, Joseph and Randolph Tauss: "Science and Intelligence Analysis: the Requirement for 'Critical Thinking' Training in the Intelligence Community" (2004).
8. Such teaming is required pursuant to Sections 123, National Intelligence Council; 145, Office of Alternative Analysis, and 222, Independence of Intelligence, in the 2004 National Intelligence Reform Act.
9. "Boundarylessness"—in effect, horizontal integration—was one of the core tenets of CEO Jack Welch's leadership of General Electric, a conglomerate not unlike the IC, in the 1980s-90s. Welch, Jack, with John A. Byrne: *Jack: Straight From the Gut;* Warner Business Books, 2001.

Implementing this proposal would both require and propel a revolution in both the synthetic (creative-imaginative) and analytic (rigorous-critical) dimensions of intelligence assessment, as part of a major advance in the IC's "analytic culture."[10] Yet **since it is methodological, managerial, and behavioral in nature, this solution would require only modest expenditure in technical systems development and acquisition, infrastructure, or manning levels.** The new methodology would supplement today's standard operating procedure, which, although practical and productive, relies on a risky combination of practices: routinized bureaucratic procedure conjoined with informal, intuitive reasoning. Both practices exacerbate susceptibility to internal bias and adversary deception, and hence increase vulnerability to intelligence failure and surprise.[11]

In sum, then, IC threat anticipation and warning could be improved substantially, affordably, and relatively quickly, should the national leadership act to transform the methodology and systemic processes governing intelligence synthesis, analysis, and assessment. Moreover, beyond its immediate value in improving assessment within the disparate agencies of the national IC, the plan proposed herein would both strengthen and integrate the community, accelerate the intelligence cycle rate (the "optempo" of our "OODA Loop"), and transform the IC into a unified system of agile learning organizations with a network-centric capability optimally adapted to today's security challenges and intellectual and technological opportunities.[12]

The Problem: Meeting the Challenge of Foresight, Anticipation, and Warning

Traditional IC Assessment Culture and Practice

"Methodology" refers to the logic governing methods. It derives philosophical epistemology, the theory of knowledge. Methodology is applied epistemology and takes the form of an integrated theory of assessment that specifies the domain of application, the criteria of truth, the definition of evidence, and the rules for inference. Thus, although tools and techniques and even fairly basic methods proliferate in abundance, all of these fall under a very small number of underlying methodologies.

Essentially two logical-factual methodologies exist for understanding the world of physical things and human behavior, one involving informal, and the other formal, methods. The informal methodology can be characterized broadly as **historiography**, the more or less scholarly study of qualitative evidence formulated as words and sentences in natural language. This typically is undertaken by individual scholars or analysts, either working independently or compartmentalized under vertical

10. On "analytic culture," see Johnston, Rob: *Analytic Culture in the U.S. Intelligence Community: an Ethnographic Study;* Central Intelligence Agency Center for the Study of Intelligence (CIA/CSI), 2005.
11. A burgeoning multidisciplinary literature addresses the problems and causes of intelligence failure. Cognitive psychology has examined the problems of bias in intuitive reasoning. The seminal application to intelligence is Heuer, Richards J., *Psychology of Intelligence Analysis;* CIA/CSI, 1999. Seminal studies of group and governmental error include Janis, Irving L.: *Groupthink: Psychological Studies of Policy Decisions and Fiascoes;* Houghton-Mifflin, 1972/1982, and Jervis, Robert: *Perception and Misperception in International Politics,* Princeton University Press, 1976. Related challenges in the practice of science are addressed in Kuhn, Thomas, *The Structure of Scientific Revolutions,* University of Chicago Press, 1972. The historical literature on intelligence failure is growing as well; a classic case study is Wohlstetter, Roberta: *Pearl Harbor: Warning and Decision;* Stanford University Press, 1962.
12. Optempo and OODA loop are terminology from military command and control theory. Operational tempo, or "optempo," refers to the cyclic rate of C4ISR task accomplishment within and among units. The Observation-OrientationDecision-Action (OODA) Loop was Col. John Boyd's generalization of what we call the "intelligence cycle" or "TPED": Tasking, Processing, Exploitation, and Dissemination.

chains of authority ('stovepipes") in offices within bureaucracies. Traditional intelligence assessment methodology has always been historiographical.

By definition, historiography is strictly descriptive ("graphic"). It can be applied to two timeframes, both of them retrospective: the long-term or distant past, this being history proper (in intelligence, this is "term analysis"); or the short-term or recent past, this being journalism, or current intelligence. By its very nature, historiography cannot produce reliable inferences or assessments concerning the other important timeframe: *the future.* Historiography cannot predict.

The risks associated with the misapplication of informal, intuitive, retrospective methods to problems of prediction are becoming increasingly well understood. A burgeoning literature has emerged in **cognitive and social psychology, perceptions theory** and the **history of science** that describes theory and findings concerning human perception, cognitive "heuristics" (habituated rules of thumb), mental and institutional "paradigms" (belief systems) and "satisficing" (the tendency to opt for quick, seemingly adequate solutions rather than search exhaustively for utility-maximizing solutions[x]).[13] Herbert Simon, Daniel Kahneman, and Amos Tversky, Robert Jervis, Irving Janis, and Thomas Kuhn are pre-eminent names in these fields.[14] Satisficing heuristics employ assumption-based reasoning for the sake of simplicity and efficiency, and are useful under normal circumstances of low risk. They often are optimal, in fact, especially under constraints such as time pressure (as General Patton noted, "A good plan today is better than a perfect plan next week"). Nonetheless, haste and habit have a cost in introducing patterns of bias and error into human reasoning. Moreover, they are highly susceptible to deception and surprise.

Groups and organizations can fall prey to similar decision maladies, which can be summarized broadly under the rubric "**groupthink**," the process whereby group members conform to given assumptions, stifling doubt and debate so as not to disrupt group togetherness.[15] DIA Indications and Warning (I&W) expert Cynthia Grabo notes that "the rejection of evidence incompatible with one's own hypotheses or preconceptions, the refusal to accept or to believe that which is unpleasant or disturbing or which might upset one's superiors—these are far more common failings than most people suspect."[16]

The distinguished Richards J. Heuer, long the leading counter-deception analyst and trainer in the CIA, summarized the findings from cognitive psychology and applied them to the intelligence problem in his aforementioned *Psychology of Intelligence Analysis.* The literature on intelligence and especially on deception and intelligence failure amplify these findings.[17]

13. "Satisfice": a combination of "satisfy" and 'suffice." Distinguished from classical utility maximization. Concept developed in Simon, Herbert A.: "A Behavioral Model of Rational Choice," *Quarterly Journal of Economics,* Vol. LXIX, February 1955, pp. 99-101 (reprinted in Simon, *Models of Man: Social and Rational;* 1957). Note that satisficing often optimizes under conditions of constraint (especially temporal) and can therefore often provide more rational (utility-maximizing) outcomes than can "paralysis by analysis."
14. Daniel Kahneman shared the 2002 Nobel Prize in Economics for his work in cognitive psychology. The multidisciplinary literature here is vast and indispensable. Space constraints restrict full citation, but oft-cited authors include Herbert A. Simon, Daniel Kahnemann, Amos Tversky, Irving L. Janis, Allen Newell, Robert Jervis, Richard E. Nisbett, Lee Ross, Thomas Gilovich, Scott Plouse and Thomas Kuhn (see works as cited in footnote 3).
15. Janis, Irving L.: *Groupthink: Psychological Studies of Policy Decisions and Fiascoes;* Houghton-Mifflin, 1972/1982.
16. Grabo, Cynthia: *Anticipating Surprise: Analysis for Strategic Warning;* Joint Military Intelligence College, Washington, DC, 2002, p. 39.
17. The literature here as well is substantial, but theory remains underdeveloped. Oft-cited authors include Richard Betts, Michael Handel, Ephraim Kam, James J. Wirtz, Barton Whaley, Donald C. Daniel & Katherine L. Herbig, John Gooch & Amos Perlmutter, Michael Howard, Roy Godson, Roger Hesketh & Nigel West, and Thaddeus Holt.

In sum, then, by their inherent nature, qualitative methodologies such as historiography are incapable of prediction and entail an excessively high risk of error when employed for that purpose—which is precisely what traditional intelligence does in the United States and other countries. The inevitable result, seen time and again, decade in and decade out, is an unnecessarily high rate of intelligence failure and surprise, with no discernible trend line of upward improvement so far.

What then is required for effective anticipation and warning?

Prediction: Process and Prerequisites

How can we fulfill the highest goal of intelligence? The CIA has defined intelligence in relevant terms: "Reduced to its simplest terms, intelligence is knowledge and foreknowledge of the world around us—the prelude to decisions and action by U.S. policymakers."[18] Foreknowledge, conceived in a scientific, business, or intelligence sense, obviously does not imply psychic clairvoyance or deterministic "point" prediction. On the contrary, it refers to rational expectation: estimative forecasting based on available evidence and formal analytic methods.

Such estimative prediction requires both ***creative and critical thinking***, specifically: 1) formal analytic rigor and the explication of assumptions, and 2) perception and understanding across both the *depth* and the *breadth* of a problem domain, each of which imposes its own specific methodological and practical requirements. First we will examine the problems of depth and breadth and then address that of rigor.

Critical Thinking and Analytic Depth

Extension in depth consists of analysis and extrapolation, the projection of patterns and trends into the long- or short-term future based on statistics and mathematical probability. Such trend projection is typical in the related group of disciplines known as neo-classical economics, operations research, management science, and decision theory. It relies on strict deductive inference from given premises, including the precept that man is a utility-maximizing "rational actor" ("economic man"). Moreover, "man" the "actor" has always explicitly included both the subject of analysis (e.g., a foreign decision maker) and, implicitly, the subject *performing* the analysis (the analyst). Such methods, although they provide powerful tools for testing, eliminating, or justifying propositions, are only as good as their assumptions—the old "garbage in, garbage out," or "GIGO," problem. Yet, as noted above, social scientists and philosophers have revealed limitations and sources of error in human reasoning that make the selection of assumptions a "non-trivial" task subject to human error. These patterns of error not only cripple qualitative methodology, they also afflict strictly analytico-deductive methods as well in the following ways.

First, human rationality is "bounded," limited and often biased by psychological factors involving perception, cognition, emotion, values, and personal interest.[19] Busy observers and participants often tend to form images and frame opinions rather hastily and uncritically ("leaping to con-clusions" through "hasty generalization"). These perceptions produce often implicit and inchoate mental images

18. "A Consumer's Guide to Intelligence"; CIA Office of Public Affairs, 1999, p. vii.
19. "Bounded rationality": Simon, "Behavioral Model." See also March, James G. and Herbert A. Simon: *Organizations;* 1958 (2nd ed.: Blackwell Publishers, 1993), and Simon, Nobel Prize Lecture, 1978: "Rational Decision-Making in Business Organizations"; http://nobelprize.org/nobel_prizes/economics/laureates/1978/simon-lecture.pdf (last accessed 7 December 2006).

of the world. This subjectivity and tacit imprecision appear to be "co-dependent," each "enabling" the other: comfortable biases are best defended if left camouflaged, which in turn protects them even when they're not a source of comfort.

Next, once observers have formed images and framed opinions, they then tend to internalize them, identify with them, personalize them, and defend them against all incoming data and criticism. Thus even sound assumptions persist and can be rendered obsolete by dynamic change in the environment.

NOTE ON TERMINOLOGY

Understanding intelligence assessment requires clear distinction among related terms such as methodology and methods; analysis, synthesis, and assessment, or judgment; and induction, abduction, and deduction.

Briefly, methodology is the logic governing methods. Synthesis builds order and unity out of disorder—in this case, theory and models out of sparse or massive data. It encompasses induction, the collection and ordering of empirical data, and abduction,* the generation and selection of hypotheses for testing. Hypothesis testing in turn involves deductive analysis, the isolation of variables, definition of metrics, and determination of logical-mathematical relationships among these. Re-integration and final assessment again involves synthesis, but at a higher level (completing a cycle of the spiral). Synthesis and analysis are complementary opposites, being jointly necessary but individually insufficient for sound assessment. Finally, the term assessment refers herein to the entire integrated process of synthesis-analysis-synthesis.

* For more on the concept of abduction, see footnote 24.

When they rest on such dubious premises, even the most powerful analyticodeductive methods lack the ability not only to predict non-linear, revolutionary discontinuities, but even to identify extant and emerging trends well enough reliably to predict even evolutionary change. Until advanced models emerge, the intelligence community can prevent surprise (or at least reduce the risk, rate and severity of surprise) only if it can anticipate the innovative, asymmetric, and often devious gambits an adversary might employ.[20] This requires a very wide span of peripheral vision that can imagine not just conventional contingencies, but plausible unprecedented ones as well—hypotheses and alternative scenarios. This breadth of imagination is a *synthetic* rather than an analytic function. It is what enables us to "ask the right questions" in the first place.

Creative Thinking and Synthetic Breadth

In surprises, the "ball comes in out of left field," outside the victim's span of "peripheral vision" at the time of the event, which often is narrowly focused in a given direction, when the victim's attention often is narrowly focused elsewhere. Surprise thus usually comes in the form of events for which there had been previous evidence that was ignored or dismissed. In Grabo's words: "It is the history of every great warning crisis that the post-mortems have turned up numerous relevant facts or pieces of information which were available but which, for one reason or another, were not considered in making

20. These would have to take the form of complex adaptive systems (CAS) models that produce self-organized emergence and non-linear dynamics. The most promising models available today appear to be those based on the work of Jay Forrester (see, *inter alia, Principles of Systems,* Pegasus Communications, 1968/1990, and http://www.systemdynamics.org/). Highly sophisticated CAS models of emergence and evolutionary dynamics (e.g., agent-based models) promise even more powerful capabilities for the future. The Santa Fe Institute (SFI; http://www.santafe.edu/) and New England Complex Systems Institute (NECSI; http://necsi.org/) are good sources for relevant research information.

assessments at the time."[21] As noted above, social scientists have explored some of the reasons for this misdirection of attention.

However, to the perennial frustration of philosophers, logicians, methodologists, and managers, no rules-governed procedure, algorithm, or software exists for ensuring perspicacity, imagination, creativity, and discovery "on demand." These are stochastic, wholistic, and "emergent" complex-systems phenomena, thriving through 'self-organized criticality at the edge of order and chaos."[22] Deterministic, reductionistic analytics do not promote or proliferate hypotheses; on the contrary, as a "convergent" mode of reasoning, analysis *narrows* focus and *eliminates* hypotheses. Hypothesis generation is the "art" of science, the domain where intuition and imagination can and must play an indispensable role in science and decision making. What is required is a reliable method for broadening such "divergent" reasoning (a process the IC misleadingly refers to as alternative "analysis"). Much of the rest of the paper proposes a solution to the problem of promoting these synthetic methods.[23]

The underlying prerequisites lie in induction and "abduction"—the collection, collation, and ordering of data, and the process of "pattern recognition" required to infer hypotheses to explain the data and make predictions based on it.[24] Once these challenges are solved, proper task sequencing requires that this synthetic phase *precede* the deductive analyses described above, for it is here where alternative hypotheses emerge for subsequent testing using the formal analytic methods.

Analytico-Synthetic Integration

Sound forecasting requires that both elements be integrated into a single unified methodology in order to ensure that the full range of potential contingencies, including even seemingly improbable ones, are subjected to full analytic development and rigorous testing. Synthesis and analysis are complementary and in fact interdependent: by itself, creative imagination can posit a wide range of hypothetical scenarios of undetermined plausibility but cannot test or substantiate them so as either to eliminate them or convert them into forecasts. This conversion requires formalization. In this stage, the assumptions defining the multiple alternative hypotheses are modeled for internal consistency, extrapolated into the future, and compared with known and incoming intelligence evidence. The veracity of such analysis is largely a function of the range of alternative hypotheses generated in the

21. Grabo, *Anticipating Surprise*, p. 9. This thesis underlies much of Wohlstetter's opus *Pearl Harbor: Warning and Decision*; she indicated that much data that appears retrospectively to have constituted clear I&W ('signals," in information theoretic terms) was lost in the surrounding "noise." While retrospective criticism can be disparaged as "20/20 hindsight," this paper embraces the thesis argued by Bazerman and Watkins that many surprises are predictable and should have come as no surprise. Bazerman, Max and Michael Watkins: *Predictable Surprises: the Disasters You Should Have Seen Coming and How to Prevent Them;* Harvard Business School Press, 2004. See also Watkins and Bazerman: "Predictable Surprises: the Disasters You Should Have Seen Coming"; *Harvard Business Review* (reprint), March 2003.
22. General and complex systems theory is another discipline with a thriving literature. Good introductions include Von Bertalanffy, Ludwig: *General System Theory: Foundation, Development, Applications;* Braziller, 1968; and Waldrop, Mitchell M.: *Complexity: Life at the Edge of Order and Chaos;* Simon & Schuster, 1992. See also SFI and NECSI, fn. 20 above.
23. The 9/11 Commission attributed the failure to understand the gravity of the looming terrorist threat to a range of causal factors, prominent among which was a "failure of imagination." The methodology proposed herein would implement the commission's call for the IC to "institutionalize imagination" through a combination of alternative analyses, "red-teaming" (i.e., red-cell role-playing and simulation gaming), and "rigorous analytic methods" (*9/11 Commission Report,* Chapter 11, pp. 344-348).
24. "Abduction," a concept generally credited to Charles Sanders Peirce, refers to the formulation and selection of hypotheses. It often is characterized as "inference to the best explanation." As such, it is not an alternative to induction or deduction. Instead, it interweaves both in complex sequences to derive explanations or predictions.

preceding stage. **What is required, then, is a continuous, total-systems feedback loop between synthetic induction and analytic deduction. This organizational learning spiral traditionally has been known as *scientific method*.**

Forging the Solution: Predictive Network-Centric Intelligence Assessment

Scientific Methodology: Principles and Practices

Scientific methodology marries intuitive, open-minded imagination with skeptical standards of proof. Archimedes sat in a bathtub and conceived buoyancy; Newton noted the falling apple and conceived universal gravitation, and equally intuitive inspiration prompted Einstein to ask if space and time might be relative rather than absolute phenomena. But all then subjected their hypotheses to rigorous mathematical formalization and both logical and factual proof by comparing predictions deducible from the formalized theory with observable empirical data.[25]

In fact, the entire purpose of science is to seek data and infer predictions concerning future outcomes under specified conditions. The purpose of science and the test of its effectiveness lies in prediction that is more accurate, precise and hence reliable than that produced through any other method of investigation and reasoning.

Science achieves this through the union of complementary opposites in both its underlying epistemology (the philosophy of knowledge) and in its methodology. Epistemologically, science unites **empiricism**, the doctrine that experience and observation are the basic data source for physical fact, in complementary interdependence with **rationalism**, the doctrine that logical and mathematical classification and inference are the basic methods required for sound interpretation of observed fact.[26] This "rational-empirical" epistemology recognizes and exploits the power of deductive methods (logic and mathematics) to order physical facts into meaningful patterns (theories and models) and then project beyond these to make estimates about facts for which we have as yet no empirical data. This is **scientific prediction**, made possible only by the creative tension between rationalism and empiricism and the synergy unleashed by their symbiosis.

To close the rational-empirical loop, science requires that all estimates and assessments (all hypotheses and theories) be ***tested,*** both rationally, for internal logical and/or mathematical coherence, and empirically, for correspondence with the observable world. This testing is the essence of Francis Bacon's scientific and specifically **experimental method**. Informative results either corroborate hypotheses and dictate their retention, directly contradict them, thus dictating their elimination, or (more often) limit their scope of applicability, thus dictating their modification. This process requires multiple alternative and, in fact, competing hypotheses, since testing, as noted, is a process of elimination.

25. The principle that induction and discovery are largely intuitive and cannot be reduced to recursive rules, whereas testing and proof can and must be absolutely rigorous, "demarcates" the inductive "context of discovery" from the deductive "context of justification." This principle is associated with the epistemologists and philosophers of science David Hume, William Herschel, Hans Reichenbach and Karl Popper, and is emphasized by Ben-Israel, "Philosophy and Methodology of Intelligence."
26. The literature on the philosophy of science is voluminous. Two overview works can be identified as particularly influential in shaping the present proposal: Cromer, Alan: *Uncommon Sense: the Heretical Nature of Science;* Oxford University Press, 1993; and Losee, John: *An Historical Introduction to the Philosophy of Science;* Oxford University Press, 1972/2001.

Scientific Method

"Method" applies methodology to the solution of practical problems. In science, the problem involves the quest for knowledge of the world.[27] In intelligence, the target of interest involves the capabilities and intentions of foreign actors.

Scientific method implements the aforementioned rational-empirical (analytico-synthetic) feedback loop: practitioners observe and measure phenomena of interest and then delineate the relationships among the data through formal theory (systems of logical and/or mathematical propositions formulated as **models** and algorithms). These theories/models then support the deduction of necessary observable implications: "if these data are true, and this theory/model is valid, then this other observable fact necessarily follows." Such testable deductions postulate correlation or causation in the form of "counterfactual conditional propositions" or **hypotheses**, in which the baseline data and theory function as a set of **independent variables** and the expected outcomes are **dependent variables**. These hypotheses are tested first for logico-mathematical coherence and then typically through laboratory experimentation in which independent variables are manipulated and their outcomes are recorded and then compared with field observation (e.g., intelligence collection).

In sciences that study phenomena and systems that cannot be manipulated physically (e.g., the heavens, the Earth, the past, and mankind), scientists must substitute laboratory work and models for physical experimentation on real-world specimens. They assemble observable data from the historical record (natural history or human), but they must perform all of their experiments on models. Experimentation on models is known as **simulation**, and is conducted almost entirely on computers. This work is so important in modern science that an entire methodological sub-discipline has emerged called **modeling and simulation (M&S)**.[28]

Predictive Network-Centric Intelligence: Practical Procedures and Infrastructure for Scientific Assessment

Thinking within the "box" or paradigm of traditional intelligence "tradecraft" and vertically stovepiped bureaucracy, today's managers attempt to improve imagination by focusing on individual analysts and exhorting them to "think outside the box." The social sciences have shown, however, that that approach is likely to yield but little counter-intuitive fruit.

By contrast, modern business management practice has taken a new approach, one that opens a wholly new paradigm for broadening perception and enhancing the likelihood of discovery. This new method focuses on cross-functional **team collaboration**, which combines interdisciplinary, interdepartmental, and interagency domain experts (regional and functional intelligence subject matter experts or SMEs) in **Integrated Project Teams (IPTs)**. Under the leadership of professional facilitators, modern IPTs use a rapidly developing suite of tools and techniques for the marshalling of available data, structured

27. In logic and scientific method, again the literature is vast and substantial. Salient authors include, in addition to Aristotle and Francis Bacon, Carl G. Hempel, Rudolf Carnap, Hans Reichenbach, R.B. Braithewaite, Ernst Nagel, Frederick Suppe, John Holland, Colin Howson & Peter Urbach, Hugh G. Gauch, David A. Schum, Paul Thagard, and Edward Waltz *Knowledge Management in the Intelligence Enterprise.* This proposal has been guided in great part by the work of philosophers associated with logical positivism/empiricism, such as Carl Hempel, Hans Reichenbach and Karl Popper.
28. See, for instance, Casti, John L.: *Would-Be Worlds: How Simulation is Changing the Frontiers of Science;* John Wiley & Sons, 1997; Hausrath, Alfred H.: *Venture Simulation in War, Business and Politics;* McGraw-Hill, 1971, and Schrage, Michael: *Serious Play: How the World's Best Companies Simulate to Innovate;* Harvard Business School Press, 1999.

brainstorming, and the generation of plausible hypotheses concerning alternative futures and contingencies. Collaborative teaming supplies a double-barreled countermeasure against groupthink, involving substantive SMEs, who bring together multiple frames of reference. Skilled facilitators then elicit the SMEs' insight, fomenting creative tension, fruitful conflict, cognitive dissonance, discovery, reconceptualization, and organizational learning.[29]

As noted earlier, much current emphasis is placed, rightly, on virtual collaboration, and indeed, the entire IC must move into the age of wide-area networking. But virtual collaboration is fraught with difficulties, and even when it functions smoothly, remains insufficient. For a variety of social-psychological and communicological reasons, distributed collaboration, especially if asynchronous, can never be as dynamic, intensive, rich, or fertile as face-to-face interaction.[30] Although distributed interaction can commence immediately upon warning while physical congregation requires travel, the difference in potential productivity and optempo once teams form is dramatic. Thus while virtual collaboration must become the new IC "equilibrium state," it should be punctuated frequently by major lab-based projects for the production of national-level intelligence assessments, especially deep-looking and far-reaching reassessments, and for the resolution of critical controversies and the conduct of crisis- and combat-support operations.

This in turn requires an institutional setting and infrastructure that supplements bureaucratic offices and stove-piped chains of command with a new system of horizontal integration within and across organizations and the community as a whole. The optimal solution is an IC-wide network of intelligence assessment laboratories.

The Optimal Setting: the Computational Collaboratory

Unlike vertically integrated bureaucracies, laboratories are the quintessential "flat," egalitarian organizations, maximizing intercommunication while minimizing managerial friction. Computational collaboratories would be purpose-designed to bring analysts together from multiple agencies; form them into cross-functional IPTs led by facilitators and suppor5ed by technical analysts; stimulate their thinking through facilitated brainstorming; capture their ideas in explicit, formal models; test them via analysis and simulation; and then publish the results.[31] Each computational collaboratory would integrate the functions of an "electronic meeting room," for collaboration, and a "math lab," for computational analysis, and teams would perform the two activities in iterative succession to propel a spiral of discovery and organizational learning.

Since these computational collaboratories would be designed to stimulate and integrate both creative "right-brain" and critical "left-brain" functions, they should be designed in two "hemispheres." The right

29. For more on collaborative teaming, see Katzenbach, Jon R. and Douglas K. Smith: *The Wisdom of Teams: Creating the High-Performance Organization;* Harvard Business School Press, 1993; and Bennis, Warren G. and Patricia W. Biederman: *Organizing Genius: the Secrets of Creative Collaboration;* Perseus Books, 1997.
30. Recent research in team performance argues for the continued importance of proximity for team performance maximization. See, *inter alia,* Fischer, Bill and Andy Boynton: "Virtuoso Teams"; *Harvard Business Review,* reprint, July-August 2005, pp. 116-123; Hoegl, Martin and Luigi Proserpio: "Team Proximity and Teamwork in Innovative Projects"; *Research Policy* 33, 2004, pp. 1153-1165; and Freechild, Sage: "Team Building and Team Performance Management," http://www.phoenixrisingcoaching.com/documents/Article-TeamBuildingandTeamPerformance.pdf, 2004 (last accessed 14 September 2006).
31. This process extends the proposal made by Ron Johnston in "Integrating Methodologists into Teams of Experts," *Studies in Intelligence,* Vol. 47, No. 1, CIA/CSI, 2003, pp. 57-65; see also chapter 5 in his *Analytic Culture in the U.S. Intelligence Community*.

hemisphere would stimulate group dynamics and supply the SMEs with extensive access to classified and open-source databases, with an ergonomic layout that encourages multilateral interchange. There, professional facilitators would coach the teams through the classic "forming, storming, norming, and performing" stages of team development while driving them at an energetic pace through problem-framing, brainstorming, and "sense-making" activities using the numerous informal and semi-formal techniques intelligence methodologists and corporate facilitators have developed.[32]

The resulting mental models, scenarios, and hypotheses would then be handed over by the substantive teams to their assigned technical support group in the "math lab" or "left hemisphere" of the collaboratory for analytic development ("instantiation" in computational models) and simulation testing. The technical group would consist of methodologists (modelers, experimental designers, and statisticians—"quants," as Wall Street calls them) armed with the requisite mathematical tools (e.g., Bayesian statistics and multi-attribute utility analysis) and simulation models (ideally systems-dynamics models).[33]

The tech teams would then submit their experimental results and findings back to the substantive analytic teams and explain them in some detail in order to support the next phase of substantive expert review and final assessment. In this stage of the cycle, facilitators would help the experts generate new hypotheses to replace those eliminated in testing. Senior substantive team leaders would determine when the cycling should be interrupted for summary assessment and reporting, based either on diminishing analytic returns or external requirements.

This process would generate an organizational learning spiral involving initial inductive synthesis, rigorous analysis, and final comprehensive synthesis and intelligence assessment. In fact, twin spirals would ensue, one involving the substantive intelligence issue under investigation and therefore primarily of concern to the intelligence analysts, and the other involving the computational-collaborative methodology itself, which must constantly undergo scrutiny and improvement by the methodologists.

A suitable name for the national intelligence computational collaboratory might be the **Intelligence Training, Assessment and Simulation Center (ITASC)**.[34] Organizationally, none of the substantive analysts need be ODNI personnel; the line IC production centers would supply these visitors to the ITASC. ODNI, though, ought to manage the ITASC and supply its permanent staff of methodologists, technicians, and administrators who would organize and coordinate projects and agendas, facilitate the teams, perform all M&S and analysis, maintain permanent databases, and oversee the drafting of project reports (e.g., NIEs).

32. Examples include Heuer's Analysis of Competing Hypotheses (ACH in *Psychology of Intelligence Analysis,* chapter 8; Morgan Jones's many techniques (Jones, Morgan: *The Thinker's Toolkit: 14 Powerful Techniques for Problem Solving;* Three Rivers Press, 1995.); and many additional group techniques discussed in the literature on team facilitation.
33. Collaborative modeling is discussed in Vennix, Jac: *Team Model Building: Facilitating Team Learning Using System Dynamics;* John Wiley & Sons, 1996; and in Morecroft, John D.W., and John D. Sterman (eds): *Modeling for Learning Organizations;* Productivity Press, 2000.
34. A name inspired by the U.S. Joint Forces Command's Joint Training, Analysis and Simulation Center (JTASC) in Suffolk, VA. By contrast with the JTASC, the ITASC would of course address foreign threats and do so across the full civil-military spectrum. Moreover, it would prioritize assessment above training.

Toward a National Intelligence Computational Collaborative Network

The ITASC and computational collaborative methodology would create an opportunity to unite the entire IC into a single enterprise or "system of systems" featuring a high degree of "boundaryless" horizontal integration. Once the ITASC has lain the groundwork, the DNI could direct and resource parallel efforts within the line agencies and commands. Some agencies have prototypes already in place, such as the Battle Lab in the Defense Intelligence Agency (DIA) and the Advanced Analytic Lab (AAL) in the National Security Agency (NSA). Most, however, have not even begun to experiment along these lines. Such intra-agency labs can be more austere than the national center. Each would implement inter-departmental teaming and tools-based analyses within its agency's special areas of responsibility.

Analytic labor in this national intelligence collaborative architecture would be divided according to agency charter. All, however, should function as a node in a national network integrated through the use of unified, documented scientific methodology supported by a unified family of analytic methods and a shared set of models, computational tools, and databases as well as the IT standards and protocols required to ensure full interoperability, data exchange, and scientific replication (a "plug-and-play" capability necessary for competitive analysis).[35]

Once in place, such a **National Intelligence Computational Collaborative Network**[36] would enable full-spectrum network-centric intelligence. ITASC-based collaborative projects for the production of major and enduring DNI assessments could then be supplemented by near-real-time global interagency production of current intelligence for strategic and tactical I&W and crisis and operations support [37] Community watch offices could undertake continuous virtual collaboration over a secure, real-time, distributed network using video teleconferencing (VTC) and a unified set of IT tools and data, creating a **National Operational Intelligence Watch Officers' Network (NOIWON) for the 21st century**. The DNI could mobilize crisis action teams (CATs) in immediate response to contingencies, for action either within the ITASC or across the collaborative net. This high-intensity, high-velocity system-of-systems would divide labor according to agency charter, exchange data packets and outputs multilaterally, and synthesize assessments through web-enabled distributed production and dissemination. Properly implemented, the resulting whole would vastly exceed the sum of the parts, compress the intelligence cycle rate, and improve IC agility and U.S. national-security response capability by an order of magnitude.

Conclusion: the Need for Scientific Methodology and Network Centricity

In summation, this paper argues that in order to overcome pervasive, long-standing deficiencies in insight and warning, the national intelligence community must integrate horizontally in structure and function and adopt advanced methodology that is scientific in essence and intensive in execution. We need to:

35. The Advanced Research and Development Activity (ARDA) has already begun the development of the requisite infrastructure for the kind of secure wide-area network this IC 'system of systems" would require (not unlike DoD's DARPANet). This program is the Research and Development Experimental Collaboration network (RDEC), which currently links forty-two IC and DoD components (intelligence producers and users) into a unified distributed environment for the testing and evaluation of advanced tools, data-sharing, and collaboration.
36. Potential acronym: "NICCNet."
37. The ITASC process would implement Grabo's recommendations for effective I&W (*Anticipating Surprise*, chapter 8, especially concerning probability judgments, pp. 145-156, and impediments to warning, 163-169).

- Tie the multifarious agencies together into a single virtual organization through IT-enabled data sharing and advanced analytico-synthetic tools and techniques
- Bring IC analysts together to form IPTs in collaboratories that maximize both the fertility of imagination and the rigor of analysis
- Maximize rigor by using computational models, metrics, and databases
- **E**nsure that team cycles build on previous achievements by capturing all findings in these models and databases

The implementation challenge will be threefold: meeting standing production requirements while recapitalizing the community, changing from a guild-based craft to a fully modern profession, and graduating from today's largely intuitive pre-scientific "tradecraft" to a formal interdisciplinary science of intelligence.[38] As both Thomas Kuhn and Clayton Christensen discuss, such paradigm shifts and disruptive innovations are never easy or uncontroversial. Paradigm shifts involve transitions from periods of "normal science" operating within established paradigms to "revolutionary science" that challenges the extant paradigm.[39] Disruptive innovation involves a similar shift from "sustaining" to "disruptive" technologies.[40] In both cases, innovation begins in an immature state, its ultimate superiority not at first being obvious. Extensive testing and data are required to bring it to full fruition and prove its superiority to the inevitable legions of doubters. As Galileo Galilei could attest, many potentially lucrative innovations are attacked and suppressed during this time of acute vulnerability.

In intelligence reform, however, the cliché holds, "failure is not an option." The national security stakes are too great. Senior leadership can provide the requisite direction, instructions, and resources. Middle management must implement the requisite programs and projects. And all of us will be called upon to help propel manifold spirals of intelligence assessment to produce the continuous discovery and learning necessary for American intelligence to adapt to the dynamics, threats, and opportunities of the 21st century.

38. On the need to move from guild craftsmanship to full professionalism, see Marrin, Stephen: Intelligence *Analysis: Turning a Craft into a Profession;* International Conference on Intelligence Analysis, May 2005; https://analysis.mitre.org/proceedings/Final_Papers_Files/97_Camera_Ready_Paper.pdf (last accessed 7 December 2006).
39. Kuhn, Thomas: *The Structure of Scientific Revolutions.*
40. Christensen, Clayton: *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail;* Harvard Business School Press, 1997.

Biographical Sketches

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Mr. Armstrong writes on public diplomacy, irregular warfare and terrorism, civil-military relations, and private military companies at his website, http://mountainrunner.us. At the request of the Department of Homeland Security, Science and Technology Directorate, he organized and moderated two panels for the May 2007 Homeland Security Science and Technology Stakeholders Conference. He has published journal articles as well book chapters on private military companies and public diplomacy in the age of information warfare.

Mr. Armstrong earned a B.A. and an M.A. in International Relations from the University of Southern California (USC). He has done postgraduate work at the University of Wales, Aberystwyth, where he studied U.S. Intelligence, Contemporary European Security, and the Middle East.

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Professor Cynthia Ayers is the National Security Agency's (NSA) Visiting Professor of Information Superiority at the Center for Strategic Leadership, U.S. Army War College, where she teaches senior officers of all U.S. military services (reserve and active duty) as well as officers from allied foreign military units. She is currently assisting Dr. Gheorghe Tecuci, Director of the Learning Agents Center at George Mason University, in an effort to develop a cognitive assistant for intelligence analysts. Dr. Tecuci and Professor Ayers co-teach a course entitled "Military Applications of Artificial Intelligence: Intelligence Analysis." She also participates in the Army War College's annual Strategic Decision Making Exercise as a counterterrorism subject matter expert. Professor Ayers has had over thirty years of experience in federal service, all within the field of intelligence and mostly overseas, but her most recent assignment prior to her arrival at the U.S. Army War College was that of NSA Representative to the Director of Central Intelligence's Counterterrorism Center (2000-2002).

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Concurrent with his civilian career, Mr. Bruzdzinski serves at the rank of Lieutenant Commander as a Special Duty Officer in the U.S. Navy Reserve. He earned an A.B. in Government from St. Lawrence University in New York State and holds an M.A in National Security Studies from Georgetown University's Edmund A. Walsh School of Foreign Service.

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Dr. Marvin Cetron is the founder and president of Forecasting International and has been identified as one of the foremost forecaster-futurists in the world. As a pioneer in corporate, industry, demographic, and lifestyle forecasting, he has structured Forecasting International to provide industry and government with the benefits and insights of an international group of experts in the fields of management techniques, technological forecasting, corporate strategic planning, technology assessment, R & D planning, project selections, resource allocation, economics, marketing, and the behavioral sciences. He has written numerous articles, papers, and publications and three dozen books. During his twenty-year career in research and development, planning, and forecasting with the U.S. Navy, Dr. Cetron was in charge of the design, development, and implementation of the most comprehensive technological forecast in the United States. He has extensive experience with government agencies, foreign governments, and industry.

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He holds a masters and a doctorate degree from the State University of New York at Buffalo in Political Science and has written on futures research, strategic planning, joint operations, and environmental policy. Dr. Czarnecki is a distinguished graduate of the Armed Forces Staff College and the Naval War College; he is also a graduate of the Army War College's Defense Strategy Program.

Mr. Owen Davies

Mr. Owen Davies is a veteran writer in the fields of business, technology, and the future. Since 1971 he has written or edited 14 books, numerous magazine articles, and many business reports and other specialized works. He has held staff positions at Medical World News (1971-'72), then considered the Newsweek of the medical community, American Druggist (1976-'77), and Omni (1979-'82). He has freelanced for more than 25 years. Since 1986, he has served as a consultant to Forecasting International (FI), in Falls Church, VA. With FI, he has researched and written approximately 100 studies for commercial clients, professional associations, and government agencies, including Best Western, Capital One, and World Travel Market 2006; the National Restaurant Association, and International Association of Exhibition Management, and the Hospitality Sales and Marketing Association International; the Department of Defense, the Transportation Security Administration, and the National Security Agency.

CDR Alfred Elkins, USN (Retired)

CDR Al Elkins is a senior analyst with the Joint Warfare Analysis Center, where he identifies, harvests, and generates future initiatives for the center. He finished his 28-year surface warfare career as a systems analyst at the Chief of Naval Operations Strategic Studies Group. His work now focuses on how national power can be employed today, analogous to a series of investments, for as-yet unimagined future scenarios. While he was on active duty, CDR Elkins wrote the concept of operations for the Navy's Littoral Combat Ship, had a day named in his honor by the mayor of San Francisco for his efforts as the city's Base Transition Coordinator, and conducted the initial photographic analysis of the maiden voyage of the Soviet TYPHOON SSBN. Before he joined the Navy, he was a journalist, working on daily newspapers and freelancing.

CDR Elkins holds a Bachelors degree from the University of Florida in Journalism and earned a Masters in National Security and Strategic Studies from the U.S. Naval War College. He has done graduate work at the University of California, Berkeley and spent a summer studying complex systems at the Santa Fe Institute.

Dr. Thomas Ferleman

Thomas Ferleman is a Consultant with Booz Allen Hamilton. He has provided strategy-level consulting to the United Nations, the Joint Chiefs of Staff, the U.S. Army, the U.S. Air Force, the

Missile Defense Agency, Defense Intelligence Agency, and the President's Commission on Critical Infrastructure Protection.

He holds a Doctorate of Strategic Leadership from Regent University. His dissertation is *International Futures: Forecasting Global Patterns, Defining Alternatives, and Mitigating Risk.* He holds a Master of Business Administration, a Masters of Science in Management, and a B.S. in Government and Politics from the University of Maryland, University College.

Dr. Noel Hendrickson

Dr. Noel Hendrickson is on the faculty of James Madison University (JMU), where he developed and now teaches a series of four courses on advanced reasoning methods for intelligence analysis (Hypothesis Testing, Causal Analysis, Counterfactual Reasoning, and Strategy Assessment). These courses serve as the "critical thinking" component of JMU's Information Analysis major, which is designed to educate future intelligence analysts. His dissertation and early research focused on reasoning strategies for analyzing agents and their intentions, and the structure and explanation of contingencies in human decision and action. More recently, his work has focused on developing new methods of analysis for intelligence. For example, he is currently developing a normative theory of counterfactual reasoning: a more precise mechanism for assessing alternate scenarios and their consequences that builds on current academic work on counterfactuals in political science, history, psychology, logic, and analytic philosophy. His publications include a series of papers in action theory, counterfactual reasoning, and (as a co-author) *The Elements of Critical Thinking* (forthcoming from Rowman and Littlefield).

Dr. Hendrickson earned a B.A. in Philosophy at San Jose State. His graduate work was done at the University of Wisconsin, where he earned an M.A. and a Ph.D. in Philosophy.

Dr. Barton Kunstler

Dr. Barton Kunstler is a consultant and educator and the author of *The Hothouse Effect*, published by the American Management Association. The book addresses the development of high-performing groups driven by creative interactions at all levels of organizational complexity. Dr. Kunstler has published numerous journal articles and book chapters on technology, leadership, creativity, eCommerce, and education and has frequently presented on these topics. He has been featured on several TV shows and written a regular column about future-oriented issues in Massachusetts's *Metrowest Daily News*. *The Hothouse Effect* has garnered attention from organizations worldwide, including the U.S. Embassy in Ankara, Saatchi & Saatchi, The Economist, My Business magazine, the American Red Cross, USA Today, and the U.S. Forest Service, it has been translated—as a whole or in parts—into numerous languages. He recently co-edited a special issue of *On the Horizon* dedicated to presenting and analyzing institutional strategic approaches to online learning in higher education. Dr. Kunstler has worked as a full professor and program director at the Lesley University School of Management in Cambridge, Massachusetts, and as Director of the Graduate Communication Management program at Emerson College in Boston, where he developed innovative programs that promote high-level analytic, strategic, and communication skills in organizational settings.

Dr. Kunstler earned his Bachelor's degree at SUNY at Stony Brook (1971) and his doctorate in Classics at Boston University (1983).

Mr. Bruce LaDuke

Mr. Bruce LaDuke is a question consultant and an expert in knowledge creation, performance, integration, change management, knowledge management, and social transformation. He is the author of *Directional Categorization*, which is a new and powerful mind tool akin to brainstorming, mind mapping, or lateral thinking. *Digital Categorization* is focused on the question/definition cycle of knowledge creation. Mr. LaDuke is also an expert in industrial performance, knowledge management, and communications and has a wealth of knowledge on virtually any business topic. Mr. LaDuke is conversant on topics like nanotechnology, molecular manufacturing, the convergence, singularity, possible futures, and others.

Mr. LaDuke earned a B.F.A. in Graphic Design/Advertising from Ball State University.

Mr. Graham T. T. Molitor

Mr. Molitor, an authority on forecasting government policy, is president of Public Policy Forecasting, and former vice president/legal counsel of the World Future Society. He headed lobbying staffs at General Mills and Nabisco, chaired a legislative Commission on the Future, directed research for the White House Conference on the Industrial World Ahead, served on the White House Social Indicators Committee, headed research for both of Vice President Rockefeller's presidential campaigns and played part-time roles in two other presidential campaigns, worked as a legal counsel in the U.S. Congress, and served with the Assistant Chief of Staff at the Pentagon. He served in elective, appointive, or advisory capacities on assignments ranging from the White House to local government. Mr. Molitor's expertise spans the government policy issue spectrum, and his unique predictive skills are based on broad experience as a lawyer, lobbyist, political campaign strategist, university professor, author, encyclopedist, forecaster/futurist, and business owner/executive.

Mr. Molitor received a B.S. from the University of Washington and a Law degree from American University.

Dr. William G. Perry

Dr. William Perry is a professor of computer information systems in the College of Business at Western Carolina University. He teaches advanced computer networking and information security. Dr. Perry has written a number of books and articles. His most recent book, *Developing Professional Information Security Competencies,* is to be published by Delmar in 2007. He is a former U.S. Naval officer and has experience in counterintelligence and threat assessment. He has coordinated and participated in various security-related workshops involving the FBI, the Central Intelligence Agency, and the U.S. State Department. Dr. Perry also served as editor on two books related to the intelligence community and has made national presentations on protecting the nation's critical infrastructure.

Dr. Perry earned his B.A. at the University of South Florida. He completed his graduate work at the University of North Dakota, where he earned his M.A. and Ph.D.

Mr. Timothy S. Rosenberg, JD

Mr. Tim Rosenberg is an information security specialist with a strong legal background. Mr. Rosenberg is the President and CEO of White Wolf Consulting, a company designed to produce and

deliver Information Protection training to a wide variety of clients. He has been an Associate Research Professor at the George Washington University, where he taught Information Warfare and Computer Security courses as well as an Adjunct for Georgetown University's Security Studies Program. Tim has presented material at a variety of international conferences and has also been a guest lecturer at the U.S. Military Academy at West Point, the Army War College Center for Strategic Leadership, and the Villanova University School of Law.

Mr. Rosenberg has a B.S. from Indiana University of Pennsylvania and earned a Jurist Doctor from the Villanova University School of Law. He was admitted to the Pennsylvania Bar in 1997.

Mr. Timothy J. Smith

Mr. Smith is a career analyst and methodologist with the Office of Naval Intelligence (ONI). He has served as an intelligence watch officer, an integration analyst in SPEAR, ONI's air warfare team, and as a Modeling and Simulation Coordinator and Analytic Methodologist. He actively supports the ODNI policy of modernizing Intelligence Community (IC) assessment methodology, and is devising a methodology of interdisciplinary 'computational collaboration' in intelligence assessment laboratories. This methodology and its rationale are the topic of his 2006 Galileo Award-winning paper *Predictive Network-Centric Intelligence: Toward a Total-Systems Transformation of Analysis and Assessment*.

Mr. Smith has a B.A. in International Order and Conflict from the University of Maryland and is pursuing further graduate studies.

Dr. Dennis Walters

Dr. Dennis Walters is an active duty Army Special Forces Officer with over 20 years of military service. He has served at all levels of the Army and has multiple combat tours in the Balkans and Middle East. His academic background includes a Doctor of Strategic Leadership from Regent University, a Masters in Public Policy from Georgetown University and a Bachelor of Arts in International Relations from Methodist University. Major Walters is currently assigned to the Pentagon where he works as a strategic planner for the Army. He is also an adjunct professor at Regent University where he teaches a course he developed on strategic defense futures.

Mr. William Wimbish III

Mr. Bill Wimbish is a private consultant and currently the Project Manager for Proteus USA. He is a retired Army Colonel and a former U.S. Army War College faculty member. He received a B.S. from Columbus State University, and holds an M.A. in Business Management from Webster University. He is a graduate of the U.S. Army Command and General Staff College and the U.S. Army War College.

Mr. Christopher C. Wright

Mr. Wright is a National Security Studies Fellow in the National Security Analysis Department of the Johns Hopkins University Applied Physics Laboratory (APL). In this position he has been responsible for guiding and undertaking analyses on topics ranging from airborne electronic attack force mix to tactical communications network sufficiency. Before joining APL, Mr. Wright served in

the federal government for over thirty-four years, the last fifteen as a member of the Senior Executive Service. He was Director, Force Structure Analysis Division, and Director, Tactical Air Forces Division, in the Office of the Director, Program Analysis and Evaluation, Office of the Secretary of Defense, from 1990 to 2005. He received the Presidential Rank Award of Meritorious Federal Executive in 2000. During his government career he served in exchange assignments in the United Kingdom and Australia and also served as a member of a U.S. arms control negotiations team in Vienna, Austria. He holds a B.A. from Harvard College and an M.S. from the Massachusetts Institute of Technology.