

WORLD OF WARCRAFT MEETS WAR PLAN ORANGE:
THE MILITARY UTILITY OF COLLABORATIVE PROBLEM SOLVING IN A
VIRTUAL ENVIRONMENT

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APPROVAL

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DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.



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ABSTRACT

This study explores the utility that collaborative problem solving in a virtual environment may have for the military, and for the Air Force in particular. The author assesses the ability of large groups of laypeople to outperform small groups of experts, drawing conclusions on what types of problems yield to the wisdom of crowds, and in what circumstances. After examining the phenomenon of crowdsourcing, discussion turns to the Air Force's ability to adopt a crowd-based approach to problem solving. Finally, potential environments for problem solving are proposed, ranging from fully immersive simulated worlds to lower fidelity, web-enabled exercises. Though research shows it to be dependent upon technology and subject to certain constraints and requirements, the potential applications for crowd-sized collaboration in virtual environments hold significant promise for the Air Force of the future.



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Introduction

SETTING:

Two people meet in a foreign land, having travelled far to reach it. They are both experts in war and strategy, though each is specialized to some degree. They are here to slay a formidable adversary, one both literal and figurative; their specializations will be key to their survival. Both warriors have years of experience doing what they do, each amassing thousands of hours of combat training. The foe they face will be demanding, requiring a resilient plan of attack. Having studied the latest intelligence on the enemy, they know his strengths and weaknesses. They also know how others have fared against him—some successful, others not.

With their plan agreed upon, the warriors head into battle by clicking ENTER DUNGEON on their computer screen. The dragon they vanquish is virtual. The loot they acquire, intangible. After the battle, each player logs out and resumes their normal life of work. One goes to a civilian place of employment, the other to a military flight line for a shift repairing A-10 engines.

The vignette above is a common, daily occurrence. Millions of people collectively invest millions of hours each week playing online games.¹ To reach the skill levels required to beat these games' toughest challenges, players spend incredible amounts of time developing their online personas to adequate levels, equipping their avatars with the right talents and gear. The quests they complete bring great gain, but only in the worlds their characters inhabit. After all, one cannot take a virtual

¹ A 2008 source cited 50 million players, with each player averaging 22 hours of game time each week. Byron Reeves, Thomas W. Malone, and Tony O'Driscoll, "Leadership's Online Labs," *Harvard Business Review* 86, iss. 5 (May 2008), 60-61.

vorpall sword home for use against real-world jabberwockies.² But a different kind of treasure *does* survive the logoff script: the problem-solving skills and talents gained by the user. Many believe these talents can be applied to real-world issues and problems, and to good effect. Researchers suggest collaborative problem solving in a virtual environment has potential transfer value to real world situations.³

Designers of multiplayer online games ensure their platform's über-enemies can be killed many times over, but never truly die. The same dungeon can be conquered on a different server by a different team of players, or the same team can try to beat the same enemy again, using different tactics if desired. Each iteration may be unique, each path to success or failure distinct. This aspect of multiplayer online gaming bears a strong similarity to the phenomenon of crowdsourcing.⁴

In crowdsourcing, companies outsource design and research problems to masses of lay contributors who compete to create a winning solution.⁵ Contributors may have different motivations to participate—from earning a cash reward, to gaining research experience and credentials, to simply knowing they contributed to a cause they are interested in or feel is worthy. Crowdsourcing hinges on the belief that the best solutions are often found by turning to the population at large, not the experts on staff. Judging by multiple tests and research efforts

² In *Through the Looking-Glass*, Lewis Carroll includes a poem titled “Jabberwocky” in which a dragon-like beast is vanquished by a hero brandishing a weapon called the vorpall sword. Lewis Carroll, *The Complete Works of Lewis Carroll* (New York: Random House, 1936), 154-155.

³ Jane McGonigal, “Gaming Can Make a Better World” (speech, TED Conference, Long Beach, CA, February 2010), http://www.ted.com/talks/jane_mcgonigal_gaming_can_make_a_better_world.html.

⁴ Both crowdsourcing and Massively Multiplayer Online games use cheap failure to fuel creativity. If one has little to lose and much to gain by trying a unique approach, then one might as well try, or so goes the psychology. Finding creatively different paths to success may even become a source of pride, whether slaying a tough monster or submitting a sports car design. For more on this phenomenon, see Byron Reeves and J. Leighton Read, *Total Engagement: Using Games and Virtual Worlds to Change the Way People Work and Businesses Compete* (Boston, MA: Harvard Business Press, 2009).

⁵ Jeff Howe, *Crowdsourcing: Why the Power of the Crowd is Driving the Future of Business* (New York: Crown Business, 2009), Kindle e-book location: 3%.

over the last hundred years, this faith in the wisdom of crowds is well founded; many entrepreneurs have already built multi-million dollar businesses around the concept.⁶

Might the talents of today's technology-savvy generation be combined with crowd-based business models to form a formidable tool for solving intractable problems? Can the Air Force profit from such an approach? Recognizing these two trends—the rise of technological natives and the phenomenon of crowdsourcing—is one thing. Translating them to a military setting is another. To date, few research efforts have attempted to explore the potential of combining (1) the problem-solving skills of the tech-savvy crowd and (2) the broad access brought by social technology platforms to affect real-world issues faced by the military. Until one examines the military utility of such an approach, one cannot know its current and future usefulness for the force.

This paper explores the potential that collaborative problem solving in a virtual environment may have for the military, and for the Air Force in particular. Rigorous, objective analysis leads to a bold proposition: the Air Force has vast resources of cognitive talent ready to be tapped, and can use technology platforms it already possesses to do so. A crowd-based approach to problem solving, when enabled by social technology, shows promise for the military since it leverages the most important and expensive weapon system in America's arsenal: the human mind.

Crowd-based problem solving is not unique to the Computer Age, and so approaches in the past are duly examined. In history, one finds governments that solved intractable issues by turning to the public it ruled (and taxed) instead of the experts it retained (and paid). Other organizations found ways to elicit the wisdom of its members by creating

⁶ Howe, *Crowdsourcing*, Kindle e-book location: 2%.

unique environments for problem solving—settings where wargames could run their course and lessons could be learned for the future.

As for the present, one finds many organizations leveraging technology platforms to create environments where difficult problems are solved. Web-enabled platforms give companies access to the best inputs and ideas of the clientele they serve. Seeing research and design as something that can be outsourced—and for much less than keeping it inside company walls—is a revolutionary approach that transforms business practices. The Air Force is home to some of these transformative efforts, though it has the potential to foster much more.

In the future posited at the end of this paper, one finds a potential way the military can benefit from collective wisdom gleaned in virtual worlds it sponsors. Two candidate platforms for solving problems are held to the light. Two scenarios (one on each platform) facilitate an investigation into the qualities, boundaries, and properties each approach to problem solving has for the Air Force.

Upon reflection, it seems the stark, dichotomous world presented in the opening vignette may someday be more of a blend: individuals will not leave their online problem-solving skills behind when they go to their place of employment. Rather, their talents will be put to use addressing the needs of the Air Force (and the nation) through collaborating in virtual environments—worlds designed to elicit ideas and translate them into real-world solutions.

Chapter 1

The Past

This summer, thousands of people will book passage on cruise ships to the Caribbean. Some will call a travel agent and make short work of it, but many others will spend hours online perusing blogs and independent reviews about cruise vacations. These people recruit the inputs of others—usually complete strangers with varied experiences—to determine the best company, the best location, and the best price. By the time the latter types commit funds, they are likely confident they made a sound decision. Hopefully, their mind is at ease about every last detail, but in at least one area, they rest assured: the ocean liner will be able to find its intended destination. In other words, their cruise ship will not wander aimlessly around a broad ocean area, hoping to find Grand Cayman Island.

The tourists cannot know it, but not long ago, such an assumption would be rather bold. Sailing to different points of longitude was for much of naval history considered impossible to do with any reliability. The secret to doing so was only discovered in the eighteenth century by an English carpenter named John Harrison. As for our passengers' faith in the aggregated opinions of strangers, only in the early twentieth century did studies prove that the solutions generated by large groups of laypersons are almost always better than those generated by small groups of experts.¹ Thankfully, lack of a scientific study did not stop the English Parliament from using a crowd-based approach to find Mr. Harrison. Nor did it preclude the wargaming teams at the Naval War College in Newport, Rhode Island, from using the wisdom of crowds to refine War Plan Orange in the years between the First and Second World Wars.

¹ James Surowiecki, *The Wisdom of Crowds* (New York: Anchor Books, 2004), 4-7.

In looking at these examples, one finds that collaborative problem solving in unique settings is no recent phenomena. Governments and organizations faced with wicked problems have turned to collaboration many times in the past, though perhaps not as a first resort.² By examining the story of longitude and the war gamers in Newport, this chapter establishes a common ground with events in the past. Before turning the pages of history, however, one must explore the notion of collective wisdom and discover why answers to tough problems often emerge from outside the mainstream.

The Wisdom of Crowds

Exploiting the “wisdom of crowds,” to use James Surowiecki’s 2004 term, sounds at first like a novel approach to problem solving.³ Actually, it is an old technique enjoying renewed attention. In his book, *The Wisdom of Crowds*, Surowiecki provides numerous examples of untutored crowds beating out experts in activities ranging from election prediction to stock market analysis, and he makes a case for why collective wisdom should be relied upon more regularly.⁴ His work joins a number of others drawing attention to the phenomenon of crowd-based intelligence.

Can a group of laypeople really trump a cadre of experts? It appears they can, and routinely. One well-known experiment documented the ability of groups to outperform individuals when

² In 1973, Horst Rittel and Melvin Webber used the adjective *wicked* to describe ill-defined planning problems that do not yield to linear solutions. Wicked problems have no definitive formulations and no stopping rules; solutions to wicked problems are not true-or-false, but only relative assessments of good-or-bad; and every wicked problem is essentially unique. Horst W. J. Rittel and Melvin M Webber, “Dilemmas in a General Theory of Planning,” *Policy Sciences* 4 (1973), 155-169.

³ Surowiecki, *Wisdom of Crowds*, xiv.

⁴ Surowiecki’s book shows crowd-based wisdom in many lights, but for an eleven-page *tour de force* of examples and applications, one need look no further than the Introduction (pp. xi-xxi). Surowiecki left no stone unturned; indeed, much of the evidence to support the claims in this sub-heading was found by following leads in the bibliography to *The Wisdom of Crowds*.

guessing the number of jellybeans in a jar.⁵ Another showed that the average of 800 separate attempts to guess an ox's weight was incredibly close: though individual answers varied by large margins, the aggregate answer was only off by a single pound.⁶ If the utility of crowd-based wisdom were confined only to jellybeans and bovines, it would remain largely irrelevant, however interesting. But crowd-sourced intelligence works in other, more practical arenas too.

Consider prediction markets. These markets capitalize on the wisdom of crowds by creating a stock trading environment for non-financial futures, like political elections or Hollywood award shows. Prediction markets, usually involving just a few thousand traders, are uncannily accurate in predicting outcomes, and reliably outperform professional pundits.⁷ An example of an actual stock market behaving like a prediction market can be found in the aftermath of the Space Shuttle *Challenger* disaster. The four biggest companies involved in manufacturing the *Challenger* all experienced drops in their stock price on the day of the accident. Three of them recovered the bulk of their losses before the closing bell. But one company stayed low, losing 12 percent of its value. Six months later, the Presidential commission investigating the accident largely exonerated the first three companies, but not the fourth company (Morton Thiokol, the maker of the infamous

⁵ In what has become a classic example, finance professor Jack Treynor demonstrated the ability of a crowd to outperform the individual by having his class guess the number of jellybeans in a jar. The jar held 850 beans; the class, as an averaged whole, guessed 871. Out of 56 people in the class, only one student made a guess that was closer. Jack Treynor, "Market Efficiency and the Bean Jar Experiment," *Financial Analysts Journal* 43, iss. 3 (May/June 1985): 50-52.

⁶ Francis Galton, "Vox Populi," *Nature* 75 (7 March 1907): 450-451.

⁷ For more on prediction markets, see Joyce Berg, Robert Forsythe, Forrest Nelson, and Thomas Reitz, "Results from a Dozen Years of Election Futures Market Research," (working paper, College of Business Administration, University of Iowa, 2000), <http://www.biz.uiowa.edu/iem/archive/BFNR-2000.pdf>; for information on the Hollywood Stock Exchange, see David Pennock, Steve Lawrence, C. Lee Giles, and Finn Arup Nielsen, "The Power of Play: Efficiency and Forecast Accuracy in Web Market Games," NEC Research Institute technical report 2000-168 (2000), <http://artificialmarkets.com/am/pennock-neci-tr-2000-168.pdf>.

O-rings). What took the commission six months to report, the investing crowd judged in as many hours.⁸

As mysterious as it may seem, the phenomenon of crowd-based wisdom yields to logic. There are two basic requirements to make it work: (1) each participant must guess closer to the truth than not, and (2) answers must be aggregated.⁹ Applying these rules to the example of the ox given above, one finds that each person who guessed was closer to the ox's actual weight than not. To comply with rule number one, each person would have to guess within +/- 49% of the ox's true weight (a feat within most fair-going people's powers of experience and observation). Once one applies rule number two and aggregates all these better-than-average answers together, a certain accuracy emerges; the more people that participate, the better that accuracy is refined ... and the less mysterious the wisdom of crowds appears to be.

But to truly exploit the wisdom of crowds, one must recognize that some crowds are better suited than others for solving particular problems. The artful strategist should determine, therefore, which traits lend themselves to profitable exploitation of collective wisdom. In general, the characteristics to look for are diversity, independence, decentralization, and aggregation.¹⁰

First, candidate crowds must be diverse. Here, *diversity* means a distinction of perspective, not a difference of ethnicity or gender. As Irving Janis argues in his book, *Groupthink*, groups can exert a conforming pressure on their members; "when the members' strivings for

⁸ Michael T. Maloney and J. Harold Mulherin, "The Complexity of Price Discovery in an Efficient Market: The Stock Market Reaction to the Challenger Crash," *Journal of Corporate Finance* 9, no. 4 (2003): 453-479.

⁹ In the case of Morton-Thiokol and the *Challenger*, aggregation took place via the stock market. Individual decisions to buy or sell stock in companies involved in the production of a space shuttle were like votes, aggregated to reveal the judgment of the crowd regarding which company was most responsible for the disaster. See Surowiecki, *Wisdom of Crowds*, 7-11; and Cass R. Sunstein, *Infotopia* (New York: Oxford University Press, 2006), 25.

¹⁰ Surowiecki, *Wisdom of Crowds*, 10.

unanimity override their motivation to realistically appraise alternative courses of action,” groupthink sets in.¹¹ If all members of the group see the problem the same way, the group loses its diversity of perspective, and their potential for collective wisdom is eroded. Bees find the best fields by sending out drones to different places at once; the diversity of information that comes back to the hive allows the colony to profit from the entire area, not just one familiar sector. The goal is the same with crowds: to have “meaningful differences among ... ideas rather than minor variations on the same concept.”¹² Janis showed how a lack of diversity could have disastrous effects in events like the Bay of Pigs.¹³

Another requirement for the wisdom of crowds to fully flower is independence. If people in a group are dependent upon each other for information, or upon the same sources of information, it becomes harder to produce a variety of perspectives and differentiated actions.¹⁴ People often follow an accepted practice—not because they thought of it on their own, but because others are doing it in numbers large enough to make it seem correct. This is normal, and even helpful to a point. But sometimes, established practice is wrong. Economist David Romer demonstrated, for example, that professional football teams could make many more points if they were to forego field goals for fourth-down conversions. Yet coaches almost always opt for the safer approach.¹⁵ An independent choice is risky, but often more profitable. Independence can be cultivated by forming a group of people from across organizational structures, but it can also be maintained by encouraging group members

¹¹ Irving L. Janis, *Groupthink: Psychological Studies of Policy Decisions and Fiascos* (Boston, MA: Houghton Mifflin Company, 1982), 9.

¹² Surowiecki, *Wisdom of Crowds*, 28.

¹³ Janis, *Groupthink*, 14-47.

¹⁴ Surowiecki, *Wisdom of Crowds*, 41.

¹⁵ Romer’s research is fascinating. In his study of three NFL seasons, “he found 1,100 plays where the teams would have been better off going for it. Instead, they kicked the ball 992 times.” This quote came from Surowiecki, who covers Romer in *Wisdom of Crowds*, pp. 44-47; one can find the full analysis in David Romer, “It’s Fourth Down and What Does the Bellman Equation Say? A Dynamic Programming Analysis of Football Strategy,” working paper, University of California, Berkeley (2003).

to seek their own information about a particular subject. Whatever the method, ensuring independence of action in a group setting is an important goal for those attempting to bring out the best in group dynamics.

A third requirement for maximizing a crowd's ability to generate an optimal solution is decentralization. Close control at a central command node may be appropriate for some missions, but to truly leverage the information and perspective of the people at the lower end of the command chain, a decentralized approach is needed. An apt example of the benefits of decentralization is found in the German idea of blitzkrieg. Used to good effect in the opening stages of the Second World War, blitzkrieg allowed the German war machine to succeed by "using a smaller but more nimble force against a well-provisioned opponent."¹⁶ By placing radios in their tanks, training for rapid communication, and pushing initiative down to the lowest levels, the Germans enabled their leaders at the front lines to adapt to situations more rapidly than their opponents.¹⁷ Decentralization allowed the German high command to benefit from the wisdom of crowds because they trusted their junior leaders with a broad mission and trusted them to determine the best way to accomplish it, within limits. This empowered the fighters at the front to capitalize on the information unique to their area of battle.

Aggregation, Surowiecki's fourth requirement for harnessing the wisdom of crowds, has been alluded to already. Capturing votes and averaging them together may be easy to do in some cases, difficult in

¹⁶ Clay Shirky, *Here Comes Everybody: The Power of Organizing Without Organizations* (New York: Penguin Books, 2008), 173.

¹⁷ These tactics and techniques did not spring fully formed from Hitler's head. Rather, the Germany army worked them out in the years before the Nazis came into power. "The German army used large-unit maneuvers to test organizational concepts before adopting any new sort of organization as part of operational doctrine." James S. Corum, "A Comprehensive Approach to Change: Reform in the German Army in the Interwar Period," in *The Challenge of Change: Military Institutions and New Realities, 1918-1941*, eds. Harold R. Winton and David R. Mets (Lincoln, NE: University of Nebraska Press, 2000), 49.

others. Still, a system must be found that matches each situation. In the ox-weighing contest described above, aggregating votes was a simple matter of recording guesses and averaging them out. In the case of the *Challenger*, the stock market was the aggregating agency—a more complex system than the one used in the bucolic example of the county fair. Recording someone’s guess on who will win an Oscar, for example, is different from capturing his or her thoughts on how to balance a budget. But without an ability to aggregate answers in a way that is fair and evenly balanced, a crowd’s wisdom quickly dissolves into a collection of individual opinions.

Lest one become infatuated with the prospects of using crowd-based solutions for every problem under the sun, it is important to mention two crucial caveats. First, there are many problems that are beyond what the average person can grasp with any confidence. As Cass Sunstein puts it, a crowd may be able to guess the number of jellybeans in a jar, but will be hopelessly lost when asked to guess the number of atoms in a jellybean.¹⁸ A better-than-random chance at guessing the correct answer is required; the crowd in play has to have some information with which to work. Second, crowd wisdom can be compromised by bias. Strong opinions can skew collective knowledge if those opinions are shared by a majority of the group. Asking a group of Philadelphians who will win the next World Series may produce a different answer than the same question asked in New York City; “systemic bias in one or another direction will create serious problems for the group’s answers.”¹⁹

Solutions Often Emerge From Outside

It seems counterintuitive that the best answers to difficult problems often emerge from the laity and not from credentialed experts—the scientists, lawyers and engineers of this life. Perhaps culture, and

¹⁸ Sunstein, *Infotopia*, 36.

¹⁹ Sunstein, *Infotopia*, 34.

Western culture in particular, is too quick to instill in its denizens a belief in the potential of the individual over the group. And yet answers to tough questions frequently come after the experts reach an impasse and turn the issue over to the untutored masses ... or rather, after they turn the issue over to someone outside their paradigm.

Sometimes, the solution to a tough problem can only emerge in an environment that allows unique answers to flourish, especially if those answers go against conventional wisdom. As Thomas Kuhn contends, paradigms and theories have a way of inspiring deep loyalty.²⁰ Similarly, Yuen Foong Khong maintains that metaphors are useful for understanding the present in light of the past, but can also blind one to important differences.²¹ This is why outsiders find it easier to innovate; they are free of the imprisoning power of paradigms and metaphors.

Paradigms are important; they allow a community of practice to succeed by seeing things a certain way. By adhering to a set of beliefs “that permit selection, evaluation, and criticism,” the world makes better sense, and previously unexplainable phenomena find purchase in reality.²² Paradigms allow for progress and refinement in belief systems. However, they can also prevent new information from being properly assessed. If, for example, a tradesman from the Middle Ages believed the world is flat, he would not seek a sea route to the Far East by sailing west. What is more, that same merchant might naturally reject the suggestion that sailing west would be profitable. As Kuhn relates, people do not seek new information if their current stock adequately explains reality; they do not “aim to invent new theories, and they are often intolerant of those invented by others.”²³

²⁰ Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: The University of Chicago Press, 1962), 169.

²¹ Yuen Foong Khong, *Analogies at War: Korea, Dien Bien Phu, and the Vietnam Decisions of 1965* (Princeton, NJ: Princeton University Press, 1992), 14.

²² Kuhn, *Structure of Scientific Revolutions*, 17.

²³ Kuhn, *Structure of Scientific Revolutions*, 24.

Metaphors have similar limitations. Sometimes called analogical reasoning, metaphors help decision makers assess a new situation by comparing it with one in the past. This approach plays on the belief that “if two or more events separated in time agree in one respect, then they may also agree in another.”²⁴ Analogical reasoning is an efficient way to process information, and like paradigms, can be a useful tool for making sense of reality. But also like paradigms, metaphors can lead one to overlook important contradictions. To paraphrase Khong, metaphors highlight the similarities between two situations and downplay their differences.²⁵ Once a group agrees upon an analogy, it can be difficult to see an unfolding situation in any other light than the one chosen. The groupthink that Janis warned about sets in, and “the advantages of having decisions made by a group are often lost.”²⁶ Outsiders—those who have yet to accept the group’s preferred metaphor—may be the only ones able to break free of the power of analogical reasoning.

Outsiders solve problems because they can operate outside the limitations of accepted paradigms and metaphors, while crowds solve problems by aggregating wisdom. Taken together, these characteristics do much to explain the history of invention as well as the development of successful strategy. Two examples from history illustrate this below. The first depicts a crowd-sourced path to invention; the second details an approach to strategy that paid off handsomely in the Second World War.

The Problem of Longitude

Though they could not know it, the rulers of England in the 1700s had much in common with the crowdsourcing companies of today. Both turned to the masses outside their organization to help solve intractable problems. Both profited from incentivizing innovation and invention. The issues faced by modern companies have to do with creating new

²⁴ Khong, *Analogies at War*, 6-7. Khong adapted his definition from David Hackett Fischer, *Historians’ Fallacies* (New York: Harper and Row, 1970), 243-259.

²⁵ Khong, *Analogies at War*, 20.

²⁶ Janis, *Groupthink*, 12.

products for emerging markets.²⁷ King George I had a more difficult problem: he could not tell time.

More specifically, he could not tell time at sea. When an English ship (or any vessel of the era) was away from a trusted time source on land, its sea clocks quickly lost their accuracy. This led to difficulties in determining longitudinal position at sea. Beyond issues of safety, the problem of longitude was an issue of national security for England. The British Crown kept its kingdom united by sea power. Accurate reckoning at sea was key to ruling the waves and maintaining advantage; and if an enemy could not reckon position as accurately as the Crown, so much the better. An 18th century sea power with the aid of accurate longitude would be roughly equivalent to a modern nation having satellite imagery while everyone else has binoculars.

But the advantage so dearly sought proved elusive. While latitude is calculable by the sun and stars, longitude is dependent on accurate knowledge of time. Dava Sobel explains why: “To learn one’s longitude at sea, one needs to know what time it is aboard ship and also the time at the home port or another place of known longitude—at the very same moment. The two clock times enable the navigator to convert the hour difference into a geographical separation.”²⁸ One only has to reflect a moment to realize the difficulties inherent in not knowing one’s longitude while at sea. Arriving at the right place at the right time becomes guesswork; avoiding treacherous reefs and other dangers, even if they are known, becomes a matter of luck rather than certainty. When errors in longitude claimed the lives of almost two thousand British sailors on a foggy night in 1707, the political leadership of England took action. Parliament quickly passed the Longitude Act, promising “a prize of

²⁷ Don Tapscott and Anthony D. Williams, *Wikinomics: How Mass Collaboration Changes Everything* (New York: Penguin Group, 2008), 103-108.

²⁸ Dava Sobel, *Longitude: The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time* (New York: Walker & Company, 1995), 5.

£20,000 for a solution to the longitude problem.”²⁹ This staggering amount, equal today to almost 1.6 billion pounds, attests to the importance the British government placed on solving this problem.³⁰

By the time of the Longitude Act, scientific luminaries the world over had given up on finding a practical way to calculate longitude at sea. Galileo, Cassini, Huygens, Hook, Newton, Halley—all had tried and failed.³¹ Enter John Harrison. A humble carpenter from the county of Yorkshire, Harrison had much in common with the Wright Brothers.³² Self-educated and hungry for learning, he combined the best attributes of polymath and mechanic. When Harrison learned of the prize offered for solving the problem of longitude, he dedicated himself to finding a practical answer. Instead of focusing on the heavens and planetary motion like the frustrated experts who preceded him, Harrison built a clock able to withstand the harsh environment of a ship at sea.

Harrison submitted his first clock to the Longitude Board in 1730, four years after he started work on the project.³³ By that time, the Board had received numerous entries; none captured the prize. Harrison’s clock had to prove itself just like any other submission. When his clock performed well during sea trials, Harrison received a commission to improve on his design. Eventually, the British adopted his invention, and the longitude problem was finally laid to rest. To ensure the permanence of their prize, England ensconced a Harrison clock in their observatory in Greenwich, using it as the time standard for the Empire (and by extension, the world). To this day, the world synchronizes its clocks to Greenwich Mean Time.

²⁹ Sobel, *Longitude*, 16.

³⁰ To retroactively adjust currency for inflation, visit <http://www.nationalarchives.gov.uk/currency/default0.asp#mid>

³¹ Sobel, *Longitude*, 29. Cassini even set up an “international task force” to help solve the longitude problem.

³² For further insight on the qualities of the Wrights and their uncanny similarity to the Harrison brothers, see Peter L. Jakab, *Visions of a Flying Machine: The Wright Brothers and the Process of Invention* (Washington, DC: Smithsonian Institution Press, 1990).

³³ Sobel, *Longitude*, 74.

By casting the problem of longitude upon the masses, the British were able to tap into the wisdom of crowds. They grasped, perhaps intuitively, a principle Bill Joy of Sun Microsystems made famous: “No matter who you are, most of the smart people work for someone else.”³⁴ The British also capitalized on the useful perspective of the outsider. John Harrison was not beholden to the planetary paradigm (scientists of Harrison’s day tried to solve longitude through astronomy) that kept the experts in a box.

A current-day corollary to the 18th century English may be found in Proctor and Gamble. Like the Crown, P&G maintains a network of industry that is global in scope; and like the Crown, they face problems that are beyond their capability to solve with internal resources. This became clear in the late 1990s when P&G “launched an internal survey and discovered it was spending \$1.5 billion on (research and development), generating lots of patents, but using less than 10 percent of them.”³⁵ If the British had a vast fleet of naval vessels that could not reliably navigate home, Proctor and Gamble had a vast inventory of ideas that could not find their way to potential customers.

In a modern nod to the Longitude Act, the directors of Proctor and Gamble began to use a web site called InnoCentive to solicit innovators outside their own staff.³⁶ InnoCentive posts difficult research problems and solicits solutions from any contributor who cares to offer one. If a submission solves a problem, the contributor receives a cash reward. Today, problem solvers the world over help solve P&G’s product development issues for much less than the cost of producing similar results internally. These days at P&G, “45% of the initiatives in [their] product development portfolio have key elements that were discovered

³⁴ Shirky, *Here Comes Everybody*, 254.

³⁵ Tapscott and Williams, *Wikinomics*, 103.

³⁶ Tapscott and Williams, *Wikinomics*, 13.

externally.”³⁷ John Harrison would be proud (and perhaps a highly rewarded contributor).

“Nothing Surprised Us”—The Navy War College and War Plan Orange

In their essay, “Lessons of War,” Allen Millet and Williamson Murray argue that “mistakes in operations and tactics can be corrected, but political and strategic mistakes live forever.”³⁸ While a company may be able to recover from failed strategy in the marketplace, a nation employing poor strategy in war enjoys no such luxury. Obviously, there is great incentive to get strategy right the first time; military and political leaders expend enormous amounts of energy to craft a winning plan. Yet, as Helmuth Graf Von Moltke observed, plans often fail to survive first contact with the enemy.³⁹ Why do nations get such a high stakes game wrong? Perhaps the best way of answering that question is by learning from those rare instances when strategists got it *right*. Ed Miller believes such a rarity occurred during the years leading up to the Second World War when the United States laid the foundations for its strategy in the Pacific.⁴⁰ War Plan Orange, the code name for U.S. plans against Japan, was conducted much as it was planned in the Navy boardrooms of Newport and Washington. The plan succeeded because it rested on the wisdom of crowds and because the Navy institutionalized a way for outside opinions to be heard.

Though the Army played a small role in the formulation of U.S. operational plans in the Pacific, War Plan Orange was predominantly a

³⁷ Larry Huston and Nabil Sakkab, “Connect and Develop: Inside Procter & Gamble’s New Model for Innovation,” *Harvard Business Review* 84, no. 3 (March 2006): 61.

³⁸ Allen R. Millet and Williamson Murray, “Lessons of War,” *The National Interest* 14 (Winter 1988/1989): 85.

³⁹ Helmuth Graf Von Moltke, *Moltke on the Art of War: Selected Writings*, ed. and trans. Daniel J. Hughes and Harry Bell (New York: Presidio Press, 1993), viii.

⁴⁰ Edward S. Miller, *War Plan Orange: The U.S. Strategy to Defeat Japan, 1897-1945* (Annapolis, MD: Naval Institute Press, 1991), 5.

Navy show.⁴¹ Any role for the Army would come after the Navy secured sea lines of communication and the Marines established a foothold on land. Accordingly, the Navy took the lead in crafting War Plan Orange, dividing responsibilities between a General Board of officers at department headquarters in Washington and the Naval War College in Newport, Rhode Island.⁴² It was a complementary relationship. The General Board took the overall lead after 1911, but Newport played a vital role in the Orange Plans “by testing them on the gaming board, training strategists, and submitting occasional studies.”⁴³

Over the years, ideas for beating Japan in an all-out war ran the gamut from building an impregnable base of operations on Guam to rushing a massive relief column to the Philippines.⁴⁴ These plans were abandoned as war gaming and fleet exercises proved them untenable. Through an iterative process, the planners tested the advantages and disadvantages of various approaches until finally settling on what was to become the winning strategy: “a prolonged, step-by-step return to the Philippines, the path subsequently taken by Nimitz’s Central Pacific offensive in late 1943, (with) attacks first on the Gilberts, then the Marshalls, and finally the Marianas.”⁴⁵

⁴¹ D. Clayton James, “American and Japanese Strategies in the Pacific War,” in *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton, NJ: Princeton University Press, 1986), 710.

⁴² The plans against Japan (Orange) started in 1897, when Assistant Secretary of the Navy Teddy Roosevelt asked the War College to focus on the problem of an ascendant Japan. By 1900, “students had worked on the problem of a Japanese invasion of California. In 1911 Newport produced a ‘Strategic Plan of Campaign Against Orange,’ which envisioned a war ending with a Navy blockade of Japan. Much of the plan, which foresaw the fall of the Philippines, was still accepted doctrine on December 7, 1941.” Thomas B. Allen, *War Games: The Secret World of the Creators, Players, and Policy Makers Rehearsing World War III Today* (New York: McGraw-Hill Book Company, 1987), 120.

⁴³ Miller, *War Plan Orange*, 81.

⁴⁴ Miller, *War Plan Orange*, 31.

⁴⁵ Eliot A. Cohen, “The Strategy of Innocence? The United States, 1920-1945,” in *The Making of Strategy: Rulers, States, and War*, Williamson Murray, MacGregor Knox, and Alvin Bernstein, eds. (Cambridge, UK: Cambridge University Press, 1994), 462.

The gaming floor at the Navy War College became a machine for harnessing the wisdom of crowds. At Newport, the Navy institutionalized the properties suggested by Surowiecki: diversity, independence, decentralization, and aggregation.⁴⁶ Diversity of perspective was guaranteed by the itinerant nature of Newport's students. Many of them came for a summer conference only, "mulling over" strategies and producing reports before reporting back to their normal duties at sea.⁴⁷ Newport was, by design, a place of independence—an academic environment designed to operate on an information flow different from Washington's. The Navy War College enjoyed the benefits of decentralization in a peacetime environment: "with neither civilian guidance nor dangers to vital U.S. interests, the planners enjoyed considerable latitude in defining a response to the expected enemy strategy."⁴⁸ The final ingredient, aggregation, is harder to see. Perhaps if one considers each planning conference as an individual vote, and then averages those votes over the years, an aggregation of sorts will emerge. This approach leaves much to be desired. Newport in the years leading up to the Second World War is better seen as a place that aggregated learning—an institution that exchanged one theory of victory for another as war games and exercises led them to do so.

Among its many benefits, the Newport gaming center most importantly prepared leaders for strategic decision-making.⁴⁹ The

⁴⁶ "There are some particular benefits in conducting war games at the War Gaming Department in Newport, Rhode Island, the site of the Naval War College. The War College is remote both geographically and bureaucratically from key Navy staffs. The physical and mental separation is healthy and allows the (wargaming board) the autonomy to be a sophisticated idea test lab. A traditional non-attribution policy at the War College coupled with an acknowledged attitude towards gaming inviting imaginative thinking, experimentation and trial and error facilitate the examination and probing of strategies, plans, and tactics." James P. Euliss II, CDR, USN, "War Gaming at the US Naval War College," *Naval Forces: International Forum for Maritime Power* 6, no. 5 (1985): 97.

⁴⁷ Miller, *War Plan Orange*, 15.

⁴⁸ Miller, *War Plan Orange*, 28.

⁴⁹ Some would argue it was not a byproduct at all, but a main line of effort. Francis McHugh believes that by 1922, "the emphasis shifted to educational games, that is to

Captains and Admirals that led the charge in the Pacific had done their time at the War College, and each carried with them the experience of the war games they participated in while a student. Speaking after the war's end, Admiral Nimitz praised the value of gaming: "The war with Japan had been reenacted in the game rooms at the Naval War College by so many people in so many different ways, that nothing that happened during the war was a surprise ... absolutely nothing except the kamikaze attacks."⁵⁰ Indeed, Newport produced not only robust strategy, but also leaders prepared to meet uncertainty.⁵¹

Conclusion

Governments and corporations have tapped the resources of collective wisdom for centuries now, and to great benefit. By finding or creating places where diversity, independence, decentralization, and aggregation can flourish, leaders at all levels may gain solutions to complex problems. However, pockets of innovation are often located outside the mainstream. This is due in part to the limitations inherent in dominant paradigms and metaphors. Helpful as they are, paradigms can sometimes function as prisons in the mind; only those outside their walls can see an issue in a liberating light.

In 1730, England found an answer to the longitude problem by taking an unheralded approach: tapping into the intelligence and ambition of its subjects. Years later, the U.S. Navy embarked on a similar voyage when crafting a strategy for the coming war in the Pacific. The Navy, however, found benefits far beyond those of the British. The

games conducted for the primary purpose of providing the players with decision-making experience." Francis J. McHugh, "Gaming at the Naval War College," *United States Naval Institute Proceedings* 90, no. 3, whole no. 733 (March 1964): 51.

⁵⁰ Quoted in Thomas B. Allen, "The Evolution of Wargaming: From Chessboard to Marine DOOM," in *War and Games*, Tim Cornell and Thomas B. Allen, eds. (Suffolk, UK: Boydell Press, 2002), 234.

⁵¹ Beyond the works cited above, the reader wishing to delve deeper into Newport's role in War Plan Orange can find additional material in Peter Rosen, *Winning the Next War*, 69-71; Williamson Murray's article "Innovation: Past and Future," in *Military Innovation in the Interwar Period*, 300-328, and Richard Overy, *The Air War: 1939-1945*, 85-101.

Board of Longitude enriched the Crown. The Newport planners enriched not only War Plan Orange but also the abilities of those who participated in the plan's production.



Chapter 2

The Present

If the story of longitude has any lesson, it may be that casting impenetrable problems upon society in hopes that a solution may emerge reveals wisdom rather than weakness. Likewise, the story of Newport in the inter-war years showed that a unique environment for problem solving can be used to great effect, especially if it brings together diverse individuals who freely experiment with intricate issues. But if the lessons from history are so demonstrable, and their benefits so profitable, why are there so few examples in history of others using similar techniques?

Many groups wishing to solve a perplexing issue do not have the budget or the broadcast ability of a government-level agency like the Board of Longitude. Others do not have the facilities of the Naval War College Gaming Department, with its ability to pull in the best and brightest military officers to participate in strategy exercises. Economists describe this reality in terms popularized by the Englishman Ronald H. Coase, an economist who studied American industry in the 1930s.¹ Coase's Law states, "An organization will tend to grow only when the advantages that can be gotten from directing the work of additional employees [outweigh] the transaction costs of managing them."² Firms and government agencies in the past may have wished to use the wisdom of crowds, but were prevented by fiscal constraints and structural realities.

¹ Ronald Coase won the Nobel Prize for Economics in 1991. He is best known for applying the concept of transaction costs to firms, and for suggesting that property rights can exert more influence than external costs and benefits. For his original work on organizational growth in relation to transaction costs, see his article "The Nature of the Firm," *Economica* 4, no. 16 (November, 1937), 386-405.

² Clay Shirky, *Here Comes Everybody: The Power of Organizing Without Organizations* (New York: Penguin Books, 2008), 43.

The Internet is changing the Coasean calculus, making transaction costs cheaper, and in some cases, free. Now, organizations can advertise a need simply by posting it on a website, expanding their worker base by orders of magnitude through crowd-sourced initiatives. Fueled by the Internet, today's organizations are increasingly turning to web-based communication and collaboration tools, hoping to harness the talents latent in crowds. These modern-day Boards of Longitude know that the quicker they advertise their conundrums, the quicker the John Harrisons of today will appear, clocks in hand.

Companies and Crowdsourcing

Corporations can profit tremendously from outsourcing their overhead to individuals outside their company willing to work on a problem for a fraction of the cost. As previously shown, difficult research and development obstacles can be overcome by using the Internet to expand time and talent. Beyond monetary and research savings, companies also stand to gain loyalty from customers who had a hand in the design process of the product they are buying.

Taken together, these benefits are called *crowdsourcing*. A term coined by Jeff Howe in a 2006 *Wired* article, crowdsourcing refers to the way "technological advances in everything from product design software to digital video cameras" have broken down "the cost barriers that once separated amateurs from professionals."³ Laypersons with talent and interest suddenly have "a market for their efforts," and forward-thinking companies have a way to access the talent in the crowds outside their corporate doors.⁴ In a subsequent book on the subject, Howe stresses the social relationship behind crowdsourcing, cautioning companies to see it not as a "cheap labor force," but rather a "community" of

³ Jeff Howe, "The Rise of Crowdsourcing," *Wired*, June 2006, <http://www.wired.com/wired/archive/14.06/crowds.html>.

⁴ Howe, "Rise of Crowdsourcing."

collaborators.⁵ This distinction is important; it is the reciprocal social relationship between company and crowd that makes crowdsourcing work. When the right balance is struck, both sides win.

Besides expanding their workforce at incredibly low costs, crowdsourcing companies also gain the advantage of outside opinions. By accessing an entirely new community of practitioners, crowdsourcers invite a healthy challenge to the traditional community of problem solvers. Turning again to Thomas Kuhn's work on paradigms, we find that people rarely turn to alternative ways of looking at things if the current way is working. "So long as the tools a paradigm supplies continue to prove capable of solving the problem it defines," a community has little reason to abandon them.⁶ This is not necessarily obstinacy, but rather normal perception: "What a man sees depends both upon what he looks at and also upon his previous visual-conceptual experience has taught him to see."⁷ Only when a new approach is offered (often by the young and uninitiated) and shown to be successful can the power of paradigms be trumped.⁸ Crowdsourcing allows access to this important group of people that lie outside institutional walls.

Boeing is one company that understands this dynamic. For its latest passenger jet model, Boeing made a radical shift from the old way of doing things to a deeply cooperative approach. Market forces drove the change. It is becoming increasingly difficult for companies like Boeing and Airbus to make a profit by exploiting conditions Ron Coase would find familiar—expanding infrastructure, acquiring rivals, integrating an all-inclusive production line under one corporate roof.

⁵ Jeff Howe, *Crowdsourcing: Why the Power of the Crowd is Driving the Future of Business* (New York: Crown Business, 2009), Kindle e-book location: 6%.

⁶ Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: The University of Chicago Press, 1962), 76.

⁷ Kuhn, *Scientific Revolutions*, 113.

⁸ "They are men so young or so new to the crisis-ridden field that practice has committed them less deeply than most of their contemporaries to the world view and rules determined by the old paradigm." Kuhn, *Scientific Revolutions*, 144.

Faced with rising costs and falling profits, Boeing chose to embrace a concept Coase never considered: collaboration. For the 787, Boeing is “handing suppliers control over a large proportion of the thousands of features and components that make up its airplanes in a bid to control costs, improve innovation, and get new planes to market more quickly.”⁹ More than simple outsourcing, the new approach is a form of crowdsourcing, with a “broad horizontal network of partners who are collaborating in real-time, sharing risk and knowledge to achieve a higher level of performance.”¹⁰ In a nod to Newport, Boeing even established a virtual environment (called the Global Collaborative Environment) where any team-member worldwide can access and address engineering and design problems.¹¹ As a result of these efforts, orders for the 787 are up, and Boeing has seen its assembly time fall precipitously: what used to take thirteen days now takes three.¹²

Large companies like Boeing are only the latest corporate comers to collaborative approaches. For some time now, smaller companies have used crowdsourcing to create new markets for everything from clothing to cars. Entire industries, most of them niche, are built around it. One of them is Local Motors, “the first open source car company.”¹³ Local Motors produces custom vehicles at a fraction of the typical cost because it crowdsources the designs, uses off-the-shelf components when possible, and depends on customers for assembly. With a 500/1 ratio of volunteers to employees, Local Motors’ typical turn time from concept design to street-ready sale is 18 months.¹⁴

⁹ Don Tapscott and Anthony D. Williams, *Wikinomics: How Mass Collaboration Changes Everything* (New York: Portfolio, 2006), 225.

¹⁰ Tapscott and Williams, *Wikinomics*, 225.

¹¹ Tapscott and Williams, *Wikinomics*, 227-228.

¹² Tapscott and Williams, *Wikinomics*, 227.

¹³ Chris Anderson, “In the Next Industrial Revolution, Atoms are the New Bits,” *Wired* 18, no. 2 (February 2010), 58.

¹⁴ Anderson, “Atoms are the New Bits,” 58.

Another example can be found in the humble t-shirt. In 2000, two Chicagoans started Threadless.com, an online business that depends on its customer base to design the shirts it sells. Individuals submit artwork, and users vote on which submission they like best. Winners get free shirts; everyone else gets to buy one. This simple social contract allows Threadless to crowdsource the most expensive part of its business while simultaneously creating a loyal customer base, and it propels remarkable profits: Threadless made \$17 million in 2006.¹⁵

If corporations find the prospect of retooling their business model to accommodate crowdsourcing too daunting, there are middlemen willing to bridge the gap. One such broker is TopCoder, “the world’s largest competitive software development community.”¹⁶ TopCoder accepts tough software design challenges from businesses, then crowdsources a solution. Winning programmers earn a portion of the fee TopCoder charges its clients. Put differently, “TopCoder takes a software problem, breaks it into pieces, puts them out to competition and pulls the solutions together into a bigger system.”¹⁷ Companies hiring TopCoder’s crowds save overhead and time (TopCoder turns a typical project in five months versus the industry’s average of twelve) but also find lasting benefit: programs generated by TopCoder teams have 83% fewer software bugs than traditional competitors.¹⁸

Crowdsourcing is not a panacea for companies facing rising costs and shrinking demand. Though effective, it seems to work best under certain conditions. According to Nicholas Carr, there are three considerations any organization should make before jumping on the crowdsource bandwagon.¹⁹ First, tasks need to be amenable to

¹⁵ Howe, *Crowdsourcing*, Kindle e-book location: 2%.

¹⁶ Home page banner on <http://www.topcoder.com>, (accessed 28 January 2011).

¹⁷ Graham Warwick, “Crowd Control,” *Aviation Week and Space Technology* 172, no. 40 (November 1/8, 2010): 75-76.

¹⁸ Howe, *Crowdsourcing*, Kindle e-book location: 42%.

¹⁹ Nicholas Carr, “The Ignorance of Crowds,” Booz-Allen-Hamilton, 31 May 2007, <http://web.rollins.edu/~tlairson/ecom/opensource.pdf>.

individualization: “Peer production works best with routine or narrowly defined tasks that can be pursued simultaneously by a big crowd of people.”²⁰ Second, there needs to be a central authority able to aggregate submissions, separating wheat from chaff: “The central authority takes care of synthesizing the work of the crowd, choosing the best contributions, melding them together into a coherent product, and then redistributing the work to the crowd for the next go-round.”²¹ Finally, as its name suggests, crowdsourcing requires a plethora of cheap labor. For every nine Threadless.com design winners, there are ninety-one losers.²² The latter may try again next time, and may even win, but if all hundred submitters were to get free t-shirts, the Threadless crowdsourcing system would soon collapse.

Education and Government Join In

Crowdsourcing opportunities are not realized in the corporate world only. Similar environments can be found (or created) in the realms of education and government. In recognition of this, research organizations and government centers alike increasingly turn to crowds as a way to reach their goals. Using connections made possible by the Internet, these agencies tap into new resources for innovation and progress.

In 2006, the Massachusetts Institute of Technology (MIT) established an entire center to study and harness the wisdom of crowds. Called the Center for Collective Intelligence (CCI), it attempts to “use prediction markets to crowdsource the viability of solutions to intransigent problems.”²³ Prediction markets have proven remarkably accurate in forecasting the results of elections and sporting events. MIT believes a similar approach can be useful in other arenas and seeks to employ crowds in these markets. One such focus area for MIT is climate

²⁰ Carr, “The Ignorance of Crowds.”

²¹ Carr, “The Ignorance of Crowds.”

²² Howe, *Crowdsourcing*, Kindle e-book location: 2%.

²³ Howe, *Crowdsourcing*, Kindle e-book location: 54%.

change. To explore the effects of present-day decisions on the world in the future, the CCI “developed an online forum called the Climate Collaboratorium, a combination of software tools on a website and a broad community of people who use them, including policy makers, businesspeople, educators, students, activists, and other concerned citizens.”²⁴ Participants use simulation models to predict the impact of suggested actions. The results are aggregated up to produce a combined recommendation for policy makers and scientists.

Government agencies faced with rising costs and shrinking budgets find a measure of success in crowdsourcing their needs. In October of 2010, the National Aeronautics and Space Administration (NASA) contracted with TopCoder and the Harvard Business School “to develop a generic platform for challenges” it faces in software design for space systems.²⁵ NASA calls its environment Tournament Lab, and it functions much like the TopCoder environment that birthed it. NASA sees Tournament Lab as “an online virtual facility for NASA researchers with a computational or complex data processing challenge,” and it uses the environment to advertise problems and receive competitive solutions.²⁶ NASA casts a wide net on Tournament Lab, accepting submissions from any country willing to participate. This means the computer code NASA uses to control future space vehicles may have originated in Kenya as well as in Kansas, and brings a new meaning to NASA’s original charter to function as an agency of international cooperation.²⁷

²⁴ Nancy Stauffer, “Harnessing the World’s Collective Intelligence to Deal with Climate Change,” MIT Energy Initiative, 9 December 2009, <http://web.mit.edu/mitel/research/spotlights/collective-intel.html>.

²⁵ Warwick, “Crowd Control,” 75-76.

²⁶ “NASA Establishes Tournament Lab for Software Developers,” NASA, <http://www.nasa.gov/directorates/somd/ntl/> (accessed 28 January 2011).

²⁷ Walter A. McDougall, ... *The Heavens and the Earth: A Political History of the Space Age* (Baltimore, MD: The Johns Hopkins University Press, 1985), 181.

Recently, the Defense Advanced Research Projects Agency (DARPA) pushed the boundaries of cooperation even further, questioning the assumption that “only U.S. citizens can work on U.S. defense programs.”²⁸ If Internet connections allow access to the best and brightest design minds around the world, DARPA reasons, why constrain a defense program to domestic input only, especially if security concerns are properly addressed? To test these notions, and to see if crowdsourcing can produce design solutions more elegantly and cheaply than conventional paths, DARPA launched the Fast, Adaptable Next-Generation Ground Combat Vehicle (FANG) effort. The intent is to “crowd-source the design of an infantry fighting vehicle and compare it with the U.S. Army’s conventionally sourced Ground Combat Vehicle in terms of capability, cost and timescale, with a prize of up to \$1 million for the winning design.”²⁹ For this project, DARPA took an open-source approach, establishing a virtual environment where designers can assess the performance characteristics of their design against FANG requirements and make changes based on that feedback. This iterative, competitive approach to design is a radical change from the Department of Defense’s typical acquisition approach. But if DARPA is successful, critics may find it difficult to argue with reduced timelines, improved design characteristics, and decreased costs.

Solving Real Problems Using Virtual Worlds

The corporations and agencies described above have something in common: they each leverage the wisdom of crowds by using the power of the Internet to foster an environment conducive to collaboration. Some organizations, however, take the *environment* side of the equation a step further. These groups believe the best way to solve problems may be to: (1) construct a virtual environment that recreates the conditions under study, and (2) allow team members to interact with each other *and* the

²⁸ Warwick, “Crowd Control,” 75-76.

²⁹ Warwick, “Crowd Control,” 75-76.

environment to reach a solution. The hope is that, by spending time in a contrived world, solutions will arise that can transfer to reality. The environment for collaboration can range from a map and a conference call to a fully immersive computer game. Most are somewhere in between.

For example, the gamers of Newport created (and over the years, optimized) an environment to facilitate innovation and experimentation. The Naval War College dedicated entire buildings to wargaming, separating students from their normal classes and placing them in open game rooms where models of ships were moved around on a gridded floor.³⁰ Students and faculty took on roles ranging from low-level planners to high-level strategists; each had an important part to play in the way a particular scenario unfolded.³¹ Gamers devoted themselves to the task of applying the concepts of strategy and operational art learned in the classroom, projecting what they had learned against predicted situations in the Pacific. Taken together, these structures and settings became an immersive world—a virtual environment designed for problem solving.

Exercises in virtual environments are unique from other crowd-based activities in that the outcomes (i.e., answers) they produce are often unbounded. While a prediction market might accurately forecast the winner of an election based on a list of candidates, collaborative problem solvers in virtual world have no such constraints. Such worlds resemble a sandbox more than a decision tree: they have borders, but only to mark off a place where free exploration can occur. Virtual environments can be places where designers ask questions without having firm ideas on the range of outcomes.³² In this type of setting, the

³⁰ McHugh, “Gaming at the Naval War College,” 50.

³¹ McHugh, “Gaming at the Naval War College,” 48-55.

³² Jane McGonigal, quoted in Eliza Strickland, “Forecasting the Future May Be a Matter of Fun and Games,” *Discover*, 5 September 2008, <http://discovermagazine.com/2008/sep/05-forecasting-the-future-may-be-a-matter-of-fun-and-games>.

different reactions of participants in a virtual world can be as important as the results they produce while they are there.³³ When, as with wicked problems, “the formulation of a problem depends on individual perspective,” different reactions become critical to “constructing an interpretation that is sufficiently useful in dealing with reality.”³⁴

The first large-scale effort in using a virtual world to host a crowd of problem solvers was *Superstruct*. Billed by its creators at the California-based think tank Institute for the Future as a massive multiplayer forecasting game, *Superstruct* began in October of 2008 and had over 7,000 participants.³⁵ The game ran for six weeks and amassed over 500 different solutions for consideration.³⁶ The premise of *Superstruct* is simple: in the year 2019, a number of economic, social, and environmental threats combine to portend humanity’s extinction; players must act together to make plans and avert disaster. *Superstruct* aggregated peer-reviewed inputs for solving future maladies. Game managers recast these inputs as recommendations for the next ten years (2009 to 2019)—actions to take to prevent a *Superstruct* scenario from ever happening.

A smaller-scale example may be found in *E=H2O*, a virtual reality game hosted by the Institute of Electrical and Electronics Engineers (IEEE) on 3 June 2010 to produce ideas for dealing with water shortages during an energy crisis.³⁷ IEEE recruited 1,388 players from 88 countries “to predict how water and energy resources will compete in the future.”³⁸ Players received points for submitting an idea, and additional points if other players believed the idea good enough to build upon. In

³³ Peter P. Perla and Michael C. Markowitz, *Conversations with Gamers* (Alexandria, VA: Center for Naval Analyses, 2009), 65.

³⁴ John F. Schmitt, “A Systemic Concept for Operational Design” (unpublished paper, available from http://www.au.af.mil/au/awc/awcgate/usmc/mcwl_schmitt_op_design.pdf).

³⁵ Strickland, “Forecasting the Future.”

³⁶ *Superstruct* archive website, <http://archive.superstructgame.net/>.

³⁷ “Gaming the System,” *IEEE Spectrum* 147, no. 12 (December 2010), 10.

³⁸ “Gaming the System,” 10.

this fashion, game play continued until corporate answers emerged. One intriguing suggestion called for manufacturers to publish a water footprint: similar to a carbon footprint, but focused on how much water it takes to produce a given item.³⁹ This idea has begun to resonate in industry, and companies like Levis are designing new products that use much less water in the manufacturing process.⁴⁰

Game designers like Jane McGonigal at the Institute for the Future (ITF) must look to online games with a bit of envy. If think tanks like hers had the same budget as the gaming industry (whose corporations routinely invest millions of dollars into the creation of virtual worlds), constructs like *Superstruct* and *E=H2O* could become much more immersive. ITF's fiscal constraints limit its games to those that can be staged using affordable technology. No fancy avatars here—much is left to the player's imagination. For all their visual differences, the similarities between the environments ITF creates and the *World of Warcraft* are striking. Both environments leverage the wisdom of crowds (engendering user-created wiki sites, for example), and both depend on collaborative problem solving skills to overcome tremendous difficulties.⁴¹ To paraphrase Dr. McGonigal, if half the time spent solving the problems of Azeroth were devoted to solving the problems of Earth, how much farther along might humanity be in its search for solutions to troubling dilemmas?⁴²

³⁹ "Gaming the System," 10.

⁴⁰ Bryan Walsh, "Green Jeans: Levi's Makes its Denim with Less Water," *Time*, 8 January 2011. <http://www.time.com/time/magazine/article/0,9171,2041116,00.html>.

⁴¹ "A *wiki* is a website that allows the creation and editing of any number of interlinked web pages via a web browser using a simplified markup language or a WYSIWYG [what you see is what you get] text editor. Wikis are typically powered by wiki software and are often used to create collaborative works. Examples include community websites, corporate intranets, knowledge management systems, and note services." From "Wiki" entry on *Wikipedia*, <http://en.wikipedia.org/wiki/Wiki> (accessed 29 March 2011).

⁴² Jane McGonigal, "Gaming Can Make a Better World" (speech, TED Conference, Long Beach, CA, February 2010). Azeroth is the name of the fictional world created for *World of Warcraft*.

Conclusion

The Internet loosens the bonds of Coase's Law on organizations. Today, agencies and firms from all walks of life can expand their operations through crowdsourcing. Web-based communication and collaboration tools allow companies to harness the talents in crowds and have even fostered thought experiments that work backwards from future maladies to find present cures.

Some argue the biggest potential for problem solving remains untouched. If one believes Malcolm Gladwell's *Outliers*, most of life's incredible achievers have something in common: they spend approximately 10,000 hours practicing their craft over the space of ten years.⁴³ If one applies this theory to people who play online role-playing games (like *World of Warcraft*), one finds a happy match: demographic studies show most are 26 years old, play 22 hours a week, and have been playing for quite some time.⁴⁴ Estimates show an average young person living in a country with a strong gaming ethos arriving at Gladwell's 10,000-hour mark by the time they are 21 years old.⁴⁵ This means the world already contains a vast amount of people (500 million) with virtuoso abilities at solving problems in virtual settings.

In the coming years, their numbers will continue to grow. A good portion of them will enter the United States Air Force.

⁴³ Malcolm Gladwell, *Outliers* (New York: Little, Brown and Company, 2008), 41.

⁴⁴ Nick Yee, "Motivations for Play in Online Games," *CyberPsychology & Behavior* 9, no. 6 (2006), 772-775.

⁴⁵ McGonigal, "Gaming Can Make a Better World."

Chapter 3

Air Force Ability to Adopt and Adapt

If one intends to fight a war, one should first sit down to estimate one's own abilities; otherwise, one runs the risk of being able to start a fight but not finish it.¹ In perhaps his best-known proverb, Sun Tzu put understanding friendly forces on equal footing with knowledge of a foe, saying that, if this is achieved, "in a hundred battles you will never be in peril."² Considering one's own capabilities is important; it informs any strategy of engagement with an enemy.

With this in mind, what of the Air Force? For a start, it is in the war-fighting business. It also tends to be an early adopter of new technology.³ Since it does no good to propose new methods of problem solving if the system affected cannot support them, this chapter will explore the Air Force capacity to adopt the techniques discussed previously, adapting its organization in the process. By investigating the demographic makeup of the Air Force, the technological platforms available, and possible ways the two (people and platforms) can combine, one finds a service in excellent position to exploit the wisdom of air-minded crowds.

Demographics

This is not your father's Air Force. The average officer was born after 1976; the average enlisted member, after 1982. More than a third

¹ Paraphrase of Luke 24:28-30

² Sun Tzu, *The Illustrated Art of War*, trans. Samuel B. Griffith (1963; repr., New York: Oxford University Press, 2005), 125.

³ Thomas Mahnken puts these two ideas together when he says, "It is likely, then, that U.S. armed services will favor advanced technology in general, but will be particularly bullish on those systems that comport with existing mission areas." Thomas G. Mahnken, *Technology and the American Way of War* (New York: Columbia University Press, 2008), 226.

of all Air Force members are below the age of 26.⁴ These Airmen grew up immersed in technology—computers were part of their everyday lives, and few would remember a time when a television signal predominantly came from a broadcast tower instead of a cable. Most “spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age.”⁵ Today’s Air Force is made up of digital natives, not digital immigrants.⁶

Collectively, the age group that makes up the younger portion of the Air Force is called the *Millennial Generation*, *Generation Y*, or just *Millennials*. Born between 1982 and 2001, these individuals are characteristically different from generations past.⁷ If one takes the year groups offered by William Strauss and Neil Howe as definitive, the earliest Millennial joined the Air Force in 2000 and can retire in 2018, around the time the last Millennial turns 18 and enters the Air Force.⁸ Put another way, every addition to the Air Force will be a Millennial until 2019.

In contrast, the Air Force’s most senior leaders are from the Baby Boomer generation (born from 1943 to 1960). As they retire, leaders from what Strauss and Howe call the Thirteenth Generation (born from 1961-1981) take their place. Unlike the Millennials, these two generations fall into the digital immigrant category, growing up at a time

⁴ The actual number is 38%; 44% of enlisted Airmen are below 26 compared to 13% of officers. Statistics derived from the Air Force Personnel Center website, current as of December 2010. <http://www.afpc.randolph.af.mil/library/airforcepersonnelstatistics.asp> (accessed 9 February 2011).

⁵ Marc Prensky, “Digital Natives, Digital Immigrants,” *On the Horizon* (MCB University Press) 9, no. 5 (October 2001).

⁶ Terms used by Prensky in “Digital Natives, Digital Immigrants.”

⁷ “Behavior and attitudes of each phase of life change character entirely.” William Strauss and Neil Howe, *Generations: The History of America’s Future, 1584-2069* (New York: William Morrow and Company, Inc., 1991), 31. Note that at the time of their writing *Generations*, Strauss and Howe did not set a specific date for the end of the Millennial generation, merely placing it near the turn of the century/millennium. This paper uses 2001 as the end date, as that seems to be the consensus of most other sources.

⁸ Strauss and Howe, *Generations*, 32.

when computers were not household items, and cell phones, if available at all, were cumbersome.

The Air Force Recruiting Service (AFRS) took notice of these new generational patterns and altered its approach to attracting Millennial talent. Because of high entrance standards, “only 27% of today’s American youth qualify for Air Force Duty,” so, “to recruit from this small pool of eligible candidates, the Air Force must be able to understand the Millennial generation.”⁹ Accordingly, the AFRS has changed its tactics in recent years, adding social media platforms to its usual advertisement suite of television, movies, and radio. One can now find an Air Force recruiting presence on popular social networking sites such as Facebook and Twitter.¹⁰ To reach the next generation of Airmen, they also rent virtual billboards for display on video game systems.¹¹

Technology

Today’s Airmen are adept at using various technological platforms to interact with their environment, seek information, and process what they find. In recognition of this, some Air Force leaders believe the service must create an enduring “infrastructure that leverages (Millennial’s) life long (*sic*) exposure and aptitude with technology.”¹² The suggested infrastructure could be bought, or might already be resident in Air Force inventories. Indeed, many of the technology platforms used by the Air Force to perform its mission are the same ones being used in the civilian sector to access collective wisdom and create new environments for problem solving.

⁹ Air Education and Training Command white paper, “On Learning: The Future of Air Force Education and Training,” 30 January 2008, <http://www.aetc.af.mil/shared/media/document/AFD-100726-035.pdf>, 7.

¹⁰ Find the Air Force on Facebook at <http://www.facebook.com/USairforce>. On Twitter, go to <http://twitter.com/usairforce>.

¹¹ In 2008, for example, the Air Force created “custom intro billboards” that displayed on the Xbox LIVE online entertainment network and the Xbox.com website. “Air Force Reaching Out Through XBox,” *Brand Noise*, http://brandnoise.typepad.com/brand_noise/2008/11/air-force-reach.html.

¹² Air Education and Training Command, “On Learning,” 7.

One such platform is the Air Force Portal.¹³ The Portal is meant to be a one-stop shop for Air Force personnel—a place where properly credentialed users can “quickly find authoritative, relevant data and information, applications and collaboration tools to help (them) do (their) job and live (their) life in the USAF.”¹⁴ As such, it blends work and social aspects together. The structure of the Portal shows considerable effort was made to accommodate the desires of the Millennial generation. There are options to customize the site for one’s personal preferences, create a profile to match site content with one’s job and location, contact other Portal members through instant messaging, and access a wiki-like repository of information called Knowledge Now.¹⁵ As for the latter, Portal members are encouraged to “tap into functional expertise, tools and documents” and “make connections to solve common problems, develop skills and share common practices.”¹⁶

While it seems the Portal may be tailored to accommodate the talent of Air Force crowds in a secure environment where information and ideas are freely exchanged, in reality it is something less than that. As with most Department of Defense sites, user activity is recorded and monitored, making it difficult to establish an environment of unfettered collaboration. The psychology is different. One cannot join, say, a chat room for F-16 engine mechanics, but rather a chat room for the mechanics plus one: a Silent Partner able to replay your words back to you in a setting where the Uniformed Code of Military Justice is brought to bear. Another underdeveloped area is the wiki portion of the Portal. *Knowledge Now* is not a true wiki where conventional wisdom is freely contributed and openly moderated, but more of a bulletin board where

¹³ <https://www.my.af.mil>.

¹⁴ “What is the Air Force Portal?” Air Force Portal, https://www.my.af.mil/afp/netstorage/login_page_files/afportal_faqs.html (accessed 18 February 2011).

¹⁵ Air Force Knowledge Now (AFKN) is accessible through the Air Force Portal, and can be found at <https://www.my.af.mil/afknprod/Community/Views/Home.aspx?Filter=OO#b>.

¹⁶ “What is the Air Force Portal?”

members can access approved documents. Still, the *potential* exists for the Portal to facilitate problem solving and make use of—to a greater extent than ever before—the talents of Air Force members.

Another Air Force platform catering to Millennials is MyBase. In 2008, Air Education and Training Command (AETC) invested significant time and resources to craft a virtual world where individuals (or more accurately, their avatars) could engage in Air Force-related activities and learn more about the service.¹⁷ Called MyBase, it is hosted by Second Life, an online community where individuals and organizations construct virtual worlds for social interaction.¹⁸ Second Life made its Internet debut in 2003, and now boasts 800,000 regular users.¹⁹ Besides the Air Force, the Navy, Army, and Marines also have a virtual presence in Second Life.

In part to promote the use of MyBase, AETC wrote a white paper that focused on the potential uses of new technology for training and education. AETC's commander at the time, General Steven Lorenz, recorded a speech to his command explaining the benefits new technologies like Second Life may have for education and training.²⁰ In the years since the white paper's release, however, MyBase remains primarily a proof of concept. Air Force training has not moved *en masse* to virtual environments like those found in Second Life. Though educators are attracted to the potential value of immersive learning environments, much needs to be done to make sites like MyBase truly engaging. Still, "virtual social worlds offer significant opportunities for

¹⁷ Andrew G. Stricker and Larry Clemons, "Simulation Gaming for Education in MyBase: The Future of Air Force Education and Training With Virtual World Learning" (paper presented at the Spring Simulation Multiconference (Military Modeling and Simulation Symposium), San Diego, CA, 24 March 2009), 1.

¹⁸ Stricker and Clemons, "Simulation Gaming for Education", 1.

¹⁹ Where *regular user* equates to repeat logins. Nelson Linden, "The Second Life Economy in Q3 2010," Second Life, 28 October 2010, <http://blogs.secondlife.com/community/features/blog/2010/10/28/the-second-life-economy-in-q32010#comment-795051> (accessed 18 February 2011).

²⁰ Or rather, his avatar did; camera crews recorded the General at his desk, then substituted his doppelganger for the actual transmission.

collaboration,” and as a potential platform for problem solving, they should be taken seriously.²¹

Wishing to tap into the potential of crowdsourcing, the Air Force is listing research and development problems on a government website designed to incentivize innovation. Challenge.gov is the federal government’s answer to InnoCentive.²² There, government “seekers” advertise their challenge areas in hopes that “solvers” will submit a winning answer in exchange for a monetary prize or some other reward.²³ As of this writing, the Air Force has one listing (of seven total in the Defense Department) calling for “public, online, and international” solutions to the difficulties of cyber crime forensics.²⁴

For the moment, Defense Department challenges on Challenge.gov seem to be continuations of previously existing competitions, repackaged for a crowdsourcing platform. When accessed by the author, only one listing in the defense category (a posting from the Defense Advanced Research Projects Agency calling for designs for an Experimental Crowd-Derived Combat-support Vehicle) was an original initiative. Nevertheless, Challenge.gov is a viable platform for the Air Force to seek and find solutions to difficult problems. Interestingly, it is the only platform reviewed thus far that allows for solutions to emerge from both inside and outside the Air Force’s corporate walls.

The Air Force has other tools at its disposal—platforms already in its inventory, though not purpose-built for harnessing the wisdom of air-

²¹ Bryon Reeves, Thomas W. Malone, and Tony O’Driscoll, “Leadership’s Online Labs,” *Harvard Business Review* 86, iss. 5 (May 2008), 62.

²² InnoCentive is a middleman for crowdsourcing. On its website (<http://www.innocentive.com/>), InnoCentive posts problems faced by large companies and solicits solutions from contributors around the world. If a submission solves a problem, the contributor receives a cash reward. To find Challenge.gov, navigate to <http://challenge.gov>.

²³ “About Challenge.gov,” Challenge.gov, <http://challenge.gov/about> (accessed 18 February 2011).

²⁴ U.S. Air Force, “DC3 Digital Forensics Challenge,” Challenge.gov, <http://challenge.gov/AirForce/42-dc3-digital-forensics-challenge> (accessed 18 February 2011).

minded crowds. Massively Multiplayer Forecasting Games (MMFG) like *Superstruct* use inexpensive tools to produce an immersive problem for players to tackle, tools the Air Force already has in abundance. A website, content-hosting servers, video software, and database management are the minimum entry requirements for staging a MMFG.²⁵ The biggest investment would likely be the time required to script and generate a MMFG to Air Force standards.

The Air Force could also construct a virtual world for problem solving similar to the ones found in *World of Warcraft* and other Massively Multiplayer Online Games (MMOG) like *Eve* or *EverQuest*. This would be a much bigger investment, though small in comparison to acquisition funding lines for major weapons systems.²⁶ To build an Air Force MMOG, the service would likely contract with a civilian programming firm to create a three-dimensional world suitable for hosting the types of problems the Air Force is interested in solving. Once written, the program would require additional infrastructure: servers, bandwidth, database support, etc. Like an MMFG, an MMOG's biggest outlay would eventually be people. Properly managing a massive virtual world requires a full complement of people dedicated to its care and upkeep.²⁷

Some might say the Air Force already has an MMOG: it is called MyBase. But this ignores a critical distinction between virtual worlds made for socializing (e.g., Second Life) and those made for gaming. The latter are built from their virtual ground up around game objectives.

²⁵ <http://archive.superstructgame.net/about>; also, <http://spectrum.ieee.org/waterpodcast0610>.

²⁶ The most expensive MMO ever created (and the most profitable) is likely Blizzard's *World of Warcraft*, which cost \$100 million to develop. Dan Gallagher, "Activision Bets Big on PC Game," *Wall Street Journal*, 16 June 2010, <http://online.wsj.com/article/SB10001424052748704682604575369093457494042.html>.

²⁷ Blizzard employs 2,700 people, many of whom work on *World of Warcraft*. Source: Blizzard Entertainment response to a question on ChaCha.com: "How many employees does Blizzard entertainment have?" ChaCha.com, <http://www.chacha.com/question/how-many-employees-does-blizzard-software-have>.

While virtual social worlds “lack structured, mission-oriented narratives; defined character roles; and specific goals,” MMOGs have the mission built in to the world itself, with specific roles to assume and objectives to accomplish—a truly “competitive and goal-oriented environment.”²⁸ Perhaps the biggest difference between MyBase as it currently exists and a notional Air Force MMOG is the intent: MyBase wants to impart knowledge; an Air Force MMOG for problem solving would seek to extract it.

Connecting Platforms and People

Besides *extract*, verbs like *produce* and *elicit* are also appropriate since they hint at the core question: Can the Air Force bring talented people and capable platforms together, and in so doing, draw out unique solutions to difficult problems? By investigating ideas of *aggregation*, *collaboration*, *crowdsourcing*, and *controls*, one reaches a preliminary answer.²⁹

Aggregation

To capitalize on the wisdom of crowds, one must have a suitable way to aggregate inputs or votes. This can be as simple as recording guesses about the number of jellybeans in a jar and then taking an average, or as complex as creating a predictions market about a future outcome, like who will win the Oscars. The key distinction in all these systems is the *individuality* of the voting. People do not gather in groups to reach a consensus on the right number of jellybeans; rather, they

²⁸ Reeves, Malone, and O’Driscoll, “Leadership’s Online Labs,” 62, 61.

²⁹ Cass R. Sunstein addresses the promises and pitfalls of aggregating information throughout his 2006 book, *Infotopia: How Many Minds Produce Knowledge* (New York: Oxford University Press). For collaboration and crowds, the best source may be James Surowiecki, *The Wisdom of Crowds* (New York: Anchor Books, 2004), though a strong second can be found in Don Tapscott and Anthony D. Williams, *Wikinomics: How Mass Collaboration Changes Everything* (New York: Portfolio, 2006). Crowdsourcing is covered in Jeff Howe’s book by that name (New York: Crown Business, 2009); he also coined the term. The idea of *control* as a necessary requirement for leveraging collective wisdom is woven throughout the literature; one of the better arguments for having a central authority in the process is found, ironically, in Nicholas G. Carr’s “The Ignorance of Crowds,” Booz-Allen-Hamilton, 31 May 2007, <http://web.rollins.edu/~tlairson/ecom/opensource.pdf>.

make individual votes using the information they have. As Cass Sunstein reminds us, some problems are appropriate for the wisdom of crowds and some are not. Whenever systematic bias is present, or a subject is beyond someone's ken, asking a group to provide individual votes about a topic is ill advised, no matter how thorough the aggregation scheme.³⁰

Given these constraints, it seems seeking the wisdom of crowds may be profitable for the Air Force in certain situations. As long as: (1) the voters have some information on the subject, (2) the voters are not biased in opinion, and (3) the subject is something the voters are able to grasp, soliciting the opinion of Airmen through aggregated voting may be helpful. For example, one could poll all Air Force members serving in the Afghanistan theater of operations to provide their vote about where the Taliban threat is greatest. If authors like James Surowiecki are right, their answer may be surprisingly prescient.³¹

Collaboration

Collaborative problem solving in a virtual environment is not constrained to aggregating *individual* inputs. One can also approach collective wisdom in a way that aggregates the choices of *groups* into an emergent solution. When a MMOG player accesses a wiki dedicated to *World of Warcraft* looking for lessons learned, he or she is benefitting from the aggregated experience of many groups.³² Group missions are the primary means of progress in most MMOGs. There are multiple ways groups can fail, and there are multiple ways to succeed. In fact, finding new and different ways to succeed is one of the prime motivators of MMOG gamers: "even when common solutions are known, the gamer

³⁰ Cass R. Sunstein, *Infotopia: How Many Minds Produce Knowledge* (New York: Oxford University Press, 2006), 36.

³¹ James Surowiecki, *The Wisdom of Crowds*, (New York: Anchor Books, 2004).

³² The *World of Warcraft* wiki is the second largest wiki in the world. With 80,000 articles, it trails only Wikipedia. Jane McGonigal, "Gaming Can Make a Better World" (speech, TED Conference, Long Beach, CA, February 2010). To access the WoW wiki, go to <http://www.wowwiki.com/Portal:Main>.

disposition demands a better way, a more original response to the problem.”³³ Because the cost of failure is relatively low, players have an incentive to try again, even after repeated defeats.³⁴ Eventually, a solution emerges that benefits all who face the same problem; by recording those paths to success in a wiki, collective wisdom emerges.

For the Air Force, however, the cost of failure is not so low, and unlike the world of a MMOG, the environment is not virtual. Air Force leaders face daily difficulties that are never the same twice; they do not have the luxury of revisiting a problem until they get it right. This makes the transfer value of collaboration in a virtual environment somewhat problematic because it is difficult to recreate realistic conditions, risks, and rewards. With that said, there are some scenarios and applications that appear to have potential. The next chapter is dedicated to exploring their properties.

Crowdsourcing

As mentioned above, the Air Force is already employing crowdsourcing as a tool for problem solving. *Challenge.gov*, however, currently has only one project from an Air Force sponsor, and there is nothing like crowdsourcing going on behind the walls of the Air Force Portal. Clearly, this avenue for cheaply outsourcing the costs of research and development is woefully underutilized.

One corollary to crowdsourcing is the Air Force IDEA program, which pays \$200 to \$10,000 to anyone who submits an idea for an improvement that is subsequently adopted by the service.³⁵ Crowdsourcing would make the IDEA program targeted. Instead of being open-ended (“Send me your good ideas!”), it would ask contributors to

³³ John Seely Brown and Douglas Thomas, “The Gamer Disposition,” *Harvard Business Review* 86, iss. 2 (February 2008), 28.

³⁴ “Failure, instead of being viewed as a career killer, is accepted as a frequent and necessary antecedent to success.” Reeves, Malone, and O’Driscoll, “Leadership’s Online Labs,” 62.

³⁵ Air Force Instruction (AFI) 38-401, *The Air Force Innovative Development Through Employee Awareness (IDEA) Program*, 21 November 2007.

focus on a known difficulty (“Send me your good ideas on improving chemical warfare masks!”). Sometimes, inspiration kindles after a leader has identified a problem and asked for a solution. If the Air Force pinpoints specific areas for improvement and awards significant prizes to the individual or team providing the best solution, answers might emerge from new areas. Modest budgets could even be given to separate Major Commands to sponsor innovation, crowdsourcing within their command as they see fit.

Controls

With the main focus on crowds thus far, it may seem ironic to suddenly focus on the role of the leader (or strategist), but he or she is critical when it comes to harnessing group intelligence. Leadership is often what determines if a people/platform combination succeeds. Whether the first person to post a given topic on Wikipedia, or the project lead on a Challenge.gov initiative, leaders start the process, set the boundaries, and define the problem. When it comes to collective intelligence, leadership can be seen as the grain of sand that generates a pearl: necessary at the core, producing a stimulus that results in a product of great value. Leaders also set the boundaries, rules, and controls that define how a technological platform is applied and determine the environment in which it is used.

The Air Force is very good at maintaining a hierarchy and enforcing controls on a social system. Crowd-based solutions need not undermine that structure. Rather, they can be seen as new ways to approach old challenges.

Conclusion

If gamers tend to improve upon existing paths to success, how does this disposition compare to the Air Force ethic of innovation? What do Airmen and gamers have in common? From their earliest days, Air Force men and women have looked for better ways of doing what they were already successful in performing. General Hap Arnold, the Army

Air Corps' top Airman during the Second World War, vigorously promoted the utility of unmanned aerial platforms.³⁶ Arnold left a legacy of innovation, "not just white scarves and leather jackets, but professionals who see (and fight) beyond the horizon and create innovative paths to the future."³⁷ Some would say that airmen of any stripe are imbued with a deep desire to exceed current solutions, finding new measures and new methods of doing things, a birthright passed on from the Wright Brothers.³⁸

Because of this history, and because it has the tools and demographics to do it, the Air Force seems primed to exploit new approaches to problem solving using web-based technology. The Air Force can create platforms for people to maximize their potential. The business world already uses systems to leverage the wisdom of crowds, outsourcing problems to find solutions, and using virtual environments to foster collaboration. The Air Force has taken a few tentative steps in these directions, but it has the potential to rapidly expand its efforts. Most of the technology required already resides in Air Force inventories. The biggest hurdle—finding capable people who are used to using such technology—has already been cleared.

Just as rearranging *latent* yields *talent*, rearranging the existing combination of Air Force people and platforms can yield new applications for problem solving. This, however, may require organizational change—never an easy task, whether in peacetime or war. To embrace collaborative problem solving using virtual environments, the Air Force

³⁶ In 1944, Arnold said, "For twenty years the Air Force was built around pilots, pilots, and more pilots, but the next Air Force is going to be built around scientists—around mechanically minded fellows." In 1945, his thinking had already progressed: "I think the time is coming when we won't have any men in a bomber." Quoted in Tim Schultz, "What Airmen Do," *The Wright Stuff* 5, iss. 4 (18 February 2010), <http://www.au.af.mil/au/aunews/archive/2010/0504.html>.

³⁷ Schultz, "What Airmen Do."

³⁸ Alan Boyle, "Aviation's Past Sets Future Course: Experts Look Back at the 'Wright Stuff,' and Look Ahead as Well," *msnbc.com* (17 November 2003), http://www.msnbc.msn.com/id/3475897/ns/technology_and_science-science/.

must recognize the potential gains of doing so, have a willingness to explore its practical applications, and implement institutional acceptance. This means the creation (and promotion) of a new community of practice. Stephen Rosen reminds us that innovation often requires an “‘ideological’ struggle that redefines the values that legitimate the activities” of an organization.³⁹ Only when “respected senior military officers formulate a strategy for innovation” and create requisite institutional rewards will innovation succeed.⁴⁰

The next chapter uses case studies to begin the exploration process.



³⁹ Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, NY: Cornell University, 1991), 20.

⁴⁰ Rosen, *Winning the Next War*, 20-21.

Chapter 4

The Future

The second chapter showed how leaders in the past turned to the population at large as a viable resource for problem solving. Chapter three described similar efforts in the present. As technology allows varied groups of people to access information in new ways, civilian and military organizations increasingly apply a web-based, communal approach to problem solving. Future applications of social networking technology will undoubtedly uncover new ways to harness the wisdom of crowds. Like Wikipedia and Facebook, many of these future applications will grow in popularity not only because their creators wish it, but because their users do.

It is doubtful that Mark Zuckerberg ever thought his software program might someday be used by a revolutionary movement to topple a 30-year dictatorship.¹ Yet many pundits credit Facebook as a crucial catalyst in the events surrounding the February 2011 removal of Hosni Mubarak from power in Egypt.² Indeed, protest movements around the world often use Facebook and other social media platforms (e.g., Twitter) to organize, inform, and act. In 2008, for example, thousands of Columbians marched in an event against the FARC (Revolutionary Armed Forces of Columbia); the rally was organized via Facebook.³ Using social media for political ends is not just a tactic of civilians with a

¹ Mark Zuckerberg created the social networking program Facebook in 2004 while a student at Harvard.

² Mike Giglio, "Inside Egypt's Facebook Revolt," *Newsweek*, 27 January 2011, <http://www.newsweek.com/2011/01/27/inside-egypt-s-facebook-revolt.html> (accessed 18 March 2011).

³ Sibylla Brodzinsky, "Facebook Used to Target Columbia's FARC with Global Rally," *Christian Science Monitor*, 4 February 2008, <http://www.csmonitor.com/World/Americas/2008/0204/p04s02-woam.html>.

cause, but also of regimes seeking to maintain the status quo. Even North Korea has a Facebook page.⁴

One definition of *social media* is a platform upon which people can engage in social activities for which they are already strongly motivated.⁵ People use Facebook because of kinship and camaraderie—they want to stay in touch with friends and family. But as recent events make clear, they also use it to foment rebellion. Emotion and commitment play a role in both.

If individual motivation plays such a strong role in group collaboration using social technology, then future applications of social technology in the Air Force should take this into account. The Air Force must leverage both human nature and modern technology. Collaborative problem solving in a virtual environment has to be something people—even individuals under military authority—*want* to do if it is to reach its full potential. Orders will only go so far. Intrinsic motivation is the fuel for viability and a guarantor of longevity.

Before exploring two examples of potential problem solving environments, this chapter briefly covers the ways individuals might be motivated (and demotivated) to collaborate in a virtual environment. Then, criteria for identifying appropriate problems for presentation in a virtual environment are suggested. The remaining discussion illustrates two scenarios that fall within these bounds: a natural disaster and a future shock.

⁴ Although one cannot “friend” Kim Jong Il at the moment, North Korean government agencies have Facebook and Twitter accounts, as well as YouTube channels. Laura Roberts, “North Korea Joins Facebook,” *The Telegraph*, 21 August 2010, <http://www.telegraph.co.uk/technology/facebook/7957222/North-Korea-joins-Facebook.html>.

⁵ “The tools [cell phones, e-mail, a webpage, etc.] are simply a way to channel existing motivation.” Clay Shirky, *Here Comes Everybody* (New York: Penguin Books, 2008), 17.

Motivations Matter

For every virtual environment that succeeds, legions may fail.⁶ Designers of virtual gaming worlds have much at stake; understandably, they attempt to create an experience that keeps players wanting more. The trouble arises when well-intentioned designers attempt to force sociability into a mold instead of facilitating what players naturally want to do. One online game, *Star Wars Galaxies*, experienced a mass exodus of players when game designers changed in-game social rules in an attempt to encourage player interaction.⁷

Motivations matter. Most people are not coerced into performing their best work. Passion and belief in a cause can drive innovation as much as the perceived need for a solution. When it comes to social technology, motivations take on a new level of importance.

People may spend time in collaborative problem-solving environments for reasons of achievement (advancement, mechanics, competition), for social reasons (socializing, relationship, teamwork), and for the enjoyment immersion brings (discovery, role-playing, customization, escapism).⁸ These reasons are especially true for online gamers playing Massively Multiplayer Online Games (MMOG). People may also become involved in social network-based problem solving out of belief in a cause. Disaster response teams in Haiti, for example, used an open source software platform called Ushahidi to help map events during that country's recent earthquake.⁹ Ushahidi helped channel people's

⁶ *Uru*, *Asheron's Call*, and *Ultima Online* are just a few of the many Massively Multiplayer Online Games that have closed their virtual doors after initially promising starts.

⁷ The trouble arose when, to promote socializing, *Star Wars Galaxies* game managers forced players to linger in certain areas (e.g., cantinas) in order to heal. Nicholas Ducheneaut, "Massively Multiplayer Online Games as Living Laboratories: Opportunities and Pitfalls," in *Online Worlds: Convergence of the Real and the Virtual*, ed. William Sims Bainbridge (London: Springer, 2010), 139.

⁸ Nick Yee, "Motivations for Play in Online Games," *CyberPsychology and Behavior* 9, no. 6 (2006): 772-775.

⁹ José Vericat, "Open Source Mapping as Liberation Technology," *Journal of International Affairs* 64, iss. 1 (Fall 2010): 195-201.

desire to contribute to the relief effort by recording local updates and posting them online, using geotagging for precise location. The software's creator, David Kobia, explained the way entire communities can "galvanize ... around a disaster. The percentage of participants increases exponentially during a limited period of time. It is easier at that point to build the crowdsourcing effort required for a crowdsourcing tool."¹⁰

Beyond altruism, deep or professional interest in a subject or discipline is often sufficient motivation to problem solve in a virtual environment. One example of this is *Foldit*. In 2008, researchers at the University of Washington made a protein-folding video game called *Foldit* freely available via the Internet.¹¹ The researchers had an ulterior motive: they needed help modeling complex protein chains. Amino acids, the building blocks of proteins, can combine in seemingly endless ways; computers can predict some of these ways but have trouble with others. *Foldit* enlisted the aid of interested people in bridging the gap. The game, which was competitive and required three-dimensional puzzle-solving skills similar to those for a Rubik's Cube, quickly attracted a dedicated following of thousands of players.¹² Since humans are better (for the moment) than computers at recognizing patterns, *Foldit* players routinely "outperformed the software in figuring out how ... proteins fold into their three-dimensional configurations."¹³

The success of *Foldit* illustrates how scientists can use the interests and motivations of laypersons to extend and enable research, especially if the problem is amenable to crowdsourcing. *Foldit* players did not require a biology degree to participate; they only needed a knack

¹⁰ Vericat, "Open Source Mapping as Liberation Technology," 195-201.

¹¹ Alex Wright, "Managing Scientific Inquiry in a Laboratory the Size of the Web," *New York Times*, 28 December 2010.

¹² John Markoff, "In a Video Game, Tackling the Complexities of Protein Folding," *New York Times*, 4 August 2010, <http://www.nytimes.com/2010/08/05/science/05protein.html>, accessed 16 February 2011.

¹³ Markoff, "In a Video Game, Tackling the Complexities of Protein Folding."

for solving puzzles and a desire to do so. By targeting the population of puzzle solvers instead of the population of specialists (biologists and chemists), the University of Washington researchers were able to increase their computational power by orders of magnitude.

There is another way of looking at motivation, this time from the system side. In *Here Comes Everybody*, Clay Shirky distilled the necessary ingredients for capturing crowd motivation via social technology. For Shirky, every platform needs “a plausible promise, an effective tool, and an acceptable bargain with the users.”¹⁴ The *promise* of a wiki, for example, is not only that a user will find valuable information posted online, but also that other users may value their individual contribution. Wiki topics will grow organically as comments are added, subtracted, and refined; eventually the site will be better (and more current) than other ways of storing knowledge such as a book or encyclopedia. The *tool* of a wiki is the interface for posting and modifying entries. The tool must be reliable and must fit the task. Finally, the *bargain* is the rule set that governs behavior. In a wiki, the basic bargain is “that you can edit anyone else’s writing, and anyone else can edit yours.”¹⁵

Establishing the right promise, tool, and bargain can be tricky, as each affects the other in ways not easily discerned. The relationship between the three can exhibit emergent properties, with second- and third-order effects that are difficult to predict. For example, a news site called Digg found itself on the wrong side of copyright laws after its users began posting numbers used to encrypt DVDs.¹⁶ The promise made to Digg members (i.e., “Your participation defines our site”) was broken by Digg managers removing illegal content in compliance with federal law. Eventually, Digg’s owners had a choice to make: keep faith with their

¹⁴ Shirky, *Here Comes Everybody*, 260. The eleventh chapter is called, “Promise, Tool, Bargain.”

¹⁵ Shirky, *Here Comes Everybody*, 271.

¹⁶ Shirky, *Here Comes Everybody*, 290.

users and risk being shut down, or keep faith with copyright law and risk losing its clientele. They chose the former. When “faced with exerting unilateral control over their users or living up to their end of the bargain, Digg relented, allowing unlimited posting of the (DVD) key.”¹⁷

To be successful, designers of social technology have to be keen students of humanity, not just writers of code. Predicting how people will use a technology platform is difficult, to say the least. Judging by member numbers alone, Facebook gets it right, MySpace less so.¹⁸ And if the graveyard of defunct MMOGs is any indication, companies can invest millions of dollars in developing a social experience only to lose their target market to a competitor who better understands the customer.¹⁹ Clearly, striking the right balance between promise, tool, and bargain will be important for any social technology platform the Air Force attempts to adopt or create.

The Air Force has already learned some hard lessons in this respect. The service did not make the typical bargain for its online wiki Knowledge Now. Instead of taking a Wikipedia approach and allow any authorized user to make and edit entries, Knowledge Now members can only view content they are not directly responsible for (much like a “read only” file). This makes sense for some data; the Chief of Staff’s *Sight Picture*, for example, is not open to debate. However, if collaboration between Air Force members was one reason behind the creation of Knowledge Now, then some sort of creative power has to be placed in the hands of the Air Force men and women tasked to contribute. In other words, collaboration is not a one-way conversation. Most Air Force

¹⁷ Shirky, *Here Comes Everybody*, 291. Digg survived the legal firestorm and, as of this writing, is still up and running. See <http://digg.com>

¹⁸ According to Newsweek, Facebook has twice the worldwide membership of MySpace. Nick Summers, “Facebook vs. MySpace,” *Newsweek*, <http://2010.newsweek.com/top-10/heated-rivalries/facebook-vs-myspace.html> (accessed 24 March 2011).

¹⁹ For in-depth discussions on why some virtual worlds fail while others succeed, see William Sims Bainbridge, *Online Worlds: Convergence of the Real and Virtual* (London: Springer, 2010).

members view the site as a knowledge repository ... a database by another name. While tremendously helpful for what it does, Knowledge Now falls well short of its potential. This fact may have contributed to its scheduled demise.²⁰

Appropriate Problems

Sometimes a regular classroom is better than a virtual one. Sometimes it is better to host a group problem in a live environment rather than an online setting. As General Hal Hornburg suggests, there may never be a better way to get across an idea than through face-to-face communication.²¹ Finding the *right* types of problems to solve in a virtual environment is just as important as establishing the environment itself.

The right problems for the Air Force to solve in a virtual setting are those that benefit from the diversity of perspective, independence of information, and decentralized nature of its airmen.²² If an issue meets these criteria (and is not plagued by bias or ignorance), then it is likely to be a good candidate for a crowd-based approach to finding a solution.²³ All that needs to be added to the mix is a system to aggregate responses. Technology can help with the aggregation process and can be used to create environments that give large groups of airmen access to the problem. *Foldit* is an excellent example of a challenge that yielded to diversity, independence, decentralization, and aggregation. It also

²⁰ On 4 March 2011, the Air Force announced the ending of Knowledge Now, citing funding concerns. On 17 March 2011, a subsequent announcement was released stating additional funding had been acquired allowing for a one-year extension of the service.

²¹ "In rank order, my preferred modes of communication are (1) face-to-face conversation, (2) phone call, (3) short note, and (4) short e-mail. If you do not hear from me, that means only one thing: you are not hearing from me. It does not mean anything—good or bad. E-mail can be a wonderful thing, but it can also turn into a time-consuming monster. It should be short and to the point. Do not waste time crafting a pretty e-mail when a quick phone call would do the trick." Gen Hal M. Hornburg, "What I Believe," *Air and Space Power Journal* 19, no. 1, Spring 2005, 10.

²² See chapter two for a more in-depth discussion of these requirements. Adapted from James Surowiecki, *The Wisdom of Crowds* (New York: Anchor Books, 2004), 10.

²³ For how bias and ignorance can skew results, see Cass R. Sunstein, *Infotopia* (New York: Oxford University Press, 2006), 34-36.

profited from the inputs of non-expert practitioners, alchemizing the talents of the uninitiated into gold the researchers could use. The Air Force faces problems amenable to a similar approach, where opening up issues to a wide spectrum of interested players may hold untold benefits.

The biggest test may be one of leadership—identifying the right problems, creating the right conditions in which to address them, and recognizing solutions that are practical for the Air Force to adopt. Games—even war games—have a way of becoming an end in themselves: “Since they are about teaching underlying patterns, they train their players to ignore the fiction that wraps the patterns.”²⁴ For Air Force leaders seeking to harness the wisdom of air-minded crowds, however, the “fiction” is often what counts: it is the narrative in need of a change.

When identifying candidate problems for airmen to collaboratively address in a virtual environment, some thought must be given to leadership and the ability of strategists to create a realm where success can happen. Strategy is not something that submits easily to a checklist. As Williamson Murray and Mark Grimsley remind us, “Like politics, strategy is the art of the possible; but few can discern what is possible.”²⁵ Rather than a prescription or recipe for success, a better approach may be to foster a way for success to emerge in an acceptable path. Two comparisons help illustrate this point. One, an orchard; the other, chess.

Like a gardener responsible for a prize orchard, leaders cannot force growth in their organization. But with care and nourishment, both apple trees and employees will do what comes naturally: bear fruit in keeping with their nature. This is similar to the dynamics of collaborative problem solving in a virtual environment. In forecasting games, answers to problems are unknown at the start, but an

²⁴ Raph Koster, *A Theory of Fun* (Scottsdale, AZ: Paraglyph Press, 2005), 80.

²⁵ Williamson Murray and Mark Grimsley, “Introduction: On Strategy,” in *The Making of Strategy: Rulers, States, and War* (Cambridge: Cambridge University Press, 1994; 1997) 22.

environment is created where answers can emerge. When leaders and strategists do not know what success looks like ahead of time (which is often), they may have the right sort of challenge to submit to the wisdom of crowds.

Situations where the path to success is unknown have much in common with a chess game. In chess, one might “learn all the rules but still not be able to play very well because of emergent properties.”²⁶ Grand masters know “pieces are stronger if they’re out in the center of the board.”²⁷ This property is not in the rules; rather, “it’s a result of all the rules put together.”²⁸ But unlike an isolated knight in the center of a chessboard (however powerful), the strategist need not be alone. Backed by a crowd of people ready to provide input, and equipped with a means to aggregate their votes, the strategist can place different pieces into play and see what options emerge. Collaborative problem solving in a virtual environment gives the strategist that option.

A final illustration to offer is that of heterogeneous engineering. Good strategists are, in one sense, polymaths: people with deep knowledge of many subjects, voracious learners that take an encyclopedic, multivalent approach to their craft. Rather than focusing on one area of study (say, politics), they take a broad approach, taking economic, social, cultural, geographic, historical, technological, and scientific factors into account. John Law calls such activity *heterogeneous engineering*, and, though he applies the term to inventors like Thomas Edison, his logic translates to strategy. Much like successful inventions, strategic products are best “seen as a network of juxtaposed components.”²⁹ Leaders and strategists who turn to crowd-based wisdom are building a heterogeneous approach into their craft. As

²⁶ Kim Stanley Robinson, *Blue Mars* (New York: Bantam Spectra, 1996), 423.

²⁷ Robinson, *Blue Mars*, 423.

²⁸ Robinson, *Blue Mars*, 423.

²⁹ John Law, “Technology and Heterogeneous Engineering: The Case of Portuguese Expansion,” in *The Social Construction of Technological Systems*, eds. Wiebe E. Bijker, Thomas P. Hughes, and Trevor Pinch (Cambridge, MA: The MIT Press, 1989), 113.

heterogeneous engineers, strategists “seek to create a network of heterogeneous but mutually sustaining elements. They seek to dissociate hostile forces and to associate them with their enterprise by transforming them” into productive, or at least neutral, forces.³⁰ With multiple perspectives to offer, different information sources to pull from, and the freedom to offer creative inputs, crowds can expand a strategist’s thought horizon in ways that linear, blinkered thinkers could never dream.

Scenarios

Knowing the importance of motivations in collaborative problem solving, and taking into account the types of problems appropriate to address in a virtual environment, one is ready to propose potential scenarios that combine both considerations. Space does not permit covering all the possible ways a virtual world might be constructed for presentation to a problem-solving community. Because of this, the two scenarios below illustrate a wide spectrum of possibilities associated with solving problems in a virtual world. One is set in the past, the other in the future. Where one is best conducted with large numbers, the other is scalable. Other comparisons apply (see Table 1).

Table 1: Case Study Comparison

Case Study	Hurricane	Future Shock
Enemy	Natural disaster	Varies
Participants	Many	Scalable
Motivation	Humanitarian	Strategic interest
Paths to success	Multiple	Multiple

³⁰ Law, “Technology and Heterogeneous Engineering,” 121.

Case Study	Hurricane	Future Shock
Most like ...	MMOG	MMFG
Played in the ...	Past	Future
Enemy gets ...	No vote (not reactive)	Some votes
Implications for present	Multiple	Multiple
Played on ...	Dedicated server	AF Portal
Cost	More expensive	Less expensive
Level of conflict	Tactical to low operational	High operational to strategic

Source: Author's Original Work

Scenario 1: Hurricane

The disastrous events surrounding Hurricane Katrina brought heartache and anguish to the United States. Much of the misery (and later, anger) came from the inability to mobilize the nation's vast resources in support of rescue efforts. Even with "early warning and preparatory efforts, Katrina killed approximately 1,400 people."³¹ The flooding from the storm surge caused most fatalities. The devastation "overwhelmed local and state authorities, and even the federal government found its response efforts challenged."³²

In the years since Katrina, much ink has been spilled attempting to capture the lessons coming out of the event in the hopes that those lessons will be learned and applied to future situations. From committees commissioned by Congress, to internal investigations by

³¹ Randy G. Wietman and Larry M. Thompson, revised by John Segerson "Hurricane Katrina," in *Case Studies in Policy Making*, 11th ed., ed. Hayat Alvi-Aziz and Stephen F. Knott (Newport, RI: Naval War College, 2008), 211.

³² Wietman and Thompson, 211.

agencies involved, many people have attempted to capture what went wrong and what went right.³³ This is not just a nod to posterity or a sop to the wounded, but a real attempt to change organizations and structures for the better. The government rebuilt the levee, but it also addressed the broken relationships between the state and federal organizations responsible for responding in crises.³⁴ When Hurricane Ike hit the coast of Texas in 2008, the disaster response was arguably much better, despite Ike's similar destructive power.³⁵

One approach for improvement, however, has yet to be tried: using the circumstances surrounding a natural disaster as the setting for collaborative problem solving in a virtual environment. Katrina, the earthquake in Haiti, the earthquake and tsunami in Japan—all may be seen as opportunities for leveraging the wisdom of crowds. A group of problem solvers might discover new and better ways of overcoming the adversity surrounding rescue efforts, if only unleashed to do so.

The scenario offered here is modeled on a hurricane, but the same approach could be applied to any humanitarian crisis. In such crises, geography affects everything. Modifying the game for local topography is essential to the exercise. Online resources such as Google Earth make this task easier than ever.³⁶ Every region has unique circumstances to factor in and different resources to consider. Tailoring each virtual environment for maximum applicability to the real world is foundational.

³³ US Congress Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *A Failure of Initiative* (109th Cong., 2d sess., 2006, R. 109-377); also: US House, *Applying Lessons Learned From Hurricane Katrina: How the Department of Defense is Preparing for the Upcoming Hurricane Season* (109th Cong., 2d sess., 25 May 2006).

³⁴ Wietman and Thompson, "Hurricane Katrina," 211-240.

³⁵ Ike was the third most-damaging storm in America's history, behind Hurricanes Katrina and Andrew. Many sources recognize the Bush administration's handling of the situation as an improvement over Katrina. A good comparison of the two was written by Laney MacDougall, "Ike versus Katrina," *The Vista*, http://www.sandiego.edu/vista/archive_article.php?article_id=2008092532.

³⁶ Google Earth can be found at <http://www.google.com/earth/index.html>.

One environment for humanitarian relief/disaster assistance related to problem solving might be called *Help Solve a Hurricane*. The title is important: *help* and *solve* are words that speak to the motivation of the players as well as the mechanics of the game. Individuals would be *helping* with future relief efforts by: (1) finding better ways to prosecute relief efforts in the past, or (2) simulating catastrophic hurricane conditions in an area of concern, thereby addressing problems in advance. They would *solve* difficult problems by working in teams of people all concentrating on the same task. The last two words can be replaced as needed (*an Earthquake, a Tsunami, etc.*). Though sponsored by the Air Force, *Help Solve a Hurricane* is open to anyone with a computer and a reliable Internet connection. Civilians are welcome and encouraged to contribute.

Help Solve a Hurricane is similar to most Massively Multiplayer Online Games (MMOGs). The boundaries of the gaming world are the boundaries of the cities and townships affected by the storm. Players enter the world as a neophyte and choose a class for their character. Character classes correlate to the types of personnel able to respond in the aftermath—police, National Guard, Coast Guard, the Federal Emergency Response Agency (FEMA), Federal/State/local government officials, etc. Each class has different attributes based on their roles and responsibilities.

After customizing their avatar for gender, appearance, and name, players enter the world.³⁷ A movie greets them, introducing their class characteristics and providing a short narrative of the setting. The new player appears in a beginner zone: one of the lesser-hit areas, five days after the storm has passed. After getting acclimated with the game interface, users begin to interact with non-player characters (computer controlled) who give the player preset missions to perform in support of

³⁷ Avatars are a way to engage the player, drawing him or her more deeply into the experience of the game and providing a connection with the virtual environment.

the disaster response effort. The initial quests are relatively easy: take a walk down to the flooded church two blocks away; bring a bottle of water to the man sitting on the steps. The goal of these exercises is to train the player to interact with the environment in a smooth manner by performing tasks that bring familiarity with the user interface. After a suitable training period (4-8 hours of playing time), the player takes on greater challenges and begins to accomplish the purpose of the game: solving problems in unique ways through collaboration with other players.

There should be some danger involved for the player's character in keeping with the environment. The hazards in the game will reflect the hazards faced by real-world rescue teams. In *Help Solve a Hurricane*, player avatars will die if they exceed the limits of safety. Not to worry—they will reanimate at a safe location close by.

Communicating within the game is paramount. Without the ability to rapidly communicate with others, the game would soon fall flat. Through a keyboard chat interface, or through a microphone, players will communicate with their teammates in real time. These types of communication skills are already in the arsenal of many younger airmen (think Facebook), but older airmen with recent operational experience will likely have them too, thanks to tools like mIRC chat.³⁸ An Internet Relay Chat developed for the Windows operating system, mIRC is used extensively by remotely piloted aircraft operators, Combined Air Operations Center supervisors, and special forces on the ground to solve, in real time, problems associated with the kill chain (e.g., calling in air strikes, requesting close air support). In the game as in operations, coordination of group efforts—devising a plan, executing it, and adjusting as required—is key. By using communication tools like mIRC chat, the

³⁸ No one definitively knows what the “m” stands for in mIRC chat, not even its author, Khaled Mardam-Bey, but the “IRC” stands for Internet Relay Chat, a system Mardam-Bey built upon to make mIRC chat. mIRC, “Personal FAQ,” <http://www.mirc.com/pfaq.html>.

game utilizes a skill set many are already familiar with, and it helps create skills that an airman may someday use in an operational environment.

Game wardens are an important part of *Help Solve a Hurricane*. Wardens ensure the game flows smoothly and stays true to the spirit and intent of the mission. Game wardens are like the exercise evaluation team members familiar to Air Force personnel. They manage the narrative but are not part of the game. To remain unobtrusive, wardens are few in number; players will rarely come across one. Should a gamer meet a warden, though, there will be no doubt, as wardens are easily recognized by their avatar's distinctive apparel.³⁹ If a player is being incorrigible or disruptive, the game warden can kick them off the server. If, on the other hand, a player requests help in the game, the warden can assist. Some solutions may require in-game tools that were not foreseen. Wardens will route realistic requests to managers and programmers responsible for managing the virtual environment.

Once a player is comfortable with solving problems in the beginner zone, usually through solo play, they are ready to move to an intermediate or advanced area. These areas are reserved for difficult problems that cannot be solved individually. Success requires teamwork. In some cases, success may be demonstrable. Other times, it may be muted. It may not be possible, for example, to rescue every member of a nursing home under the constraints faced by rescue teams. With multiple attempts, however, low rescue numbers may be replaced by higher ones as teams learn to approach the problem differently.

All problems in a given sector will be regenerative. That is to say, a team may tackle a given problem, fail, and try again if they so desire. Or, they can try to improve upon a success. The iterative nature of problem solving in *Help Solve a Hurricane* is important, because it allows the

³⁹ No customization here. All game wardens wear the same uniform.

game managers to record different solutions to the same issue. Different teams may have different approaches to success and failure.

Upon review of the lessons-learned literature for Hurricane Katrina, several problems emerge as good candidates for collaborative solving in *Help Solve a Hurricane*.⁴⁰ These are cast as missions in the game environment. How the problem was approached in real life may be interesting, but in the game it is irrelevant. What matters is how *Help Solve a Hurricane* players solve it from a fresh perspective, using the same tools as the original responders.

Over time, unique solutions will aggregate and emerge. Each method should be studied for potential transfer value to the real world.

Example missions include:

- Establish a co-located operations center for Federal, State, and local decision makers
- Help residents evacuate to safer locations who do not have the means to leave
- Keep order at a sports arena
- Protect businesses from looting when lethal force is not authorized
- Equitably and rapidly deliver aid from distribution centers
- Provide medical care

These missions change over time; that is to say, they have different resource constraints at different times of the relief effort. Because of this, the game uses different sectors to simulate different stages of the relief effort. One area may resemble conditions hours after the rains came. Another area may reflect conditions months after the hurricane passed, at a time when different sorts of problems were faced.

One aspect of *Help Solve a Hurricane*, as proffered, is its tactical nature. The game does not simulate, for example, the interactions between state and federal governments outside the local area. Many of

⁴⁰ *The Federal Response to Hurricane Katrina: Lessons Learned* (Washington, DC: Government Printing Office, February 2006).

the lessons learned in Katrina cannot be simulated in the game world because they involve resources requiring high-level coordination and approval. But a simulation cannot be all things to all people. Many lessons remain that may benefit from a tactical- or low operational-level exercise like *Help Solve a Hurricane*. Changing the conditions from what they were in reality (e.g., no debris removal services during first few days) to what they might be in the future, given better State/Federal coordination (debris removal services contracted with local service providers) is one way to adjust for this, though at the risk of losing ties to reality.

Scenario 2: Future Shock

Opinions about future threats to national security abound, but for the Air Force, the most important opinion in the pantheon is the President's. In the 2010 *National Security Strategy*, President Obama identified many areas of concern, to include terrorism, nuclear proliferation, and cyber security.⁴¹ Addressing these and other concerns is the responsibility of those that defend the United States "from all enemies, foreign and domestic."⁴²

Rather than waiting for a future threat to materialize, an environment can be constructed that brings an undesired situation to the present so that one can work on it. In such a setting, problem solvers can better discern the consequences of inadequate preparation and can more easily divine the steps necessary to ward off an undesired event (or at least make it more manageable). This approach is similar to a geometry problem where a student is presented with a given and expected to provide an answer. In this case, the *given* is a security concern brought to the present, and the *answer* is the reaction of the problem solver. Unlike geometry, however, the answers are rarely proofs;

⁴¹ *National Security Strategy*, May 2010.

⁴² *Oath of Enlistment*, Title 10, US Code, Act of 5 May 1960 replacing the wording first adopted in 1789, with amendment effective 5 October 1962.

instead, they are a function of context, contingency, and emergent properties.

Future Shock is a potential name for this problem-solving environment. Similar to the Massively Multiplayer Forecasting Games crafted by the Institute for the Future, *Future Shock* posits a reality for which the United States is unprepared.⁴³ Less immersive than a MMOG, it is also more expansive: the boundaries of the gaming world are limited only by credulity. Instead of seeing an avatar on a screen in front of them, players use their imagination to envision what their life would be like in a given scenario. There are no classes to choose, no roles to assume. Players participate as themselves and draw upon their own skills, experience, and wisdom.

Not everything, however, is left to the mind's eye. Players are introduced to a scenario through short, scripted movies playable on any computer (much like a YouTube video). The game design staff produces the movies with off-the-shelf software, using vignettes to introduce the problem and provide a narrative for the setting. Players answer simple questions to force them into the problem, such as, "How will you get to work?" or, "Tell us what's in your pantry," keeping in mind the answers to these questions will change drastically given the overarching input. Once aware of the problem's ramifications, problem cards are presented to the participants. Players input their answers through the game interface, a collaborative website hosted on the Air Force Portal. Upon this social platform, players interact with their peers, submitting ideas and responding to discussion threads.

There is no danger, *per se*, in *Future Shock*. All notions and perspectives are encouraged. Players receive rewards when another player comments on their ideas, and more rewards if their idea is embraced and endorsed by others as having potential value for the

⁴³ *Superstruct* is an example of the type of MMFGs constructed by the IFTF. For more, visit <http://www.iftf.org/>.

group. In this way, unpopular suggestions are naturally left behind and good ideas are encouraged. Durable designs rise to the top, and “small contributions by many individuals add up to something big.”⁴⁴

Eventually, solution structures emerge with implications for the present day.

Game durations are flexible. In some cases, time and scope may only allow for a 4- to 6-hour game. Other instances might take days or even months. Eventually, the experiment will end so that conclusions may be drawn and results studied for potential transfer value to present day reality.

Future Shock is a members-only game. Only personnel inside the organization—in this case, the Air Force—may participate.⁴⁵ In an organization with over 300,000 people, this still allows for the wisdom of crowds to emerge, albeit wisdom acculturated and informed by institutional knowledge. Despite this exclusivity, the game is much broader than any other wargame the Air Force conducts. For one thing, it includes enlisted members. Enlisted personnel comprise 80% of the service, yet war games are generally not a part of their military education. Of the remaining population (officers), less than half attend the intermediate and senior service schools where most wargames are conducted. Rough math leads one to believe that 90% of the Air Force brain power remains untapped by a collaborative wargaming experience. This majority is both younger (a third are under 26) than the mid-career officers who participate in formal games at the Air Force Wargaming Institute and more experienced with modern modalities of social networking—the kinds of communication used to put on a forecasting

⁴⁴ Jane McGonigal and Kathi Vian, *The Superstruct Handbook: Reorganizing for the 21st Century*, <http://www.iftf.org/SuperstructGame>.

⁴⁵ Forecasting games like *Future Shock* are eminently scalable. This example depicts a game with only Air Force personnel, but it could encompass joint members too. Adding coalition partners to the mix would also be beneficial, as they bring a cultural context difficult to duplicate within the DOD.

game.⁴⁶ One purpose of *Future Shock* is to enfranchise the majority of airmen with a way to make their good ideas count. Another is to arm Air Force leaders with the best solutions for tackling a problem—solutions culled from the majority of the people they lead, not a relative few.

Future Shock games may also be scoped in size (i.e., number of participants). Some problems do well with general exposure. Others are relevant to a few niches of the service. Still other problems are best explored through parallel execution: one population set comes up with a solution, another of similar size does too, and neither group has access to what the other is doing. Comparing these results is informative, as the differences are just as interesting as the congruencies. Watching patterns emerge as answers aggregate will help the Air Force understand the proclivities of its people.

Example scenarios for *Future Shock* include:

- Energy depletion: oil reserves run out faster than expected
- Stealth technology is overcome by new radar
- Sustained inability to make recruiting goals
- Sustained airframe grounding (e.g., all F-15s for two years)
- Proliferation of accurate, reliable, terminally-guided anti-ship ballistic missiles

For all of these, care is taken to avoid rehashing known answers or dusting off contingency plans. Instead, the focus is on generating new answers and setting up a forum where previously unsolicited advice finds a voice. As General George Patton said, “Never tell people how to do things. Tell them what to do and they will surprise you with their

⁴⁶ See Chapter Four for more discussion on Air Force demographics. As for AFWI: as of this writing, the institute does not conduct wargames for officers until they attend Air Command and Staff College (mid-career officers). Though AFWI serves as a consulting arm for officer education efforts staging lower-level games geared for junior officers (e.g., Squadron Officer School), it does not support or conduct wargames for enlisted professional military education. For more information on AFWI and the games they conduct, see their website at <http://www.au.af.mil/au/lemay/main.htm> (click on the “Wargames” tab).

ingenuity.”⁴⁷ *Future Shock* creates an environment for the express purpose of discovering ingenuity in surprising places.

The reader may ask, “Doesn’t the Air Force already do this? It’s called wargaming!” The answer is a qualified, “No.” Collaborative war games using today’s social technology are capable of exceeding traditional wargames in four important ways. First, there is scale. As shown above, only about 10% of Air Force members participate in traditional wargames. Including the other 90% means a potential 300,000 souls wargaming issues the Chief of Staff cares about. Second, massive war games of the kind suggested here access radically different demographics than the traditional variety. Incorporating the enlisted population infuses a world of experience into the mix. Adding officers of all ranks ensures wargames are not merely an avocation of the middle-aged, middle-career, parochially minded commissioned airman. Third, most wargames are conducted in an educational setting, usually under the auspices of Air University in the course of an officer’s developmental education. When the focus is training and education, the goal rightly becomes imparting knowledge, not eliciting in the way a game like *Future Shock* might. Fourth, and potentially most significantly, there is iteration and aggregation. *Future Shock* can be played by thousands of people at once, over and over again across the course of a gaming campaign. In time, answers will congeal in unforeseen ways, and innovations will emerge. Time, once a constraint, becomes an ally, as a game that used to be run a few days is allowed to proliferate over weeks and months.

Conclusion

Despite their differences, both scenarios have much in common: they are not planning drills, but idea generators; participants are free to fail, even encouraged to; and the opponent—whether embodied in acts of nature or of mankind—is relatively static. Like traditional wargames,

⁴⁷ George S. Patton, Jr., *War As I Knew It*, annotated by Colonel Paul D. Harkins (Boston, MA: Houghton Mifflin Company, 1947), 357.

there is a Red Team presence in these scenarios, but not the typical human variety charged with throwing curveballs at the best-laid plans of Blue Team gamers. In this case, the Red Team is more of a planning consideration and less of a reactive presence in the game. Red inputs are worked into the problem setting itself so as not to upset the cart of collective wisdom. This is partly due to purpose (the goal of the exercise is to generate solutions, not test reflexes) and partly due to the time factor. Since the gamer in all cases is removed from the events in question by a generous amount of time, Red Team inputs arrive in the form of different (or adjusted) scenarios.⁴⁸ Alternatively, a Red Team can be formed to play a scenario as a group, advocating for the devil instead of confounding him. Insights gained in this manner are rolled back into future scenarios, making them more robust.

Though focused on the Air Force, the game environments depicted above are capable of expanding into the joint milieu. Putting a team of services together to tackle a difficult problem would undoubtedly yield different answers, thanks to the different perspectives of those involved. Though beyond the scope of this paper, the potential benefits of joint involvement in collaborative problem solving seem just as promising as those for the Air Force.

Jeff Jarvis, founder of *Entertainment Weekly*, said recently, “We don’t know what we are building. But from a position of optimism and respect for the public, we have to invent tools and see what they become.”⁴⁹ Jarvis was speaking about new media, but could just have easily been commenting on social platforms that facilitate problem solving. One does not know what an environment like *Help Solve a*

⁴⁸ If Red Teams were added to the jellybean jar experiment in Chapter Two, the wisdom of crowds would quickly break down. A group may ordinarily be able to guess the number of jellybeans with great accuracy, but not if a Red Team member adds/removes an unspecified amount halfway through the exercise. The same principal applies to the wargames suggested here.

⁴⁹ Quoted in James Fallows, “Learning to Love the (Shallow, Divisive, Unreliable) New Media,” *The Atlantic*, April 2011, 49.

Hurricane or *Future Shock* will become, but in a sense, that is the point. It is hard to predict the movement of the chess pieces after the initial few rounds, especially in the hands of creative players. Building a world where motivated people address problems they care about—when coupled with a system that aggregates their answers into actionable results—will produce benefits no one can fully foresee. These are benefits clever strategists can artfully exploit.



Conclusion

Collaborative problem solving in a virtual environment holds promise for Air Force leaders seeking to maximize the institution's potential. If the old saw about unused brain capacity (i.e., most of the time, we are only using a small portion of our mental faculties) applies to large organizations, the Air Force might view collaboration in virtual settings as a means to exercise underutilized capabilities.¹ Although Airmen are a vast resource, deeply trained and quite well educated, they are underutilized.² The Air Force should ask its members for their professional input about issues they know something about. Ninety percent of the Air Force is never exposed to a wargame. Surely there is latent talent waiting to be tapped.

Problem solving environments can be tailored to Air Force funding realities. At minimum, the Air Force can use existing resources found on the Air Force Portal to stage a forecasting game. At maximum, it can develop an immersive environment for players to collaborate in which they create their own personal avatars. The return on either option—a zero-dollar decision to use existing assets in different ways or a multi-million dollar investment into an Air Force MMOG (Massively Multiplayer Online Game)—may be significant, especially if best practices can be established without leaving the confines of a virtual setting.

Solutions to wicked problems often emerge from unique environments and unlooked-for areas. In the past, governments found answers in the wisdom of crowds, long before the term came into vogue.

¹ In *The Energies of Men*, William James suggested that, "We are making use of only a small part of our possible mental and physical resources." William James, *The Energies of Men* (New York: Moffat, Yard and Company, 1911), 14.

² 55% of officers have advanced or professional degrees; 69.4% of enlisted have at least some college. Figures taken from the Air Force Personnel Center website, current as of December 2010. <http://www.afpc.randolph.af.mil/library/airforcepersonnelstatistics.asp> (accessed 9 February 2011).

Crowd-based knowledge can be reliable, however counterintuitive it may seem. As long as a group is diverse, independent, and decentralized, it can produce inputs that, in aggregate, beat expert advice. This is not merely because the law of averages works in a crowd's favor, but also because crowds (unlike experts) tend to be free of the constraints imposed by theory and metaphor. John Harrison demonstrated this principle when he solved the centuries-long conundrum of longitude. The war planners at Newport showed it when they helped concoct War Plan Orange, the foundation of strategic naval victory in the Pacific during the Second World War.

Fast-forward to the present, and one finds organizations and companies benefitting from a new Coasean calculation.³ Firms are finding new ways to expand their efforts—not through hiring more employees, but by outsourcing their research and development through the Internet to willing workers outside the firm. Crowdsourcing allows companies to reduce costs by breaking down the walls between laypersons and professionals. If tasks are amenable to individualization, if a central authority is established to marshal and weigh submissions, and if enough outside interest exists, then crowdsourcing is a viable approach to problem solving. Some research institutes are experimenting with bringing crowdsourcing principles to bear on problems of a different kind, such as water shortages and famine.

The Air Force is taking tentative steps in the crowdsourcing direction, though it has the capacity to go much further. Most of the people in today's Air Force are digital natives, used to working with technology and computers. Platforms like the Air Force Portal are tailor-made for these airmen to collaborate in problem solving. However, the service has yet to use the Portal in such a way. Other Air Force-

³ Ronald Coase, the reader may recall, argued that the size of a business is governed by the cost of gaining in size compared with benefits brought by additional personnel. Growth is advantageous, but has a natural limit where costs exceed benefits.

sponsored sites that seek to capitalize on crowdsourcing initiatives, like Challenge.gov, are a step in the right direction. Still, when it comes to collaborative problem solving in a virtual environment, the right blend of Air Force platforms and people has not been created.

As for the future, there is much promise. Many options exist to produce a problem-solving platform that allows crowds of people to tackle tough problems faced by the Air Force and other military branches. These platforms can be massive, immersive, and tactically-oriented environments suitable for humanitarian assistance and disaster response missions; or, they can be lower fidelity versions focused on strategic and operational matters. Both extremes share the same unique trait: they produce answers that are unpredictable by traditional experts; they cultivate unforeseeable solutions.

The problem-solving initiatives suggested here have the potential to be bigger than the Air Force, or even the Department of Defense. If a virtual world like *Help Solve a Hurricane* was open to civilian participation, for example, the scope might change dramatically. By one account, less than 27% of 17-24 year olds are eligible to enter the Air Force.⁴ How many of the remaining 73% would like to serve their country in a meaningful way, if only in an online problem-solving exercise? How many citizens, no matter how old, would spend countless hours in a virtual simulation of Katrina, trying to find ways to prevent a similar tragedy from striking again? Opening a collaborative problem

⁴ Col (sel) Steven S. Marsman, "Recruiting for 2030: Is the Air Force Getting the Recruits It Needs for the Future?" *Air and Space Power Journal* 23, no. 3 (Fall, 2009), 42-49. Col Marsman's own footnote follows: "Their ineligibility stems from a host of disqualifying factors including overweight, moral improbity, violations of the law, medical conditions, dependents, low test scores, and so forth. Another 10 percent will not join because they are in college, and an additional 10 percent (although technically eligible to join) have limited value to the Air Force as low-quality candidates—leaving a total market of 1.4 million or only 5 percent of the youth! See House, *Prepared Statement of the Honorable David S. C. Chu, Under Secretary of Defense (Personnel and Readiness), before the House Armed Services Personnel Subcommittee on 'Overview of Recruiting, Retention, and Compensation,'* 110th Cong., 2d sess., 26 February 2008, http://armedservices.house.gov/pdfs/MilPers022608/Chu_Testimony022608.pdf."

solving environment to civilians has ramifications beyond the scope of this research effort, but it merits further consideration due to its potential revolutionary impact.

When the marketplace of warfare expands, the results can be dramatic. William McNeill illustrates this phenomenon in his book, *The Pursuit of Power*.⁵ Medieval Europe's transformation from a network of feudal kingdoms to a collection of nation states was driven, in large part, by the relationship between military power and economics. According to McNeill, military power develops and behaves differently under command economies than it does under market economies. Once market forces begin to take hold, military power will concentrate into the hands of those capable of monopolizing it.⁶ But eventually, as resources are exploited in an open, competitive environment, warfare itself becomes commercialized. As McNeill describes, "skills and aptitudes developed for successful pursuit of long-distance trade" provide the "model and context" for a new "pattern of diplomacy and war."⁷ This democratization process has profound implications for those considering collaborative problem solving. If the skills and aptitudes developed for solving problems in a virtual environment can be brought to bear on matters of national interest in a way that is practical and useful, an interesting source of influence may emerge ... one that exploits the marketplace of ideas and transcends the military instrument of power.

Clearly, more research and thought on this matter is required. The potential of virtual environments for military problem solving is a topic few have explored. One reason is that, when it comes to technology, the military is not used to being a follower. For most of the last century, society often exploited military technology for commercial gain (think GPS and Velcro). Now, the tables have turned somewhat, as soldiers

⁵ William H. McNeill, *The Pursuit of Power: Technology, Armed Force, and Society Since A.D. 1000* (Chicago: The University of Chicago Press, 1982).

⁶ McNeill, *Pursuit of Power*, 77.

⁷ McNeill, *Pursuit of Power*, 80.

used iPhone apps and iRobot creations in combat.⁸ This trend indicates the military establishment may profit by emulating other civilian-sector initiatives such as crowdsourcing and virtual forecasting.

Today, a young Air Force A-10 mechanic completes his shift and leaves for home to solve problems of a different kind on *World of Warcraft*. Tomorrow, the same young Airman may be asked to log in to a whole new world for warcraft, one that pits his wisdom against challenging obstacles faced by the Air Force. In war, “the side that learns faster and adapts more rapidly” usually wins.⁹ Collaborative problem solving in a virtual environment may indeed steal a march on the wicked problems and adversaries of the future.



⁸ “Wall Street is better than war at driving progress.” Andy Kessler, “How Videogames Are Changing the Economy,” *Wall Street Journal* 257, no. 1 (Monday, 3 January 2011), A17.

⁹ *The U.S. Army/Marine Corps Counterinsurgency Field Manual*, University of Chicago Press Edition (Chicago: The University of Chicago Press, 2007), lii.

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