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CHAPTER 12

INTRODUCTION TO STRATEGIC LEADERSHIP

In volume 1, you learned a definition of leadership that applied to individuals and small teams at the tactical level. Volume 2 expanded the concept of leadership to the role of the NCO, educator, creative thinker, motivator, and communicator, still focusing on the tactical and operational levels. This chapter introduces you to various perspectives of leadership at the strategic level. To lead strategically requires careful thought, awareness of systems, and a broad view of your mission. It requires a big picture view, one that focuses on outcomes more than methods, and goals more than tactics.

The chapter starts with a general overview of strategic leadership, provided by Col W. Michael Guillot in "Strategic Leadership: Defining the Challenge." The author will provide you with components, characteristics, and challenges of decision-making at the strategic level, and also provide you with a list of competencies that are essential for strategic leaders.

After you have a clear understanding of the definition of strategic leadership, you will read an example of how grand strategy is implemented at the national level in the White House's "National Security Strategy." In chapter 14 you will trace the development of air power theory over the past century. Look for broad concepts on this topic in this reading. Note that this reading is from the National Security Strategy (NSS) document that was current at the time this textbook went to press. While updates are issued by each administration, the overarching strategic ideas in the NSS are relatively stable.

Moving down to a smaller level, the third article covers the topic of applying systems thinking to problem solving, such as a military force (which comprises one component of a vast national strategy) might use in designing campaigns. In "Leadership and Systems Thinking," Col George E. Reed explains how leaders can apply the art of systems thinking. Echoing the teachings of Peter Senge, Reed urges readers to examine the interrelationships and patterns that present themselves in systems. The idea is to move beyond simple cause-and-effect analysis and find better solutions through more careful examination of system components, behaviors, and relationships.

The fourth article takes you down to a more familiar level, describing how corporations can apply strategic leadership to their decision-making processes. In "Strategic Thinking: Key to Corporate Survival," the authors explore the importance of truly understanding the nature of strategy and strategic planning. They cau-

tion that companies that conduct long-range planning incorrectly may actually hinder rather than help their performance.

For a specific example of applying innovative concepts with strategic planning, the final article presents the topic of crowdsourcing. This term refers to the relatively new trend of assigning work to large group of people, who may be highly-skilled amateurs, rather than just a small handful of employees in an organization. The authors of the final article, "Crowdsourcing: What it Means for Innovation," summarize the current state of this concept. As you read the article, you may discover new ways to harness the various talents of a group of people to meet the needs of your project, team, or squadron.

CHAPTER OUTLINE
This chapter's readings are:

Strategic Leadership:
Defining the Challenge
Col W. Michael Guillot, "Strategic Leadership: Defining the Challenge," *Air & Space Power Journal* (Winter 2003): 67-75.

National Security Strategy
The White House, "National Security Strategy," (May 2010).

Leadership and Systems Thinking
COL George E. Reed, "Leadership and Systems Thinking," *Defense AT&L* 35, no. 3 (2006): 10-13.

Strategic Thinking:
Key to Corporate Survival
Benjamin B. Tregoe and John W. Zimmerman, "Strategic Thinking: Key to Corporate Survival," *Management Review* 68, no. 2 (1979): 8-14.

Crowdsourcing:
What it Means for Innovation
Anhai Doan, Raghu Ramarkrishnan, & Alon Y. Halevy, "Crowdsourcing: What it Means for Innovation," *Communications of the ACM* 54, no. 4 (2011): 86-96.

CHAPTER GOALS

1. **Comprehend the concept of strategic leadership at the national and organizational level.**
2. **Summarize the use of systems thinking for strategic planning.**
3. **Explain how the use of crowdsourcing technologies can help accomplish team goals.**

12.1 Strategic Leadership: Defining the Challenge

By Col W. Michael Guillot, USAF

OBJECTIVES:

1. Define the term "strategic leadership."
2. Identify the four components of the strategic leadership environment, and list factors that belong to each component.
3. Describe four characteristics of consequential decisions.
4. List and define four challenges of strategic leadership.
5. Recall competencies that are essential for leaders who wish to develop strategic leadership skills.

The only thing harder than being a strategic leader is trying to define the entire scope of strategic leadership—a broad, difficult concept. We cannot always define it or describe it in every detail, but we recognize it in action. This type of leadership involves microscopic perceptions and macroscopic expectations. Volumes have been written on the subject, which may in fact contribute to the difficulty of grasping the concept. One finds confusing and sometimes conflicting information on this blended concept that involves the vagaries of strategy and the behavioral art of leadership. Sometimes the methods and models used to explain it are more complicated than the concept and practice of strategic leadership itself. Exercising this kind of leadership is complicated, but understanding it doesn't have to be. Beginning with a definition and characterization of strategic leadership and then exploring components of the strategic environment may prove helpful. Future leaders must also recognize the nature of that environment. Finally, they should also have some familiarity with ways of developing competencies for dealing with the broad, new challenges that are part of leading in the strategic environment.

WHAT IS STRATEGIC LEADERSHIP?

The common usage of the term *strategic* is related to the concept of strategy—simply a plan of action for accomplishing a goal. One finds both broad and narrow senses of the adjective *strategic*. Narrowly, the term denotes operating directly against military or industrial installations of an enemy during the conduct of war with the intent of destroying his military potential.[1] Today, *strategic* is used more often in its broader sense (e.g., strategic planning, decisions, bombing, and even leadership). Thus, we use it to relate something's primary importance or its quintessential aspect—for instance, the most advantageous, complex, difficult, or potentially damaging challenge to a nation, organization, culture, people, place, or object. When we recognize and use *strategic* in this broad sense, we append such meanings as the most important long-range planning, the most complex and profound decisions, and the most advantageous effects from a bombing campaign—as well as leaders with the highest conceptual ability to make decisions.

As mentioned earlier, strategy is a plan whose aim is to link ends, ways, and means. The difficult part involves the thinking required to develop the plan based on uncertain, ambiguous, complex, or volatile knowledge, information, and data. Strategic leadership entails making decisions across different cultures, agencies, agendas, personalities, and desires. It requires the devising of plans that are feasible, desirable, and acceptable to one's organization and partners—whether joint, interagency, or multinational. Strategic leadership demands the ability to make sound, reasoned decisions—specifically, consequential decisions with grave implications. Since the aim of strategy is to link ends, ways, and means, the aim of strategic leadership is to determine the ends, choose the best ways, and apply the most effective means. The strategy is the plan; strategic leadership is the thinking and decision making required to develop and effect the plan. Skills for leading at the strategic level are more complex than those for leading at the tactical and operational levels, with skills blurring at the seams between those levels. In short, one may define strategic leadership as *the ability of an experienced, senior leader who has the wisdom and vision to create and execute plans and make consequential decisions in the volatile, uncertain, complex, and ambiguous strategic environment*.

COMPONENTS OF THE STRATEGIC ENVIRONMENT

What is the strategic-leadership environment? One construct includes four distinct, interrelated parts: the national security, domestic, military, and international environments (fig. 1). Within the strategic environment, strategic leaders must consider many factors and actors. This construct is neither a template nor checklist—nor a

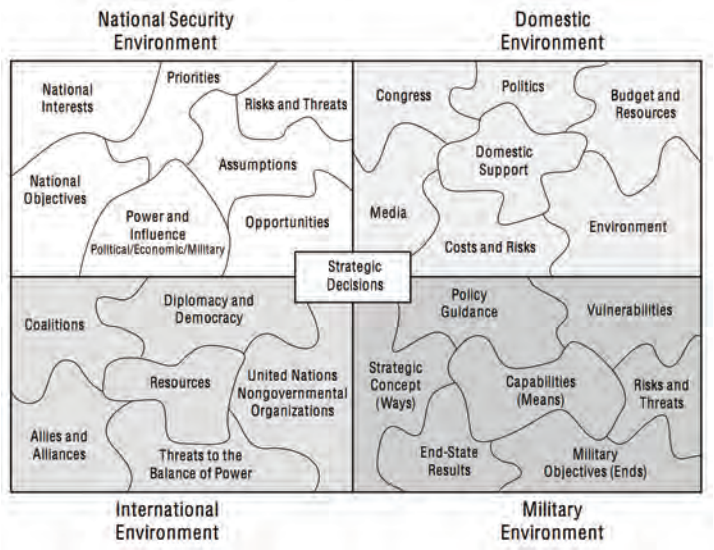
recipe for perfection. The framework recognizes the fact that strategic leaders must conceptualize in both the political and military realms. Additionally, it illustrates how the strategic environment is interrelated, complementary, and contradictory. Leaders who make strategic decisions cannot separate the components, especially when they are dealing with the national security environment.

Strategic leaders must recognize and understand the components of the national security environment. The ultimate objectives of all US government personnel are those presented in the national security strategy. The strategy and its objectives shape the decision making of strategic leaders, who must understand the national instruments of power—political, economic, and military.

These instruments provide the means of influence—for example, political persuasion (diplomacy), economic muscle (aid or embargo), or military force (actual or threatened). Within the national security environment, strategic leaders should consider national priorities and opportunities and must know the threats and risks to national security, as well as any underlying assumptions. Understanding this environment poses a major undertaking for strategic leaders. It is also the foundation for understanding the military environment.

Personnel who aspire to be strategic leaders, especially within the Department of Defense, must thoroughly understand military strategy. Two reasons come to mind. First, because the military instrument of power has such great potential for permanent change in the strategic environment, all strategic leaders must recognize its risks and limitations. Second, because military experience among civilian leaders has dwindled over the years and will continue to do so, strategic leaders have a greater responsibility to comprehend policy guidance and clearly understand expected results. Only then can they effectively set military objectives and assess the risks of military operations. Such leaders must develop and evaluate strategic concepts within the military environment and recognize potential threats. Finally, strategic leaders will have to balance capabilities (means) against vulnerabilities and, in doing so, remain aware of the domestic coalition as a major influence.

Figure 1



Since the founding of our nation—indeed, even before the signing of the Constitution—the domestic environment has influenced our leaders. Over the last 200 years, little has changed in this regard; in fact, most people would argue that domestic influence has increased. For instance, strategic leaders today must pay particular attention to the views, positions, and decisions of Congress, whose power and influence pervade many areas within the strategic environment—both foreign and domestic. Congress has the responsibility to provide resources, and we have the responsibility to use them prudently and account for them. This partnership encompasses national and local politics, budget battles for scarce dollars, and cost-risk trade-offs. Strategic leaders cannot ignore either the congressional part of the domestic environment—even though the relationship can sometimes prove difficult—or support from the population. Such support is extremely relevant in democracies and certainly so in the United States. The problem for the strategic leader lies in accurately measuring public support. Accurate or not, senior leaders in a democracy ignore public support at their peril. Actually, because of their power and influence, components of the media make it impossible to ignore domestic issues. Strategic leaders must know how to engage the media since the latter can help shape the strategic environment and help build domestic support. Finally, even though the political will may change, environmental activism will continue to affect the decisions of strategic leaders at every level. Environmental degradation remains a concern for strategic leaders in this country, as do problems in the international environment that call for strategic decisions.

When considering the international environment, strategic leaders should first explore the context—specifically, the history, culture, religion, geography, politics, and foreign security. Who are our allies? Do we have any alliances in place, or do we need to build a coalition? What resources are involved— physical or monetary? Is democracy at stake— creating or defending it? Leaders should also consider threats to the balance of power (BOP) in the environment and the involvement of both official and unofficial organizations. The United Nations may already have

mandates or resolutions that would affect our proposed operations or interests. Nongovernmental organizations may also be willing to help—or perhaps require help. Each of these concerns is legitimate and makes the international environment the most challenging and unfamiliar of them all.

This framework for the components of the strategic environment is simple in design yet complicated in practice. Most US government personnel are intimately familiar with the national security and military environments since they are linked (i.e., military strategy follows directly from national security decisions). But strategic leaders must recognize that the two greatest influences on their decisions come from the domestic and international environments. To lead effectively, they should use what is most familiar and be able to synthesize what influences their strategic decisions.

The four components of the strategic environment present a challenge for strategic leaders. The national security environment, with its many taskmasters, will drive both strategic decisions and military strategy. Leaders will feel great influence from the familiar domestic environment and must have its support for strategic action. Further, strategic leaders can be surprised and their decisions thwarted if they fail to understand the international environment sufficiently. Knowing the disparate components of the strategic environment is the first step in grasping strategic leadership. Understanding the nature of the strategic environment and strategic decisions is the second step.

NATURE OF THE STRATEGIC ENVIRONMENT

The strategic-leadership environment differs from the climate at lower levels of leadership. We should view the nature of this environment both broadly—examining consequential decisions and changes in performance requirements—and narrowly.

CONSEQUENTIAL DECISIONS

By nature, strategic leadership requires consequential decision making. All decisions have consequences, but in the strategic context, they take on a different character—specifically, they are planned, generally long term, costly, and profound.

Consequential decisions occur only at the higher levels within organizations. Generally, decision makers in the top 20 percent of the organization—the people who have ultimate control of resources—plan and execute such decisions. They also think out the implications of their decisions in advance. That is to say, the decision makers analyze and evaluate the possible, probable, and necessary ramifications of a decision beforehand. Some people argue that the sergeant on patrol in Kosovo or the bomber crew over Afghanistan can make strategic decisions in a split second and thus become strategic decision makers. No doubt, armed forces and government officials do make lethal, destructive, and sometimes regrettable decisions. However, these determinations are considered tactical opportunities or, worse, operational blunders rather than planned, consequential decisions. Planning becomes more important when one considers the long-term nature of consequential decisions.

Such decisions require years to play out. Indeed, in most cases strategic decision makers may not be around to witness the actual consequences of the decision, making it all the more essential that they carefully consider all implications before taking action. Clearly, a hasty consequential decision can become very costly.

One may classify these attendant costs as either immediate or mortgaged. For instance, some consequential decisions—such as declaring war or beginning hostilities—can have immediate costs or effects. The cost in lives could become very heavy in a matter of days. World economic costs could mount within weeks while markets collapse within hours. Mortgaged costs of consequential decisions, however, refer to lost opportunities and "sunk" costs. We see such consequences, for example, when organizations commit to huge purchases for weapons systems over a decade-long time frame. Of course in the strategic environment, costs are measured not only in dollars but also in influence (e.g., the costs of supporting one nation over another or the costs of not supporting a particular position). Many times, the decision becomes a matter of sunk costs—gone forever with no chance of recovery. Up to this point, we have considered only the negative effects of costs on consequential decisions. Suffice it to say that many consequential decisions have the aim of decreasing, avoiding, or postponing costs. In fact, some of the least costly consequential decisions turn out to be the most profound (e.g., expanding free-trade agreements and the NATO alliance, reducing the number of nuclear arms, etc.).

Consequential decisions are profound because they have the potential to create great change, lead trends, alter the course of events, make history, and initiate a number of wide-ranging effects. They can change societies and advance new disciplines. Most importantly, an entire organization, a segment of society, a nation, or humanity in general recognizes such decisions as profound.

PERFORMANCE REQUIREMENTS

The stratified systems theory of T. Owen Jacobs and Elliott Jaques classifies the performance requirements for leaders in organizations as direct, general, and strategic (in military parlance: tactical, operational, and strategic, respectively).[2] Distinct elements define the leadership environment within each level. Unmistakable differences among the three levels include complexity, time horizon, and focus.

Most people spend their careers leading at the direct or tactical level (squadron or battalion commander, branch chief, or below). In this environment, the leader interacts directly with the same people every day by maintaining a direct span of control, all the while executing plans, following policies, and consuming resources with a defined goal in mind. The time horizon is very short—normally less than one year. At the direct level of leadership, communications generally occur within the same organization and focus exclusively on the internal audience. Because leaders spend more time at this level than any other, it becomes familiar and comfortable.

Some leaders, however, will mature and move to the general or operational level, where performance requirements begin to change. Direct leadership diminishes as the span of control shrinks. At this level, leaders develop plans, write some policies, and allocate resources among subordinate organizations. The time horizon also increases—to as much as five years. Operational leaders begin to shift the focus of communication and energy outside the organization, recognizing and questioning how the external environment will affect their organizations. Group commanders, brigade commanders, and division chiefs represent this general, analytic level of leadership.

From the perspective of budding strategic leaders, performance requirements for the strategic level change the most and are the least familiar. The power of influence becomes more important than the power of the position. Conceptual ability and communications become essential. Both focus not only on how the external environment will affect the organization, but also—and more importantly—on how the organization can influence that environment. The most challenging of the performance requirements is the time frame for making decisions, which can extend to 20 years and beyond. The leader at this level must think in terms of systems and use integrative thinking—the ability to see linkages and interdependencies within large organizations (or systems) so that decisions in one system will not adversely affect another system.[3] The challenges are great, the stakes are high, and the performance requirements are stringent.

VOLATILITY, UNCERTAINTY, COMPLEXITY, AND AMBIGUITY

Framing the nature of the strategic environment in a broad context helps us understand the magnitude of the challenge. Strategic leaders operate in an environment that demands unique performance requirements for making consequential decisions. If we look more closely at this environment, we discover four characteristics that define the challenge to strategic leadership in a narrow sense: volatility, uncertainty, complexity, and ambiguity.[4]

Now that the world is no longer bipolar, the strategic landscape has become more volatile. Violence erupts in the most unlikely places and for seemingly innocuous reasons. The last few years have given us a glimpse of this volatility: ethnic cleansing in Bosnia and Kosovo, war and terrorism in the Middle East, and terrorism within the United States. The challenge for strategic leaders lies in anticipating volatile scenarios and taking action to avert violence.

In most cases, these leaders will be asked to conduct this action in a landscape of uncertainty—the deceptive characteristic of the strategic environment. They face situations in which the intentions of competitors are not known—perhaps deliberately concealed.[5] At other times, they will even have reservations about the actual meaning of truthful information. Their challenge is to penetrate the fog of uncertainty that hugs the strategic landscape. Comprehending the nature of the strategic environment constitutes the first step toward solving its complexity.

The interdependence of the components in the strategic environment produces complexity—its most challenging characteristic. Integrative thinking is essential to recognizing and predicting the effects of a decision on this "system of systems." If leaders are to anticipate the probable, possible, and necessary implications of the decision, they must develop a broad frame of reference or perspective and think conceptually.

The ambiguous character of the strategic environment stems from different points of view, perspectives, and interpretations of the same event or information. Strategic leaders have to realize that broad perspectives (e.g., using team approaches to solve problems and gain consensus) help eliminate ambiguity and lead to effective strategic decisions.[6]

The nature of the strategic environment is challenging because of the consequences of decisions and unique performance requirements. Although faced with an environment characterized by volatility, uncertainty, complexity,

and ambiguity, aspiring strategic leaders can nevertheless learn to master it. Indeed, by acquiring certain skills and competencies, they can transform this environment into something more stable, certain, simple, and clear.

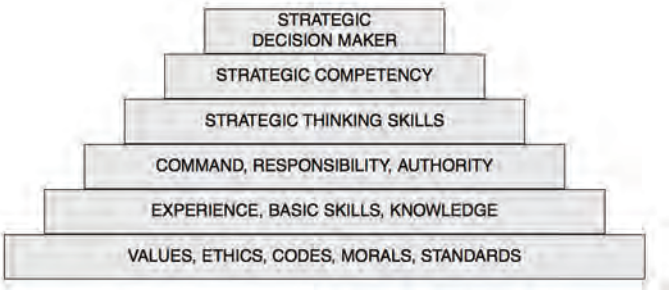
DEVELOPING STRATEGIC LEADERSHIP

If becoming a strategist is the "ends," then leadership is the "ways," and development is the "means." Learning to become a strategic leader requires special preparation in several areas. First, one must understand how such a leader develops—in essence the anatomy of strategic leadership. Second, one should recognize some of the essential competencies a strategic leader must have. Finally, the prospective leader needs to assess his or her current abilities and commit to a development plan.

ANATOMY OF A STRATEGIC LEADER

Development of a strategic leader involves a number of important aspects. First, the most important, indeed foundational, part of this preparation concerns values, ethics, codes, morals, and standards. Second, the path to strategic leadership resembles the building of a pyramid (fig. 2). Shortcuts do not exist, and one can't start at the top—strategic leaders are made, not born. Strategic leaders gradually build wisdom, defined as acquiring experiences over time.[7] One must also remember that certain activities can accelerate these experiences and widen perspectives. Leaders should know that even though some individuals with strategic competency may not become strategic decision makers, they can still influence and contribute to decisions. Additionally, having strategic competency will allow one to fully understand strategic decisions and perspectives.

Figure 2



- Strategic leadership begins with organizational values, standards, and ethics—the foundation of our profession.
- Upon this foundation, the officer develops an abstract body of expert knowledge based primarily on experience. Continuing education can influence, expand, and accelerate development.
- Next, the officer is exposed to command responsibility and accountability—a vital phase during which the officer gets his or her first real taste of consequential decision making.
- Further education in strategic-thinking skills enhances the officer's competence. In each case, an officer could have opportunities to exercise strategic competency in support of a strategic leader.
- Ultimately, the officer will participate in strategic decision making and become a strategic leader.

COMPETENCIES

It is difficult to imagine an all-inclusive list of competencies required for strategic leadership. However, some skills seem essential— vision, for instance, which allows the strategic leader to focus on the future and, in fact, build that future. Vision makes leaders proactive in the strategic environment rather than reactive. Furthermore, they should become transformational in order to inspire people toward common goals and shared values; they must anticipate change, lead change, and foster a mind-set of change; they should critically analyze their own thinking to make decisions logically; they should foster an attitude of creativity in their operations and organizations; they must audaciously seek novel ideas and understand how to frame decisions and organize chaos; and they should know how to build effective teams and gain consensus within large organizations. When consensus fails, strategic leaders must negotiate effectively, or they put success at risk. Many times, this kind of success is directly related to the cultural sensitivity and cross-cultural communications ability of the leader. Finally, the strategic leader must assume the role of both teacher and mentor. As Noel Tichy reminds us, great leaders are great teachers. They have a teachable point of view and invest in developing other leaders.[8] The competencies mentioned above form the basis of an education for aspiring strategic leaders.

ASSESSMENT AND DEVELOPMENT

Becoming a strategic leader is a daunting challenge. It starts with taking stock of leadership abilities, conceptual capacity, and interpersonal skills. A thorough self-assessment will help identify strengths and weaknesses. Such assessments can examine personality type, leadership motivation, originality, innovation, tolerance, teamwork, and conceptual ability. These assessments are like the starting point on a map, letting prospective leaders know where they are so they can take the best route to their destination. Completing a detailed self-assessment is also the first step in commitment to the personal and professional development process required to become a strategic leader.

As a follow-up to the self-assessment, aspiring leaders should ask themselves a series of questions: What are my strengths? How can I capitalize on them? Where are my weaknesses? What can I do about them? Where do I want to be in the future? How can I get there? Do I really want to commit to development? The last question is the most difficult one.[9] Those who answer yes are ready to begin the journey toward becoming strategic leaders.

At this point, leader candidates should volunteer for and accept challenging assignments—especially in areas in

which they might not have worked before. These could include moving into a different functional area, accepting joint assignments, or working in an interagency environment. Such taskings tend to accelerate experience and broaden perspectives. Furthermore, pursuing a formal course of study at senior service colleges and participating in other education programs would broaden one's knowledge and conceptual ability. Self-learning is also valuable—especially reading. All strategic leaders are voracious readers—and they read outside their normal area of expertise, again, to expand their perspective and increase their conceptual ability. In fact, many of them are experts in a number of unrelated fields. Becoming a "dual expert" helps one think in multiple dimensions.

After committing to some or all of these development activities, potential leaders should reflect on each activity as a way of mining the total benefit and seeking greater meaning. They will also benefit from mentoring other leaders and being mentored themselves. When mentors share their experiences, they help others know and understand them. As Tichy says, sharing experiences or "telling stories" shapes our own attitude, behavior, and point of view.[10] We become the story, and the story guides our lives. Gen Dwight Eisenhower endorsed mentoring when he explained that the best way to become a good decision maker is to be around others who make decisions.[11]

CONCLUSION

The many components of the strategic leadership environment challenge even the best leaders. The monumental consequences of strategic decisions call for individuals with unique performance abilities who can navigate the volatility, uncertainty, complexity, and ambiguity inherent in the nature of those decisions. Aspiring leaders can rise to the challenge by undergoing self-assessment and personal development. Accepting the demands of strategic leadership involves a transition from the art of the familiar to the art of the possible. This is the realm of strategic leadership and the strategic environment.

NOTES

1. Webster's II New Riverside University Dictionary, 1988 ed., s.v. "strategic."

2. T. Owen Jacobs, Strategic Leadership: The Competitive Edge (Fort Lesley J. McNair, Washington, D.C.: Industrial College of the Armed Forces, 2000), 24.

3. US Industrial College of the Armed Forces, chap. 1, "Overview," Strategic Leadership and Decision Making: Preparing Senior Executives for the 21st Century (Washington, D.C.: National Defense University Press, 1997), on-line, Internet, September 2000, available from http://www.ndu.edu/inss/books/books%20-%201999/Strategic%20Leadership%20and%20

Decision-making%20-%20Feb%2099/cont.html.

4. Ibid.

5. Ibid.

6. Ibid.

7. Jacobs, 46.

8. Noel M. Tichy with Eli Cohen, The Leadership Engine: How Winning Companies Build Leaders at Every Level (New York: Harper Business, 1997), 3.

9. US Industrial College of the Armed Forces, chap. 7, "Developing Strategic Leaders," Strategic Leadership and Decision Making.

10. Tichy and Cohen, 77.

11. Edgar F. Puryear Jr., American Generalship: Character Is Everything: The Art of Command (Novato, Calif.: Presidio Press, 2000), 232.

***Col Guillot** is a former cadet from Louisiana and a recipient of the Spaatz Award.*

From: Col W. Michael Guillot, "Strategic Leadership: Defining the Challenge," *Air & Space Power Journal* (Winter 2003): 67-75. Used with permission.

12.2 National Security Strategy

The Administration of President Barack Obama

OBJECTIVES:

6. List the enduring American interests as outlined in the National Security Strategy.
7. Summarize the goals listed in the National Security Strategy related to Diplomacy.
8. Summarize the goals listed in the National Security Strategy related to Strategic Communications.

"More than at any point in human history—the interests of nations and peoples are shared. The religious convictions that we hold in our hearts can forge new bonds among people, or tear us apart. The technology we harness can light the path to peace, or forever darken it. The energy we use can sustain our planet, or destroy it. What happens to the hope of a single child—anywhere—can enrich our world, or impoverish it."

—President Barack Obama,
United Nations General Assembly, September 22, 2009

The United States must renew its leadership in the world by building and cultivating the sources of our strength and influence. Our national security depends upon America's ability to leverage our unique national attributes, just as global security depends upon strong and responsible American leadership. That includes our military might, economic competitiveness, moral leadership, global engagement, and efforts to shape an international system that serves the mutual interests of nations and peoples. For the world has changed at an extraordinary pace, and the United States must adapt to advance our interests and sustain our leadership.

American interests are enduring. They are:

- The security of the United States, its citizens, and U.S. allies and partners;
- A strong, innovative, and growing U.S. economy in an open international economic system that promotes opportunity and prosperity;
- Respect for universal values at home and around the world; and
- An international order advanced by U.S. leadership that promotes peace, security, and opportunity through stronger cooperation to meet global challenges.

Currently, the United States is focused on implementing a responsible transition as we end the war in Iraq, succeeding in Afghanistan, and defeating al-Qa'ida and its terrorist affiliates, while moving our economy from catastrophic recession to lasting recovery. As we confront these crises, our national strategy must take a longer view. We must build a stronger foundation for American leadership and work to better shape the outcomes that are most fundamental to our people in the 21st century.

THE STRATEGIC ENVIRONMENT—THE WORLD AS IT IS

In the two decades since the end of the Cold War, the free flow of information, people, goods and services has accelerated at an unprecedented rate. This interconnection has empowered individuals for good and ill, and challenged state based international institutions that were largely designed in the wake of World War II by policymakers who had different challenges in mind. Nonstate actors can have a dramatic influence on the world around them. Economic growth has alleviated poverty and led to new centers of influence. More nations are asserting themselves regionally and globally. The lives of our citizens—their safety and prosperity—are more bound than ever to events beyond our borders.

Within this environment, the attacks of September 11, 2001, were a transformative event for the United States, demonstrating just how much trends far beyond our shores could directly endanger the personal safety of the American people. The attacks put into sharp focus America's position as the sole global superpower, the dangers of violent extremism, and the simmering conflicts that followed the peaceful conclusion of the Cold War. And they drew a swift and forceful response from the United States and our allies and partners in Afghanistan. This response was followed by our decision to go to war in Iraq, and the ensuing years have seen America's forces, resources, and national security strategy focused on these conflicts.

The United States is now fighting two wars with many thousands of our men and women deployed in harm's

way, and hundreds of billions of dollars dedicated to funding these conflicts. In Iraq, we are sup-porting a transition of responsibility to the sovereign Iraqi Government. We are supporting the security and prosperity of our partners in Afghanistan and Pakistan as part of a broader campaign to disrupt, dismantle, and defeat al-Qa'ida and its violent extremist affiliates.

Yet these wars—and our global efforts to successfully counter violent extremism—are only one element of our strategic environment and cannot define America's engagement with the world. Terrorism is one of many threats that are more consequential in a global age. The gravest danger to the American people and global security continues to come from weapons of mass destruction, particularly nuclear weapons. The space and cyberspace capabilities that power our daily lives and military operations are vulnerable to disruption and attack. Dependence upon fossil fuels constrains our options and pollutes our environment. Climate change and pandemic disease threaten the security of regions and the health and safety of the American people. Failing states breed conflict and endanger regional and global security. Global criminal networks foment insecurity abroad and bring people and goods across our own borders that threaten our people.

The global economy is being reshaped by innovation, emerging economies, transition to low-carbon energy, and recovery from a catastrophic recession. The convergence of wealth and living standards among developed and emerging economies holds out the promise of more balanced global growth, but dramatic inequality persists within and among nations. Profound cultural and demographic tensions, rising demand for resources, and rapid urbanization could reshape single countries and entire regions. As the world grows more interconnected, more individuals are gaining awareness of their universal rights and have the capacity to pursue them. Democracies that respect the rights of their people remain successful states and America's most steadfast allies. Yet the advance of democracy and human rights has stalled in many parts of the world.

More actors exert power and influence. Europe is now more united, free, and at peace than ever before. The European Union has deepened its integration. Russia has reemerged in the international arena as a strong voice. China and India—the world's two most populous nations—are becoming more engaged globally. From Latin America to Africa to the Pacific, new and emerging powers hold out opportunities for partnership, even as a handful of states endanger regional and global security by flouting interna–tional norms. International institutions play a critical role in facilitating cooperation, but at times cannot effectively address new threats or seize new opportunities. Meanwhile, individuals, corporations, and civil society play an increasingly important role in shaping events around the world.

The United States retains the strengths that have enabled our leadership for many decades. Our society is exceptional in its openness, vast diversity, resilience, and engaged citizenry. Our private sector and civil society exhibit enormous ingenuity and innovation, and our workers are capable and dedicated. We have the world's largest economy and most powerful military, strong alliances and a vibrant cultural appeal, and a history of leadership in economic and social development. We continue to be a destination that is sought out by immigrants from around the world, who enrich our society. We have a transparent, accountable democracy and a dynamic and productive populace with deep connections to peoples around the world. And we continue to embrace a set of values that have enabled liberty and opportunity at home and abroad.

Now, the very fluidity within the international system that breeds new challenges must be approached as an opportunity to forge new international cooperation. We must rebalance our long-term priorities so that we successfully move beyond today's wars, and focus our attention and resources on a broader set of countries and challenges. We must seize on the opportunities afforded by the world's interconnection, while responding effectively and comprehensively to its dangers. And we must take advantage of the unparalleled connections that America's Government, private sector, and citizens have around the globe.

THE STRATEGIC APPROACH—THE WORLD WE SEEK

In the past, the United States has thrived when both our nation and our national security policy have adapted to shape change instead of being shaped by it. For instance, as the industrial revolution took hold, America transformed our economy and our role in the world. When the world was confronted by fascism, America prepared itself to win a war and to shape the peace that followed. When the United States encountered an ideological, economic, and military threat from communism, we shaped our practices and institutions at home—and policies abroad—to meet this challenge. Now, we must once again position the United States to champion mutual interests among nations and peoples.

Building Our Foundation

Our national security begins at home. What takes place

within our borders has always been the source of our strength, and this is even truer in an age of interconnection.

First and foremost, we must renew the foundation of America's strength. In the long run, the welfare of the American people will determine America's strength in the world, particularly at a time when our own economy is inextricably linked to the global economy. Our prosperity serves as a wellspring for our power. It pays for our military, underwrites our diplomacy and development efforts, and serves as a leading source of our influence in the world. Moreover, our trade and investment supports millions of American jobs, forges links among countries, spurs global development, and contributes to a stable and peaceful political and economic environment.

Yet even as we have maintained our military advantage, our competitiveness has been set back in recent years. We are recovering from underinvestment in the areas that are central to America's strength. We have not adequately advanced priorities like education, energy, science and technology, and health care—all of which are essential to U.S. competitiveness, long-term prosperity, and strength. Years of rising fiscal and trade deficits will also necessitate hard choices in the years ahead.

That is why we are rebuilding our economy so that it will serve as an engine of opportunity for the American people, and a source of American influence abroad. The United States must ensure that we have the world's best-educated workforce, a private sector that fosters innovation, and citizens and busi-nesses that can access affordable health care to compete in a globalized economy. We must transform the way that we use energy—diversifying supplies, investing in innovation, and deploying clean energy technologies. By doing so, we will enhance energy security, create jobs, and fight climate change.

Rebuilding our economy must include putting ourselves on a fiscally sustainable path. As such, imple-menting our national security strategy will require a disciplined approach to setting priorities and mak–ing tradeoffs among competing programs and activities. Taken together, these efforts will position our nation for success in the global marketplace, while also supporting our national security capacity—the strength of our military, intelligence, diplomacy and development, and the security and resilience of our homeland.

We are now moving beyond traditional distinctions between homeland and national security. National security draws on the strength and resilience of our citizens, communities, and economy. This includes a determination to prevent terrorist attacks against the American people by fully coordinating the actions that we take abroad with the actions and precautions that we take at home. It must also include a com-mitment to building a more secure and resilient nation, while maintaining open flows of goods and people. We will continue to develop the capacity to address the threats and hazards that confront us, while redeveloping our infrastructure to secure our people and work cooperatively with other nations.

America's example is also a critical component of our foundation. The human rights which America has stood for since our founding have enabled our leadership, provided a source of inspiration for peoples around the world, and drawn a clear contrast between the United States and our democratic allies, and those nations and individuals that deny or suppress human rights. Our efforts to live our own values, and uphold the principles of democracy in our own society, underpin our support for the aspirations of the oppressed abroad, who know they can turn to America for leadership based on justice and hope.

Our moral leadership is grounded principally in the power of our example—not through an effort to impose our system on other peoples. Yet over the years, some methods employed in pursuit of our security have compromised our fidelity to the values that we promote, and our leadership on their behalf. This undercuts our ability to support democratic movements abroad, challenge nations that violate international human rights norms, and apply our broader leadership for good in the world. That is why we will lead on behalf of our values by living them. Our struggle to stay true to our values and Constitution has always been a lodestar, both to the American people and to those who share our aspiration for human dignity.

Our values have allowed us to draw the best and brightest to our shores, to inspire those who share our cause abroad, and to give us the credibility to stand up to tyranny. America must demonstrate through words and deeds the resilience of our values and Constitution. For if we compromise our values in pur–suit of security, we will undermine both; if we fortify them, we will sustain a key source of our strength and leadership in the world—one that sets us apart from our enemies and our potential competitors.

Pursuing Comprehensive Engagement

Our foundation will support our efforts to engage nations, institutions, and peoples around the world on the basis of mutual interests and mutual respect.

Engagement is the active participation of the United States in relationships beyond our borders. It is, quite simply, the opposite of a self-imposed isolation that denies us the ability to shape outcomes. Indeed, America has never succeeded through isolationism. As the nation that

helped to build our international system after World War II and to bring about the globalization that came with the end of the Cold War, we must reengage the world on a comprehensive and sustained basis.

Engagement begins with our closest friends and allies—from Europe to Asia; from North America to the Middle East. These nations share a common history of struggle on behalf of security, prosperity, and democracy. They share common values and a common commitment to international norms that recog-nize both the rights and responsibilities of all sovereign nations. America's national security depends on these vibrant alliances, and we must engage them as active partners in addressing global and regional security priorities and harnessing new opportunities to advance common interests. For instance, we pursue close and regular collaboration with our close allies the United Kingdom, France, and Germany on issues of mutual and global concern.

We will continue to deepen our cooperation with other 21st century centers of influence—including China, India, and Russia—on the basis of mutual interests and mutual respect. We will also pursue diplomacy and development that supports the emergence of new and successful partners, from the Americas to Africa; from the Middle East to Southeast Asia. Our ability to advance constructive cooperation is essential to the security and prosperity of specific regions, and to facilitating global cooperation on issues ranging from violent extremism and nuclear proliferation, to climate change, and global economic instability—issues that challenge all nations, but that no one nation alone can meet.

To adversarial governments, we offer a clear choice: abide by international norms, and achieve the political and economic benefits that come with greater integration with the international community; or refuse to accept this pathway, and bear the consequences of that decision, including greater isolation. Through engagement, we can create opportunities to resolve differences, strengthen the international community's support for our actions, learn about the intentions and nature of closed regimes, and plainly demonstrate to the publics within those nations that their governments are to blame for their isolation.

Successful engagement will depend upon the effective use and integration of different elements of American power. Our diplomacy and development capabilities must help prevent conflict, spur eco–nomic growth, strengthen weak and failing states, lift people out of poverty, combat climate change and epidemic disease, and strengthen institutions of democratic governance. Our military will continue strengthening its capacity to partner with foreign counterparts, train and assist security forces, and pursue military-to-military ties with a broad range of governments. We will continue to foster economic and financial transactions to advance our shared prosperity. And our intelligence and law enforcement agencies must cooperate effectively with foreign governments to anticipate events, respond to crises, and provide safety and security.

Finally, we will pursue engagement among peoples—not just governments—around the world. The United States Government will make a sustained effort to engage civil society and citizens and facilitate increased connections among the American people and peoples around the world—through efforts ranging from public service and educational exchanges, to increased commerce and private sector partnerships. In many instances, these modes of engagement have a powerful and enduring impact beyond our borders, and are a cost-effective way of projecting a positive vision of American leadership. Time and again, we have seen that the best ambassadors for American values and interests are the American people—our businesses, nongovernmental organizations, scientists, athletes, artists, military service members, and students.

Facilitating increased international engagement outside of government will help prepare our country to thrive in a global economy, while building the goodwill and relationships that are invaluable to sus–taining American leadership. It also helps leverage strengths that are unique to America—our diversity and diaspora populations, our openness and creativity, and the values that our people embody in their own lives.

PROMOTING A JUST AND SUSTAINABLE INTERNATIONAL ORDER

Our engagement will underpin a just and sustainable international order—just, because it advances mutual interests, protects the rights of all, and holds accountable those who refuse to meet their responsibilities; sustainable because it is based on broadly shared norms and fosters collective action to address common challenges.

This engagement will pursue an international order that recognizes the rights and responsibilities of all nations. As we did after World War II, we must pursue a rules-based international system that can advance our own interests by serving mutual interests. International institutions must be more effective and representative of the diffusion of influence in the 21st century. Nations must have incentives to behave responsibly, or be isolated when they do not. The test of this international order must be the cooperation it facilitates and the results it generates—the ability of nations to come together to con-

front common challenges like violent extremism, nuclear proliferation, climate change, and a changing global economy.

That is precisely the reason we should strengthen enforcement of international law and our commitment to engage and modernize international institutions and frameworks. Those nations that refuse to meet their responsibilities will forsake the opportunities that come with international cooperation. Credible and effective alternatives to military action—from sanctions to isolation—must be strong enough to change behavior, just as we must reinforce our alliances and our military capabilities. And if nations challenge or undermine an international order that is based upon rights and responsibilities, they must find themselves isolated.

We succeeded in the post-World War II era by pursuing our interests within multilateral forums like the United Nations—not outside of them. We recognized that institutions that aggregated the national inter-ests of many nations would never be perfect; but we also saw that they were an indispensable vehicle for pooling international resources and enforcing international norms. Indeed, the basis for international cooperation since World War II has been an architecture of international institutions, organizations, regimes, and standards that establishes certain rights and responsibilities for all sovereign nations.

In recent years America's frustration with international institutions has led us at times to engage the United Nations (U.N.) system on an ad hoc basis. But in a world of transnational challenges, the United States will need to invest in strengthening the international system, working from inside interna–tional institutions and frameworks to face their imperfections head on and to mobilize transnational cooperation.

We must be clear-eyed about the factors that have impeded effectiveness in the past. In order for collective action to be mobilized, the polarization that persists across region, race, and religion will need to be replaced by a galvanizing sense of shared interest. Swift and effective international action often turns on the political will of coalitions of countries that comprise regional or international institutions. New and emerging powers who seek greater voice and representation will need to accept greater responsibility for meeting global challenges. When nations breach agreed international norms, the countries who espouse those norms must be convinced to band together to enforce them.

We will expand our support to modernizing institutions and arrangements such as the evolution of the G-8 to the G-20 to reflect the realities of today's international environment. Working with the institutions and the countries that comprise them, we will enhance international capacity to prevent conflict, spur economic growth, improve security, combat climate change, and address the challenges posed by weak and failing states. And we will challenge and assist international institutions and frameworks to reform when they fail to live up to their promise. Strengthening the legitimacy and authority of international law and institutions, especially the U.N., will require a constant struggle to improve performance.

Furthermore, our international order must recognize the increasing influence of individuals in today's world. There must be opportunities for civil society to thrive within nations and to forge connections among them. And there must be opportunities for individuals and the private sector to play a major role in addressing common challenges—whether supporting a nuclear fuel bank, promoting global health, fostering entrepreneurship, or exposing violations of universal rights. In the 21st century, the ability of individuals and nongovernment actors to play a positive role in shaping the international environment represents a distinct opportunity for the United States.

Within this context, we know that an international order where every nation upholds its rights and responsibilities will remain elusive. Force will sometimes be necessary to confront threats. Technology will continue to bring with it new dangers. Poverty and disease will not be completely abolished. Oppression will always be with us. But if we recognize these challenges, embrace America's responsibility to confront them with its partners, and forge new cooperative approaches to get others to join us in overcoming them, then the international order of a globalized age can better advance our interests and the common interests of nations and peoples everywhere.

STRENGTHENING NATIONAL CAPACITY—A WHOLE OF GOVERNMENT APPROACH

To succeed, we must update, balance, and integrate all of the tools of American power and work with our allies and partners to do the same. Our military must maintain its conventional superiority and, as long as nuclear weapons exist, our nuclear deterrent capability, while continuing to enhance its capacity to defeat asymmetric threats, preserve access to the global commons, and strengthen partners. We must invest in diplomacy and development capabilities and institutions in a way that complements and reinforces our global partners. Our intelligence capabilities must continuously evolve to identify and characterize conventional and asymmetric threats and provide timely insight. And we must integrate our approach to homeland security with our broader national security approach.

We are improving the integration of skills and capabilities within our military and civilian institutions, so they complement each other and operate seamlessly. We are also improving coordinated planning and policymaking and must build our capacity in key areas where we fall short. This requires close coopera-tion with Congress and a deliberate and inclusive interagency process, so that we achieve integration of our efforts to implement and monitor operations, policies, and strategies. To initiate this effort, the White House merged the staffs of the National Security Council and Homeland Security Council.

However, work remains to foster coordination across departments and agencies. Key steps include more effectively ensuring alignment of resources with our national security strategy, adapting the education and training of national security professionals to equip them to meet modern challenges, reviewing authorities and mechanisms to implement and coordinate assistance programs, and other policies and programs that strengthen coordination.

- **Defense:** We are strengthening our military to ensure that it can prevail in today's wars; to prevent and deter threats against the United States, its interests, and our allies and partners; and prepare to defend the United States in a wide range of contingencies against state and nonstate actors. We will continue to rebalance our military capabilities to excel at counterterrorism, counterinsurgency, stability operations, and meeting increasingly sophisticated security threats, while ensuring our force is ready to address the full range of military operations. This includes preparing for increasingly sophisticated adversaries, deterring and defeating aggression in anti-access environments, and defending the United States and supporting civil authorities at home. The most valuable component of our national defense is the men and women who make up America's all-volunteer force. They have shown tremendous resilience, adapt–ability, and capacity for innovation, and we will provide our service members with the resources that they need to succeed and rededicate ourselves to providing support and care for wounded warriors, veterans, and military families. We must set the force on a path to sustainable deployment cycles and preserve and enhance the long-term viability of our force through successful recruitment, retention, and recognition of those who serve.

- **Diplomacy:** Diplomacy is as fundamental to our national security as our defense capability. Our diplomats are the first line of engagement, listening to our partners, learning from them, building respect for one another, and seeking common ground. Diplomats, development experts, and others in the United States Government must be able to work side by side to support a common agenda. New skills are needed to foster effective interaction to convene, connect, and mobilize not only other governments and international organizations, but also nonstate actors such as corporations, foundations, nongovern–mental organizations, universities, think tanks, and faith-based organizations, all of whom increasingly have a distinct role to play on both diplomatic and development issues. To accomplish these goals our diplomatic personnel and missions must be expanded at home and abroad to support the increasingly transnational nature of 21st century security challenges. And we must provide the appropriate authorities and mechanisms to implement and coordinate assistance programs and grow the civilian expedi–tionary capacity required to assist governments on a diverse array of issues.

- **Economic:** Our economic institutions are crucial components of our national capacity and our economic instruments are the bedrock of sustainable national growth, prosperity and influence. The Office of Management and Budget, Departments of the Treasury, State, Commerce, Energy, and Agriculture, United States Trade Representative, Federal Reserve Board, and other institutions help manage our currency, trade, foreign investment, deficit, inflation, productivity, and national competitiveness. Remaining a vibrant 21st century economic power also requires close cooperation between and among developed nations and emerging markets because of the interdependent nature of the global economy. America—like other nations—is dependent upon overseas markets to sell its exports and maintain access to scarce commodities and resources. Thus, finding overlapping mutual economic interests with other nations and maintaining those economic relationships are key elements of our national security strategy.

- **Development:** Development is a strategic, economic, and moral imperative. We are focusing on assisting developing countries and their people to manage security threats, reap the benefits of global economic expansion, and set in place accountable and democratic institutions that serve basic human needs. Through an aggressive and affirmative development agenda and commensurate resources, we can strengthen the regional partners we need to help us stop conflicts and counter global criminal networks; build a stable, inclusive global economy with new sources of prosperity; advance democracy and human rights; and ultimately position ourselves to better address key global challenges by growing the ranks of prosperous, capable, and democratic states that can be our partners in the decades ahead. To do this, we are expanding our civilian development capability; engaging with international financial institutions that leverage our resources and advance our objectives; pursuing a development budget that more deliberately reflects our policies

and our strategy, not sector earmarks; and ensuring that our policy instruments are aligned in support of development objectives.

- **Homeland Security:** Homeland security traces its roots to traditional and historic functions of government and society, such as civil defense, emergency response, law enforcement, customs, border patrol, and immigration. In the aftermath of 9/11 and the foundation of the Department of Homeland Security, these functions have taken on new organization and urgency. Homeland security, therefore, strives to adapt these traditional functions to confront new threats and evolving hazards. It is not simply about government action alone, but rather about the collective strength of the entire country. Our approach relies on our shared efforts to identify and interdict threats; deny hostile actors the ability to operate within our borders; maintain effective control of our physical borders; safeguard lawful trade and travel into and out of the United States; disrupt and dismantle transnational terrorist, and criminal organiza–tions; and ensure our national resilience in the face of the threat and hazards. Taken together, these efforts must support a homeland that is safe and secure from terrorism and other hazards and in which American interests, aspirations, and way of life can thrive.

- **Intelligence:** Our country's safety and prosperity depend on the quality of the intelligence we collect and the analysis we produce, our ability to evaluate and share this information in a timely manner, and our ability to counter intelligence threats. This is as true for the strategic intelligence that informs executive decisions as it is for intelligence support to homeland security, state, local, and tribal govern–ments, our troops, and critical national missions. We are working to better integrate the Intelligence Community, while also enhancing the capabilities of our Intelligence Community members. We are strengthening our partnerships with foreign intelligence services and sustaining strong ties with our close allies. And we continue to invest in the men and women of the Intelligence Community.

- **Strategic Communications:** Across all of our efforts, effective strategic communications are essential to sustaining global legitimacy and supporting our policy aims. Aligning our actions with our words is a shared responsibility that must be fostered by a culture of communication throughout government. We must also be more effective in our deliberate communication and engagement and do a better job understanding the attitudes, opinions, grievances, and concerns of peoples—not just elites—around the world. Doing so allows us to convey credible, consistent messages and to develop effective plans, while better understanding how our actions will be perceived. We must also use a broad range of meth–ods for communicating with foreign publics, including new media.

- **The American People and the Private Sector:** The ideas, values, energy, creativity, and resilience of our citizens are America's greatest resource. We will support the development of prepared, vigilant, and engaged communities and underscore that our citizens are the heart of a resilient country. And we must tap the ingenuity outside government through strategic partnerships with the private sector, nongovernmental organizations, foundations, and community-based organizations. Such partnerships are critical to U.S. success at home and abroad, and we will support them through enhanced opportunities for engagement, coordination, transparency, and information sharing.

12.3 Leadership and Systems Thinking

By COL George E. Reed, USA

OBJECTIVES:

9. List three steps in the systems thinking approach.
10. Identify barriers to our ability to use systems thinking.

"'For every problem there is a solution that is simple, neat – and wrong.' This maxim has been attributed at various times to Mark Twain, H.L. Mencken, and Peter Drucker as a wake-up call to managers who mistakenly think that making a change in just one part of a complex problem will cure the ails of an entire system. Everyday management thinking too often looks for straightforward cause and effect relationships in problem solving that ignores the effect on, and feedback from, the entire system."

-Ron Zemke,
writing in the February 2011 issue of *Training*

Leaders operate in the realm of bewildering uncertainty and staggering complexity. Today's problems are rarely simple and clear-cut. If they were, they would likely already have been solved by someone else. If not well considered—and sometimes even when they are—today's solutions become tomorrow's problems. Success in the contemporary operating environment requires different ways of thinking about problems and organizations. This article introduces some concepts of systems thinking and suggests that it is a framework that should be understood and applied by leaders at all levels, but especially those within the acquisition community. It is insufficient and often counterproductive for leaders merely to act as good cogs in the machine. Leaders perform a valuable service when they discern that a venerated system or process has outlived its usefulness, or that it is operating as originally designed but against the organization's overall purpose. Sometimes we forget that systems are created by people, based on an idea about what should happen at a given point in time. A wise senior warrant officer referred to this phenomenon as a BOGSAT—a bunch of guys sitting around talking.

SYSTEMS ENDURE

Although times and circumstances may change, systems tend to endure. We seem to be better at creating new systems than changing or eliminating existing ones. Sociologist Robert K. Merton coined the term "goal displacement" to describe what happens when complying with bureaucratic processes becomes the objective rather than focusing on organizational goals and values. When that happens, systems take on a life of their own and seem immune to common sense. Thoughtless application of rules and procedures can stifle innovation, hamper adaptivity, and dash creativity. Wholesale disregard of rules and procedures, however, can be equally disastrous.

When members of an organization feel as though they must constantly fight the system by circumventing established rules and procedures, the result can be cynicism or a poor ethical climate. Because of their experience and position, leaders are invested with the authority to intervene and correct or abandon malfunctioning systems. At the very least, they can advocate for change in a way that those with less positional authority cannot. Leaders at all levels should, therefore, be alert to systems that drive human behavior inimical to organizational effectiveness. It is arguable that military organizations placing a premium on tradition and standardization are predisposed to goal displacement. We need leaders, therefore, who can see both the parts and the big picture; to this end some of the concepts of systems thinking are useful.

The Department of Defense is a large and complex social system with many interrelated parts. As with any system of this type, when changes are made to one part, many others are affected in a cascading and often unpredictable manner. Thus, organizational decisions are fraught with second- and third-order effects that result in unintended consequences. "Fire and forget" approaches are rarely sufficient and are sometimes downright harmful. Extensive planning—combined with even the best of intentions—does not guarantee success. Better prediction is not the answer, nor is it possible. There are so many interactions in complex systems that no individual can be expected to forecast the impact of even small changes that are amplified over time.

GETTING BEYOND THE MACHINE METAPHOR

In her book *Organization Theory: Modern, Symbolic, and Postmodern Perspectives,* Mary Jo Hatch provides an introduction to general systems theory that is useful in

thinking about organizations. She makes a point worthy of repeating: The use of lower level models is problematic when applied to higher level systems. Thus, the language of simple machines creates blind spots when used as a metaphor for human or social systems; human systems are infinitely more complex and dynamic. In other words, it can be counterproductive to treat a complex dynamic social system like a simple machine.

Noted management scholar Russell Ackoff puts it another way. He asserts that we are in the process of leaving the machine age that had roots in the Renaissance and came into favor through the industrialization of society. In that era the machine metaphor became the predominant way of looking at organizations. The universe was envisioned by thinkers such as Isaac Newton, as having the characteristics of a big clock. The workings of the clock could be understood through the process of analysis and the analytical method.

Analysis involves taking apart something of interest, trying to understand the behavior of its parts, and then assembling the understanding of the parts into an understanding of the whole. According to Ackoff, "One simple relationship—cause and effect—was sufficient to explain all relationships." Much machine-age thinking remains with us today; however, there are alternatives.

SYSTEMS THINKING

Systems, like the human body, have parts, and the parts affect the performance of the whole. All of the parts are interdependent. The liver interacts with and affects other internal organs—the brain, heart, kidneys, etc. You can study the parts singly, but because of the interactions, it doesn't make much practical sense to stop there. Understanding of the system cannot depend on analysis alone. The key to understanding is, therefore, synthesis. The systems approach is to:

• **Identify a system.** After all, not all things are systems. Some systems are simple and predictable, while others are complex and dynamic. Most human social systems are the latter.

• **Explain the behavior or properties of the whole system.** This focus on the whole is the process of synthesis. Ackoff says that analysis looks into things while synthesis looks out of things.

• **Explain the behavior or properties** of the thing to be explained in terms of the role(s) or function(s) of the whole.

The systems thinker retains focus on the system as a whole, and the analysis in step three (the third bullet) is always in terms of the overall purpose of the system. Borrowing Ackoff's approach and using the example of a contemporary defense issue might help clarify what is admittedly abstract at first glance.

Consider the Institute for Defense Analyses report *Transforming DoD Management: the Systems Approach.* The authors of this study suggested an alternative approach to Service-based readiness reporting, one that considered the entire defense transportation system. One section of the report suggests that knowing the status of equipment, training, and manning of transportation units is helpful but insufficient to determine the readiness of a system that includes elements such as airfields, road networks, ships, and ports. The defense transportation system includes elements of all Services and even some commercial entities. It only makes sense, therefore, to assess readiness of these elements as part of a larger system that has an identifiable purpose—to move personnel and materiel to the right place at the right time. In this example you can clearly see the approach recommended by Ackoff.

THE PROBLEM OF BUSYNESS

Few would disagree, in principle, that senior leaders should see not only the parts, but also the big picture. So why don't we do more of it? One reason is because we are so darned busy. Immersed in the myriad details of daily existence, it is easy to lose sight of the bigger picture. While it may be important to orient on values, goals, and objectives, the urgent often displaces the important. Fighting off the alligators inevitably takes precedence over draining the swamp.

The problem of busyness can be compounded by senior leaders who are overscheduled and uneducated in systems thinking. It seems as though military officers today work excessive hours as a matter of pride. A cursory examination of the calendar of most contemporary officers, especially flag officers, will indicate an abusive pace. Consider as an alternative the example of one of America's greatest soldier-statesmen, Gen. George C. Marshall. Even at the height of World War II, Marshall typically rode a horse in the morning for exercise, came home for lunch and visited with his wife, went to bed early, and regularly took retreats to rejuvenate. To what extent are such pauses for reflection and renewal valued today? Simple cause and effect thinking combined with a culture of busyness can result in decision makers who rapid-fire short-term solutions at long-term problems without taking time to think about the actual impact of those solutions.

A common symptom of this phenomenon can be seen in leaders who unrealistically demand simplicity and certainty in a complex and uncertain environment. The drive for simplicity can lead to the need for excessive assumptions. Few contemporary issues of significance can be understood, much less solved, in a two-page point paper or a PowerPoint® slide. We might also ask whether speed and decisiveness in decision making, so valued at the tactical level, work to the detriment of good decisions at the strategic level. Absent some discipline and techniques to do otherwise, it is very hard to find time for reflection and thoughtful decision making.

Most people expect learning to just happen without their taking the time for thought and reflection, which true learning requires. In the past, with slower communication systems, we often had a few weeks to ponder and rethink a decision. Today we're accustomed to emails, overnight letters, and cell phones, and have come to believe that an immediate response is more important than a thoughtful one.

— Steven Robbins, writing in *Harvard Business School Working Knowledge* in May 2003.

INTERRELATIONSHIPS, NOT THINGS

Peter Senge submits, in *The Fifth Discipline*, that systems thinking provides just the type of discipline and toolset needed to encourage the seeing of "interrelationships rather than things, for seeing patterns of change rather than static 'snapshots.'" Senge argues that this shift of mind is necessary to deal with the complexities of dynamic social systems.

He suggests that we think in terms of feedback loops as a substitute for simple cause and effect relationships. As an example, systems scholar Daniel Aronson suggests that we imagine a farmer who determines that an insect infestation is eating his crop. The conventional approach is to apply a pesticide designed to kill the insect. Our example at this point depicts the lowest level of the thinking hierarchy—reaction. In response to the appearance of insects, the farmer applies a pesticide because he assumes that what has worked in the past will work in this instance. As additional insects appear, the farmer applies more pesticide. While the farmer's goal is to produce a crop, his activity is increasingly consumed by recurring applications of the chemical. He is surely busy, but he may not necessarily be productive. A systems thinker might step back from the problem, take a broader view, and consider what is happening over time.

For example, he might think about whether there are any patterns that appear over weeks or months and attempt to depict what is actually occurring. Recognizing the pattern of a system over time is a higher-order level of thinking. The systems thinker might notice that insect infestation did decrease after applying pesticide, but only for a short time. Insects that were eating the crop were actually controlling a second species of insect not affected by the pesticide. Elimination of the first species resulted in a growth explosion in the second that caused even more damage than the first. The obvious solution caused unintended consequences that worsened the situation.

An accomplished systems thinker would model the above example using a series of feedback and reinforcing loops. The specifics of the modeling technique are less important at this point than the observation that systems thinking tends to see things in terms of loops and patterns aided by constant assessment of what *is* happening, rather than flow charts and reliance on what *should be* happening. At the highest level of thinking, the farmer would try to identify root causes or possible points of intervention suggested by these observations.

THE IMPORTANCE OF CONTINUOUS ASSESSMENT

In *Why Smart Executives Fail*, Sydney Finkelstein examined over 50 of the world's most notorious business failures. His analysis indicated that in almost every case, the failures were not attributable to stupidity or lack of attention. To the contrary, the leaders of well-known corporations such as Samsung Motors, WorldCom, and Enron were exceptionally bright, energetic, and deeply involved in the operation of their businesses. Up to the point of massive corporate failure, they were all extremely successful, and in almost every case, there were some in the organization who vainly raised objections to the course that eventually proved disastrous. In most instances, the executives failed to see or accept what was actually happening. In some cases, they were blinded by their own prior successes; in other cases they inexplicably held tenaciously to a vision, despite plenty of evidence that the chosen strategic direction was ill-advised. The systems thinker's pragmatic focus on determining what is actually happening serves as a preventative to self-delusional wishful thinking. Wishful thinking is no substitute for a realistic appraisal. In the language of systems thinking, the executives were trapped by their own faulty mental models.

The continuous assessment process that is characteristic of systems thinking is essential in a volatile, rapidly changing environment. It takes time and good habits of critical reflection to engage in this kind of learning, both for individuals and organizations.

A systemic approach to failure is more likely to result in effective long-term solutions. Imagine for a moment if the incidents of abuse at Abu Ghraib were chalked up merely to ineffective leadership or just miscreant behavior by some thugs on the night shift. If other factors contributed to the problem, after relieving the chain of command for cause and prosecuting the abusers, the members of the replacement chain of command might have found themselves in an equally untenable situation. While inspired leadership can make a difference under the worst of conditions, we might ask just how heroic we expect our leaders to be on a regular basis. When a system is so obviously stacked against our leaders, there is a moral imperative to change the system.

Systems thinking is no panacea. There is no checklist to work through that will guarantee someone is thinking in a way that will capture the big picture or identify root causes of difficult problems. There are some concepts and approaches embedded in the systems thinking literature, however, that can be very helpful when considering why a situation seems to be immune to intervention, or why a problem thought to be solved has returned with a vengeance. Here are some of the concepts:

• Focus on the purpose for which a system was created over the processes and procedures of the system.

• Simple cause-and-effect relationships are insufficient to understand or explain a complex social system. Patterns over time and feedback loops are a better way to think about the dynamics of complex systems.

• Think in terms of synthesis over analysis; the whole over the parts.

• Busyness and excessive focus on short term gains interferes with our ability to use a systems approach.

• Leaders must see what is actually happening over what they want to see happen.

• Thinking about systems and their dynamics suggests alternative approaches and attunes leaders to important aspects of organizational behavior, especially in military organizations that value tradition and standardization.

ABOUT THE AUTHOR

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12.4 Strategic Thinking: Key to Corporate Survival

By Benjamin B. Tregoe and John W. Zimmerman

OBJECTIVES:

11. Define the term "strategy" as used in this article.
12. Describe the relationship between strategy and operations.
13. Identify reasons why long-range planning impedes strategic thinking.
14. List the advantages of separating strategic thinking from long-range planning.
15. Define the term "driving force" as it relates to long-term strategy.

Most companies face the future unprepared. Though long-range planning has saturated our corporate environment, it does not guarantee success. In our constantly changing environment, the key to corporate survival lies not so much in the quality of our long-range planning as in the clarity of our strategic thinking. To survive and flourish, organizations must face the future knowing *what* they want to be – strategic planning – as well as *how* to get there – long-range planning and operational decision making.

It is our thesis that strategy should provide a picture of the organization as it wants to look in the future. Strategy is vision. It is totally directed at what the organization *should* be rather than *how* the organization will get there. Unfortunately, the word "strategy" has been used rather casually in both management literature and the marketplace. In fact, it has assumed a variety of meanings, some of which confuse the "what" and "how" dimensions.

For example, strategy is sometimes called "strategic planning" and then is used indiscriminately with "long-range planning." Executives talk frequently about a "market strategy" or a "pricing strategy" when they really mean a plan to penetrate a market or a plan to keep prices competitive. Such "strategies" are really major operational decision points that presume an overall corporate or divisional strategy.

While not interested in legislating the meaning of the word strategy, we are interested in avoiding the confusion we have observed. For us, strategy has a very precise meaning, which we define as a *framework that guides those choices that determine the nature and direction of an organization.* These "choices" confront an organization every day. They include choices about an organization's products or services, the geographical markets and customer groups the organization serves, the organization's capabilities of supporting those products and markets, its growth and return, and its allocation of resources.

How these choices are made determines the nature of an organization. If they are made within the context of a strategic framework, the organization's direction is clearly under the control of the managers who develop that framework. If these choices are made in the absence of a strategic framework, you abdicate that control and run the risk of having a direction that is uncoordinated and in the hands of whoever is making these choices.

THE STRATEGY/OPERATIONS RELATIONSHIP

Since strategy sets direction, it must be formulated prior to long-range planning and the day-to-day decision making that flows from such planning. Failure to separate strategy formulation from planning and operations compromises corporate strategic thinking.

The chart below illustrates the relationship between strategy and operations. Clear strategy and effective operations are a winning combination, but with unclear strategy and ineffective operations, you are bound to be a loser. If strategy is clear but operations are ineffective, the result is uncertain – you may still win, but winning depends almost totally on your ability to predict and then be carried by the kindness of external forces such as the economy and competition, forces not generally known for their beneficence. Similarly, if operations are effective but the strategy is unclear, you may survive by being swept forward efficiently – but for how long?

How \ What	Clear Strategy	Unclear Strategy
Effective Operations	Clear strategy and effective operations have equalled success in the past and will in the future	Unclear strategy but effective operations have equalled success in the past, but success doubtful in the future
Ineffective Operations	Clear strategy but ineffective operations have sometimes worked in the past in the short run, but increasing competition makes success doubtful in the future	Unclear strategy and ineffective operations have equalled failure in the past and will in the future

The late W. T. Grant Company is a recent, vivid example of the bottom right quadrant of the chart. It was a loser because it did not have a clear idea of what it should be in the future and had inadequate operations plans. The following commentaries from Business Week attest to Grant's lack of direction:

> Worse yet, early on Grant seemingly could not make up its mind what kind of store it was. "There was a lot of dissension within the company whether we should go the K Mart route or go after the Ward and Penney position," says a former executive. "Ed Staly and Lou Lustenberger were at loggerheads over the issue, with the upshot being we took a position between the two and that consequently stood for nothing."

In addition to its lack of direction, Grant's day-to-day results suffered from ineffective operations:

> From 1963 to 1973 Grant opened 612 stores and expanded 91 others, with the bulk of the increase starting in 1968 under the guidance of president Richard W. Mayer and chairman Edward Staley. "The expansion program placed a great strain on the physical and human capability of the company to cope with the program," says Chairman James G. Kendrick. "These were all large stores – 6 million to 7 million square feet per year – and the expansion of our management organization just did not match the expansion of our stores." Adds a former operations executive: "Our training program couldn't keep up with the explosion of stores, and it didn't take long for the mediocrity to begin to show."

In the upper left quadrant, Sears, Roebuck & Company is typical of a "winner." With a clear image of what it should be in the future, it has also been eminently successful in its operations. While Sears has had its share of trouble recently, over the years it has consistently demonstrated the ability to anticipate needed changes in direction and to organize quickly and efficiently in order to make those changes.

The majority of organizations probably fit in the other two quadrants of the chart. For example, many conglomerates could be placed in the lower left quadrant because they are characterized by well defined growth and financial objectives and ineffective operations. Such organizations tend to see themselves as diverse giants that provide a wide range of products and services. However, the carefully thought-out grand scheme has often been marred by poor operational planning, with resultant over-expansion and inability to manage.

The Swiss watch industry is typical of the upper right quadrant of companies. Superbly efficient at producing and marketing, the industry was overtaken by changes in technology. The Swiss watchmakers' strategy was inadequate to help them anticipate external threats to their survival.

In the United States, strong operations historically have been more important than clear strategic thinking. In the past, many U.S. organizations survived even when they lacked a clear sense of strategic direction. After all, with unlimited resources, skilled labor, and a large, homogeneous market, who needed to think much about what kind of a business they wanted to be in the future?

Now, however, with diminishing resources, world competition, and rising costs, even the most efficient operations may no longer survive the handicap of operating without a clear, strategic direction. Today's company must formulate a clear strategy from which effective operations flow.

LONG-RANGE PLANNING: ROADBLOCK TO STRATEGIC THINKING

Since strategy provides the framework or picture of what the organization wants to be at some future point in time, it must precede and provide the basis for operational planning. Most long-range planning and all short-range planning are operational – they define the "how."

Paradoxically, the real danger to an organization's strategic thinking often comes from its own long-range planning. From our research on strategy, conducted in over 200 major American , Canadian, and European firms, and our strategic-planning consulting with the chief executives of some 75 of these firms, we have seen that primary emphasis on long-range planning impedes strategic thinking. It is ironic that the process on which executives rely most heavily to prepare for the future is doing the most damage, but here is how it happens:

1. *Long-range planning invariably predicts the organization's future by extrapolation from the present*. Projecting from current activities straitjackets the future. Starting with a base of current products and markets makes it difficult to incorporate the new and to eliminate the old in the light of a changing external environment.

2. *Theoreticians who urge the establishment of long-range objectives as a starting point for long-range planning fail to recognize this fact: Most managers do not set objectives that define their future because they lack a process to assist them.* Without practical tools, managers are forced to build their futures on the shaky foundations of the projections instead of on a clear definition of what they want their organizations to be. Where long-range objectives do exist, they are usually set in financial terms. Plans are then developed down the line and are force-fit into the financial constraints imposed by top management. Top executives review these plans and then congratulate

themselves on the realism of their financial objectives, while middle management congratulates itself on its skill in planning to meet those objectives. Planning against objectives that are unconnected to a larger strategy may lead to self-satisfaction; in time, however, it may very well lead to a dead-end future.

3. *Since long-range planning consists of a series of projections about the future, the future picture of the organization can only be a composite of these projections.* Under this approach, the plans companies make determine their direction instead of providing a clear sense of direction determining their plans. Long-range plans are built up from the lowest levels, where information exists to make projections. These projections are additive for the various parts of the organization and, in total, tend to become the recommended plan. But by the time these detailed plans reach the top, there is virtually no opportunity for interjecting fresh insight about the future. In fact, top management's ability to modify these plans, except in minor ways, is practically nil. Flexibility vanishes. The comment of one chief executive immersed in the planning cycle is typical: "By the time we get through with our long-range planning cycle, we are all so engrossed in the precision of our projections that we have lost our ability to question whether they are taking us where we want to go."

4. *Long-range plans invariably tend to be overly optimistic.* This results primarily from the desire of those making the projections at various levels of the organization to do better in their respective areas in the years ahead. By the time this optimism reaches top management, every unit predicts it will do 15 percent better in the years ahead. Such projections tend to become the prevailing corporate wisdom, further restricting the ability of top management to make changes. Any changes that are not purely perfunctory appear arbitrary and capricious to the rest of the organization. Since the allocation of resources is tied to these basically optimistic plans, the persuasiveness of strong personalities and the unrealistic goals they guarantee to reach often determine future resource allocation.

5. *Long-range planning usually begins with assumptions about the environment – the economy, technological change, sociopolitical events, and so on – and the organization's strengths and weaknesses.* Though this information could have great strategic significance, long-range planning tends to utilize such data only as a guide for determining how optimistic or pessimistic to make the long-range product/market projections. This is so because long-range planning is not a process that enables critical information to be used for strategic purposes.

6. *Long-range plans tend to be inflexible (even though they are usually presented in three-ring binders as evidence of their "flexibility").* It takes a tremendous amount of work to project five years ahead; such effort acts as a deterrent to change and transforms most long-range plans into Gothic structures of inflexibility. This inflexibility makes it difficult to react to unanticipated changes int the environment and to adjust plans accordingly. Modification of long-range plans usually occurs only when events reach crisis proportions.

7. *Long-range planning is more short-range than anyone really cares to admit.* To be sure, long-range planning theory suggests that planning should project out five years and then recede back to one year out. But how can this be done in the absence of a framework for looking ahead five years? Without such a structure, the sheer force of necessity leads most managers to reverse the theory and begin by projecting from year one, but beyond that point projects become iffy. Since so much work is involved, the first year usually gets the most thorough analysis. After all, the manager knows he can make changes in the following years; it is only the coming year that cannot be changed – and this year becomes the budget. The shorter the time focus, the more easily a manager is locked in to the constraints of current operations, and the less likely he is to be influenced by information of potential strategic significance. Anyway, most rewards for performance are measured by only first year results.

CHECK YOUR STRATEGY

In summary, strategic thinking is in trouble. Operational long-range planning is no longer adequate to cope with the complexities of today's world.

How is your organization doing? Ask yourself these questions:

- Are your product-market policies and decisions too frequently a reaction to outside influences such as the government, competition, unions, and other outside factors?
- Are acquisition and investment opportunities setting the direction of your company?
- Is the way you are currently organized determining what your company will be doing in the future?
- Do your annual budgets determine what your company will be in the future?
- Do your long-range projections establish the kind of company you will be in the future?
- Do you lack a systematic method to anticipate changes in the environment that may impact your company?
- Do you actually generate assumptions about the environment, but use them for projecting and assessing plans instead of as an input to formulate strategy?
- Is the persuasive manager – the one who is getting

the resources – setting the direction of your company?

- Would different members of your management team paint different pictures of what the company should be in the near and distant future?

- Is your statement of future strategy more helpful for public relations purposes than as a clear guide for future products and markets?

The more of these questions you answered "yes," the more your company's strategy is in trouble. If you answered all "yes," then you can probably hold last rites for strategy in your organization. It is officially dead.

HOW STRATEGIC THINKING CAN SURVIVE

Strategic thinking has long been considered an intellectual nicety; it has provided a patina of respectability to corporate statements built solely on operations considerations. Management attention, however, has been given mainly to operational planning and decisions, for it is here that the "big payoff" could be pursued. In addition, without a process, managers have tended to shy away from the high risks inherent in strategic thinking. They preferred instead to dwell in the lower risk, more secure area of long-range planning. But, in today's world, even the best operations planning and decisions are not enough. We can no longer afford the "security" of avoiding high risk strategic discussions. What, then, can be done?

Strategic thinking must be separated from long-range planning and must precede it. Preaching separation of strategy and long-range planning may appear platitudinous, but most organizations tend to confuse the two. One major corporation, for example, has this patchwork quilt of overall objectives:

> ...to market and produce legitimate products and services at quality levels in their respective markets...to utilize resources fully in order to maximize return on stockholders' investment...to structure the Company and assign responsibility in ways that promote efficiency and incentive, and reward achievement...to provide satisfying, healthful, long-term employment at all levels...to maintain through fluctuating business cycles the confidence of customers, employees, and stockholders...to preserve the integrity of the company in its accounting and reporting procedures, and thereby, the confidence of the investing public.

The first two objectives above say something, however vague, about what the company wants to be in terms of products, markets, and return. But the remaining objectives are operations; they are how-to oriented guidelines for the operation of the business. By masking strategic considerations with operational ones, the above company is headed for an identity crisis as it is pushed and pulled into the future with no clearly defined picture of itself.

Besides making strategic considerations usable, another advantage of separating strategic thinking from operations thinking is that it simplifies the long-range planning process. Strategic thinking and long-range planning in most instances should not cover the same time perspective. A clear, specific statement of strategy covering the next five years generally diminishes the need to project long-range plans over the same time frame. We have found that organizations with clear strategies can put their planning focus on shorter-range plans. Once a strategy is formulated and key areas identified, detailed long-range planning can be limited to these areas.

There is a tendency to feel that because long-range planning covers a longer time span than short-range planning, it is strategic. Conversely, there is a tendency to feel that the short range is not strategic, but operational. Both the operational and the strategic, however, can have either immediate or long-range time significance. Strategy is a function of direction, not time. Operations are a function of *how this direction is achieved*, not time.

Separating strategic from operational thinking also diminishes any controversy over the merits of "top down" versus "bottom up" planning. Both approaches are needed; it is just a matter of where and when. Strategy must be set at the top.

If top management has a unique responsibility, it is to determine the future nature and direction of the organization. Given this strategic framework, the long and short-range operational planning must be done at all levels in the organization where the needed information exists.

If middle and lower levels of management have one unique responsibility, it should be to plan their operations to support the overall direction of the organization.

Once separated from the operational, strategic thinking can survive only if it is clear, specific, and simple. Only then can it provide a framework in which long-range planning and day-to-day decision making can proceed. And only in this way can the executive intelligently assess which products and markets should be emphasized, which should be de-emphasized or abandoned, and what the scope of new products and markets should be. But not many companies have such a framework.

When companies do have a simple statement of corporate strategy, their statements tend to be so general that they are relatively useless as guidelines for specific future product/market choices. Consider this summary statement of corporate strategy:

> Our business is the creation of machines or methods to help find solutions to the increasingly complex problems of businesses, government, science, space exploration, education, medicine, and nearly every area of human endeavor.

Could you establish new market and product priorities based on this?

THE "DRIVING FORCE": KEY TO STRATEGY

The key to developing a simple, clear, and useful statement of strategy lies in the concept of the "driving force." Our research has identified nine strategic areas that impact and influence the nature and direction of any organization. These nine areas can be grouped into three basic categories:

Category	Strategic Areas
1. Products/markets:	Products offered Market needs
2. Capabilities:	Technology Production capability Method of sale Method of distribution Natural resources
3. Results:	Size/growth Return/profit

In every one of the 75 major organizations with which we have worked, we have found that one of the above nine areas can be identified as the *driving force* – the strategic area that is the primary determinant of the organization's products and markets. The driving force also determines the requirements of the organization's other strategic areas.

The following examples, taken from observations of the product and market actions of companies in various industries, further illustrate the concept of the driving force.

1. *Products offered.* The organization with products offered as its driving force will continue to produce products similar to those it has. New products will tend to be very similar to current products, and the organization will seek new markets where there is a need for its existing product line. Its capabilities will be directed toward the support of its basic products. For example, research and engineering would be devoted to product improvements rather than to the development of different kinds of products. The actions of the major automobile companies suggest that their driving force is "products offered."

2. *Market needs.* The organization whose driving force is market needs determine its products or services from needs in the markets or market segments it serves. This organization will constantly look for new and different products to fill these market needs. It will also search for new or emerging needs in these markets. While its capabilities are directed to the support of its current markets and products, it is perfectly willing to acquire very different capabilities to introduce new kinds of products. The actions of major consumer products companies, such as Procter & Gamble, suggest that their driving force is "market needs."

3. *Production capability.* An organization is driven by production capability when it offers products or services that can be performed using its production know-how, equipment, and processes. Looking for economies of scale, it will focus on efficiencies in production, and any new products will utilize the same production know-how, equipment, and processes that produced the original products. The actions of commodity-based companies, such as many of those in the paper industry, suggest that their driving force is (or was) "production capability."

4. *Return/profit.* An organization driven by return/profit will have very specific return/profit targets that may be quite different from its current level of performance. These targets are the basis for developing or acquiring future products and/or markets. Such a driving force will frequently lead this organization into very different and unrelated products or markets as a means of achieving these return/profit objectives over time. The actions of certain conglomerates, such as ITT World Communications, suggest that their driving force is "return/profit."

On first thought many top managers see return/profit as their driving force because profit is equated with survival and is the key measure of continued success. Thus all companies have profit objectives by which to measure operations. Profit, however, is a driving force only if it is the primary determinant of the kinds of future products and markets that characterize an organization. But this is the case in very few companies.

There is no implication in the above examples that the driving force remains fixed. Changes in external events or the desires of top management can change an organization's driving force. A typical pattern of change is from "products offered" to "market needs." For example, this pattern is true for many of the consumer goods and services companies, such as Procter & Gamble, Gillette, Playboy Enterprises, and Merrill Lynch, Pierce, Fenner & Smith.

Another common pattern is to shift from "production capability" to "products offered," a change that has characterized such companies as Kimberly-Clark and International Multifoods (formerly International Milling Company).

Four key reasons explain why the concept of driving force is critical to setting strategy:

- The essential nature of an organization is reflected in its products or services, the markets or customers it services, its capabilities to support these products and markets, and its growth and return. The driving force is the

focal point for describing and integrating these key strategic elements.

- Top management discussions to arrive at a driving force bring to the surface issues that must be resolved if an organization is going to arrive at an effective strategy statement. An approach that allows top management to stop short of this will facilitate agreement, but will also result in a general statement of strategy that is no more useful than those previously illustrated.

- Every organization has a momentum that carries it in a certain direction. This momentum is generated by the driving force. Unless the driving force is recognized, attempts to change this direction will be futile. You must know *from what* you are changing. The driving force provides the basic means for thinking about alternative futures and what each might mean in terms of products, markets, capabilities, and return.

- The concept of driving force also has great value in tracking the competition. Since there generally is no way to know the stated strategy of your competitors, assuming they have one, simply observe their actions to determine their driving force and then project what their future courses of action might be.

The rate of change and the complexity of today's world make strategic thinking essential to survival. However, the vehicle that organizations generally have used to cope with the future – long-range planning - is in many ways primarily responsible for stifling their ability to survive and triumph over the challenges ahead. Long-range planning is killing strategic thinking.

Strategic thinking must be separated from and precede long and short-range operational planning. Strategic thinking must result in a statement of strategy that is specific, simple, and clear enough to provide a framework for the determination of future products, markets, capabilities, and return. The *driving force* is the key to developing such a statement.

The chief executives we know voice an increasing sense of urgency about the importance of clear strategic thinking and about their own role in the strategy formulation process. For this urgency to be translated into effective action, top management must devote its most serious and incisive thinking to strategic issues.

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12.5 Crowdsourcing Systems on the Web

By Anhai Doan, Raghu Ramakrishnan, & Alon Y. Halevy

OBJECTIVES:

16. Identify four challenges that a crowdsourcing system must address.
17. List the dimensions used to classify crowdsourcing systems.
18. Define the roles that humans can play in a crowdsourcing system.
19. Name some common crowdsourcing systems found on the Web.
20. List strategies that crowdsourcing systems can use to recruit and retain users.

Crowdsourcing systems enlist a multitude of humans to help solve a wide variety of problems. Over the past decade, numerous such systems have appeared on the World-Wide Web. Prime examples include Wikipedia, Linux, Yahoo! Answers, Mechanical Turk-based systems, and much effort is being directed toward developing many more.

As is typical for an emerging area, this effort has appeared under many names, including peer production, user-powered systems, user-generated content, collaborative systems, community systems, social systems, social search, social media, collective intelligence, wikinomics, crowd wisdom, smart mobs, mass collaboration, and human computation. The topic has been discussed extensively in books, popular press, and academia.[1,5,15,23,29,35] But this body of work has considered mostly efforts in the physical world.[23,29,30] Some do consider crowdsourcing systems on the Web, but only certain system types[28,33] or challenges (for example, how to evaluate users[12]).

This survey attempts to provide a global picture of crowdsourcing systems on the Web. We define and classify such systems, then describe a broad sample of systems. The sample ranges from relatively simple well-established systems such as reviewing books to complex emerging systems that build structured knowledge bases to systems that "piggyback" onto other popular systems. We discuss fundamental challenges such as how to recruit and evaluate users, and to merge their contributions. Given the space limitation, we do not attempt to be exhaustive. Rather, we sketch only the most important aspects of the global picture, using real-world examples. The goal is to further our collective understanding—both conceptual and practical—of this important emerging topic.

It is also important to note that many crowdsourcing platforms have been built. Examples include Mechanical Turk, Turkit, Mob4hire, uTest, Freelancer, eLance, oDesk, Guru, Topcoder, Trada, 99design, Innocentive, CloudCrowd, and [Crowd Flower]. Using these platforms, we can quickly build crowdsourcing systems in many domains. In this survey, we consider these systems (that is, applications), not the crowdsourcing platforms themselves.

CROWDSOURCING SYSTEMS

Defining crowdsourcing (CS) systems turns out to be surprisingly tricky. Since many view Wikipedia and Linux as well-known CS examples, as a natural starting point, we can say that a CS system enlists a crowd of users to *explicitly* collaborate to build a long-lasting *artifact* that is beneficial to the whole community.

This definition, however, appears too restricted. It excludes, for example, the ESP game,[32] where users *implicitly* collaborate to label images as a side effect while playing the game. ESP clearly benefits from a crowd of users. More importantly, it faces the same human-centric challenges of Wikipedia and Linux, such as how to recruit and evaluate users, and to combine their contributions. Given this, it seems unsatisfactory to consider only explicit collaborations; we ought to allow implicit ones as well.

The definition also excludes, for example, an Amazon's Mechanical Turk-based system that enlists users to find a missing boat in thousands of satellite images.[18] Here, users do not build any artifact, arguably nothing is long lasting, and no community exists either (just users coming together for this particular task). And yet, like ESP, this system clearly benefits from users, and faces similar human-centric challenges. Given this, it ought to be considered a CS system, and the goal of building artifacts ought to be relaxed into the more general goal of solving problems. Indeed, it appears that in principle *any* nontrivial problem *can* benefit from crowdsourcing: we can describe the problem on the Web, solicit user inputs, and examine the inputs to develop a solution. This system may not be practical (and better systems may exist), but it can arguably be considered a primitive CS system.

Consequently, we do not restrict the type of collaboration nor the target problem. Rather, we view CS as a general-purpose problem-solving method. We say that a system is a CS system *if it enlists a crowd of humans to help solve a problem defined by the system owners*, and if in doing so, it addresses the following four fundamental challenges: How to recruit and retain users? What contributions can users make? How to combine user contributions to solve the target problem? How to evaluate users and their contributions?

Not all human-centric systems address these challenges. Consider a system that manages car traffic in Madison, WI. Its goal is to, say, coordinate the behaviors of a crowd of human drivers (that already exist *within* the system) in order to minimize traffic jams. Clearly, this system does not want to recruit more human drivers (in fact, it wants far fewer of them). We call such systems *crowd management* (CM) *systems*. CM techniques (a.k.a., "crowd coordination"[31]) can be relevant to CS contexts. But the two system classes are clearly distinct.

In this survey we focus on CS systems that leverage the Web to solve the four challenges mentioned here (or a significant subset of them). The Web is unique in that it can help recruit a large number of users, enable a high degree of automation, and provide a large set of social software (for example, email, wiki, discussion group, blogging, and tagging) that CS systems can use to manage their users. As such, compared to the physical world, the Web can dramatically improve existing CS systems and give birth to novel system types.

Classifying CS systems. CS systems can be classified along many dimensions. Here, we discuss nine dimensions we consider most important. The two that immediately come to mind are the *nature of collaboration* and *type of target problem*. As discussed previously, collaboration can be explicit or implicit, and the target problem can be any problem defined by the system owners (for example, building temporary or permanent artifacts, executing tasks). The next four dimensions refer respectively to how a CS system solves the four fundamental challenges described earlier: *how to recruit and retain users; what can users do; how to combine their inputs; and how to evaluate them*. Later, we will discuss these challenges and the corresponding dimensions in detail. Here, we discuss the remaining three dimensions: degree of manual effort, role of human users, and standalone versus piggyback architectures.

Degree of manual effort. When building a CS system, we must decide how much manual effort is required to solve each of the four CS challenges. This can range from relatively little (for example, combining ratings) to substantial (for example, combining code), and clearly also depends on how much the system is automated. We must decide how to divide the manual effort between the users and the system owners. Some systems ask the users to do relatively little and the owners a great deal. For example, to detect malicious users, the users may simply click a button to report suspicious behaviors, whereas the owners must carefully examine all relevant evidence to determine if a user is indeed malicious. Some systems do the reverse. For example, most of the manual burden of merging Wikipedia edits falls on the users (who are currently editing), not the owners.

Role of human users. We consider four basic roles of humans in a CS system. *Slaves*: humans help solve the problem in a divide-and-conquer fashion, to minimize the resources (for example, time, effort) of the owners. Examples are ESP and finding a missing boat in satellite images using Mechanical Turk. *Perspective providers*: humans contribute different perspectives, which when combined often produce a better solution (than with a single human). Examples are reviewing books and aggregating user bets to make predictions.[29] *Content providers*: humans contribute self-generated content (for example, videos on YouTube, images on Flickr). *Component providers*: humans function as components in the target artifact, such as a social network, or simply just a community of users (so that the owner can, say, sell ads). Humans often play multiple roles within a single CS system (for example, slaves, perspective providers, and content providers in Wikipedia). It is important to know these roles because that may determine how to recruit. For example, to use humans as perspective providers, it is important to recruit a diverse crowd where each human can make independent decisions, to avoid "group think."[29]

Standalone versus piggyback. When building a CS system, we may decide to piggyback on a well-established system, by exploiting traces that users leave in that system to solve our target problem. For example, Google's "Did you mean" and Yahoo's Search Assist utilize the search log and user clicks of a search engine to correct spelling mistakes. Another system may exploit user purchases in an online bookstore (Amazon) to recommend books. Unlike standalone systems, such piggyback systems do not have to solve the challenges of recruiting users and deciding what they can do. But they still have to decide how to evaluate users and their inputs (such as traces in this case), and to combine such inputs to solve the target problem.

A sample of basic CS system types on the World-Wide Web.

Nature of Collaboration	Architecture	Must recruit users?	What users do?	Examples	Target Problems	Comments
Explicit	Standalone	Yes	Evaluating ▸ review, vote, tag	▸ reviewing and voting at Amazon, tagging Web pages at del.icio.us.com and Google Co-op	Evaluating a collection of items (e.g., products, users)	Humans as perspective providers. No or loose combination of inputs.
			Sharing ▸ items ▸ textual knowledge ▸ structured knowledge	▸ Napster, YouTube, Flickr, CPAN, programmableweb.com ▸ Mailing lists, Yahoo! Answers, QUIQ, ehow.com, Quora ▸ Swivel, Many Eyes, Google Fusion Tables, Google Base, bmrb.wisc.edu, galaxyzoo, Piazza, Orchestra	Building a (distributed or central) collection of items that can be shared among users.	Humans as content providers. No or loose combination of inputs.
			Networking	▸ LinkedIn, MySpace, Facebook	Building social networks	Humans as component providers. Loose combination of inputs.
			Building artifacts ▸ software ▸ textual knowledge bases ▸ structured knowledge bases ▸ systems ▸ others	▸ Linux, Apache, Hadoop ▸ Wikipedia, openmind, Intellipedia, ecoliocommunity ▸ Wikipedia infoboxes/DBpedia, IWP, Google Fusion Tables, YAGO-NAGA, Cimple/DBLife ▸ Wikia Search, mahalo, Freebase, Eurekster ▸ newspaper at Digg.com, Second Life	Building physical artifacts	Humans can play all roles. Typically tight combination of inputs. Some systems ask both humans and machines to contribute.
			Task execution	▸ Finding extraterrestrials, elections, finding people, content creation (e.g., Demand Media, Associated Content)	Possibly any problem	
Implicit	Standalone	Yes	▸ play games with a purpose ▸ bet on prediction markets ▸ use private accounts ▸ solve captchas ▸ buy/sell/auction, play massive multiplayer games	▸ ESP ▸ intrade.com, Iowa Electronic Markets ▸ IMDB private accounts ▸ recaptcha.net ▸ eBay, *World of Warcraft*	▸ labeling images ▸ predicting events ▸ rating movies ▸ digitizing written text ▸ building a user community (for purposes such as charging fees, advertising)	Humans can play all roles. Input combination can be loose or tight.
	Piggyback on another system	No	▸ keyword search ▸ buy products ▸ browse Web sites	▸ Google, Microsoft, Yahoo ▸ recommendation feature of Amazon ▸ adaptive Web sites (e.g., Yahoo! front page)	▸ spelling correction, epidemic prediction ▸ recommending products ▸ reorganizing a Web site for better access	Humans can play all roles. Input combination can be loose or tight.

SAMPLE CS SYSTEMS ON THE WEB

Building on this discussion of CS dimensions, we now focus on CS systems on the Web, first describing a set of basic system types, and then showing how deployed CS systems often combine multiple such types.

The accompanying table shows a set of basic CS system types. The set is not meant to be exhaustive; it shows only those types that have received most attention. From left to right, it is organized by collaboration, architecture, the need to recruit users, and then by the actions users can take. We now discuss the set, starting with explicit systems.

Explicit Systems: These standalone systems let users collaborate explicitly. In particular, users can evaluate, share, network, build artifacts, and execute tasks. We discuss these systems in turn.

Evaluating: These systems let users evaluate "items" (for example, books, movies, Web pages, other users) using textual comments, numeric scores, or tags.10

Sharing: These systems let users share "items" such as products, services, textual knowledge, and structured knowledge. Systems that share products and services include Napster, YouTube, CPAN, and the site programmableweb. com (for sharing files, videos, software, and mashups, respectively). Systems that share textual knowledge include mailing lists, Twitter, how-to repositories (such as ehow.com, which lets users contribute and search howto articles), Q&A Web sites (such as Yahoo! Answers2), online customer support systems (such as QUIQ,[22] which powered Ask Jeeves' AnswerPoint, a Yahoo! Answers-like site). Systems that share structured knowledge (for example, relational, XML, RDF data) include Swivel, Many Eyes, Google Fusion Tables, Google Base, many escience Web sites (such as bmrb.wisc. edu, galaxyzoo.org), and many peer-to-peer systems developed in the Semantic Web, database, AI, and IR communities (such as Orchestra[8,27]). Swivel, for example, bills itself as the "YouTube of structured data," which lets users share, query, and visualize census- and voting data, among others. In general, sharing systems can be central (such as YouTube, ehow, Google Fusion Tables, Swivel) or distributed, in a peer-to-peer fashion (such as Napster, Orchestra).

Networking: These systems let users collaboratively construct a large social network graph, by adding nodes and edges over time (such as homepages, friendships). Then they exploit the graph to provide services (for example, friend updates, ads, and so on). To a lesser degree, blogging systems are also networking systems in that bloggers often link to other bloggers.

A key distinguishing aspect of systems that evaluate, share, or network is that they do not merge user inputs, or do so automatically in relatively simple fashions. For example, evaluation systems typically do not merge textual user reviews. They often merge user inputs such as movie ratings, but do so automatically using some formulas. Similarly, networking systems automatically merge user inputs by adding them as nodes and edges to a social network graph. As a result, users of such systems do not need (and, in fact, often are not allowed) to edit other users' input.

Building Artifacts: In contrast, systems that let users build artifacts such as Wikipedia often merge user inputs tightly, and require users to edit and merge one another's inputs. A well-known artifact is software (such as Apache, Linux, Hadoop). Another popular artifact is textual knowledge bases (KBs). To build such KBs (such as Wikipedia), users contribute data such as sentences,

paragraphs, Web pages, then edit and merge one another's contributions. The knowledge capture (k-cap.org) and AI communities have studied building such KBs for over a decade. A well-known early attempt is openmind,[28] which enlists volunteers to build a KB of commonsense facts (for example, "the sky is blue"). Recently, the success of Wikipedia has inspired many "community wikipedias," such as Intellipedia (for the U.S. intelligence community) and EcoliHub (at ecolicommunity.org, to capture all information about the E. coli bacterium).

Yet another popular target artifact is structured KBs. For example, the set of all Wikipedia infoboxes (that is, attribute-value pairs such as city-name = Madison, state = WI) can be viewed as a structured KB collaboratively created by Wikipedia users. Indeed, this KB has recently been extracted as DBpedia and used in several applications (see dbpedia.org). Freebase.com builds an open structured database, where users can create and populate schemas to describe topics of interest, and build collections of interlinked topics using a flexible graph model of data. As yet another example, Google Fusion Tables (tables.googlelabs.com) lets users upload tabular data and collaborate on it by merging tables from different sources, commenting on data items, and sharing visualizations on the Web.

Several recent academic projects have also studied building structured KBs in a CS fashion. The IWP project35 extracts structured data from the textual pages of Wikipedia, then asks users to verify the extraction accuracy. The Cimple/DBLife project[4,5] lets users correct the extracted structured data, expose it in wiki pages, then add even more textual and structured data. Thus, it builds structured "community wikipedias," whose wiki pages mix textual data with structured data (that comes from an underlying structured KB). Other related works include YAGONAGA, [11] BioPortal,[17] and many recent projects in the Web, Semantic Web, and AI communities.[1,16,36]

In general, building a structured KB often requires selecting a set of data sources, extracting structured data from them, then integrating the data (for example, matching and merging "David Smith" and "D.M. Smith"). Users can help these steps in two ways. First, they can improve the automatic algorithms of the steps (if any), by editing their code, creating more training data,[17] answering their questions[12,13] or providing feedback on their output.[12,35] Second, users can manually participate in the steps. For example, they can manually add or remove data sources, extract or integrate structured data, or add even more structured data, data not available in the current sources but judged relevant.[5] In addition, a CS system may perform inferences over its KB to infer more structured data. To help this step, users can contribute inference rules and domain knowledge.[25] During all such activities, users can naturally cross-edit and merge one another's contributions, just like in those systems that build textual KBs.

Another interesting target problem is building and improving systems running on the Web. The project Wikia Search (search.wikia.com) lets users build an open source search engine, by contributing code, suggesting URLs to crawl, and editing search result pages (for example, promoting or demoting URLs). Wikia Search was recently disbanded, but similar features (such as editing search pages) appear in other search engines (such as Google, mahalo.com). Freebase lets users create custom browsing and search systems (deployed at Freebase), using the community-curated data and a suite of development tools (such as the Metaweb query language and a hosted development environment). Eurekster.com lets users collaboratively build vertical search engines called *swickis*, by customizing a generic search engine (for example, specifying all URLs the system should crawl). Finally, MOBS, an academic project,[12,13] studies how to collaboratively build data integration systems, those that provide a uniform query interface to a set of data sources. MOBS enlists users to create a crucial system component, namely the semantic mappings (for example, "location" = "address") between the data sources.

In general, users can help build and improve a system running on the Web in several ways. First, they can edit the system's code. Second, the system typically contains a set of internal components (such as URLs to crawl, semantic mappings), and users can help improve these without even touching the system's code (such as adding new URLs, correcting mappings). Third, users can edit system inputs and outputs. In the case of a search engine, for instance, users can suggest that if someone queries for "home equity loan for seniors," the system should also suggest querying for "reverse mortgage." Users can also edit search result pages (such as promoting and demoting URLs, as mentioned earlier). Finally, users can monitor the running system and provide feedback.

We note that besides software, KBs, and systems, many other target artifacts have also been considered. Examples include community newspapers built by asking users to contribute and evaluate articles (such as Digg) and massive multi-player games that build virtual artifacts (such as *Second Life*, a 3D virtual world partly built and maintained by users).

Executing Tasks: The last type of explicit systems we consider is the kind that executes tasks. Examples include finding extraterrestrials, mining for gold, searching for missing people,[23,29,30,31] and cooperative debugging

(cs.wisc.edu/cbi, early work of this project received the ACM Doctoral Dissertation Award in 2005). The 2008 election is a well-known example, where the Obama team ran a large online CS operation asking numerous volunteers to help mobilize voters. To apply CS to a task, we must find task parts that can be "crowdsourced," such that each user can make a contribution and the contributions in turn can be combined to solve the parts. Finding such parts and combining user contributions are often task specific. Crowdsourcing the parts, however, can be fairly general, and platforms have been developed to assist that process. For example, Amazon's Mechanical Turk can help distribute pieces of a task to a crowd of users (and several recent interesting toolkits have even been developed for using Mechanical Turk[13,37]). It was used recently to search for Jim Gray, a database researcher lost at sea, by asking volunteers to examine pieces of satellite images for any sign of Jim Gray's boat.[18]

Implicit Systems: As discussed earlier, such systems let users collaborate implicitly to solve a problem of the system owners. They fall into two groups: standalone and piggyback.

A standalone system provides a service such that when using it users implicitly collaborate (as a side effect) to solve a problem. Many such systems exist, and the table here lists a few representative examples. The ESP game[32] lets users play a game of guessing common words that describe images (shown independently to each user), then uses those words to label images. Google Image Labeler builds on this game, and many other "games with a purpose" exist.[33] Prediction markets[23,29] let users bet on events (such as elections, sport events), then aggregate the bets to make predictions. The intuition is that the "collective wisdom" is often accurate (under certain conditions)[31] and that this helps incorporate inside information available from users. The Internet Movie Database (IMDB) lets users import movies into private accounts (hosted by IMDB). It designed the accounts such that users are strongly motivated to rate the imported movies, as doing so bring many private benefits (such as they can query to find all imported action movies rated at least 7/10, or the system can recommend action movies highly rated by people with similar taste). IMDB then aggregates all private ratings to obtain a public rating for each movie, for the benefit of the public. reCAPTCHA asks users to solve captchas to prove they are humans (to gain access to a site), then leverages the results for digitizing written text.[34] Finally, it can be argued that the *target problem* of many systems (that provide user services) is simply to *grow a large community of users*, for various reasons (such as personal satisfaction, charging subscription fees, selling ads, selling the systems to other companies). Buy/sell/auction websites (such as eBay) and massive multiplayer games (such as *World of Warcraft*) for instance fit this description. Here, by simply joining the system, users can be viewed as implicitly collaborating to solve the target problem (of growing user communities).

The second kind of implicit system we consider is a piggyback system that exploits the user traces of yet another system (thus, making the users of this latter system implicitly collaborate) to solve a problem. For example, over time many piggyback CS systems have been built on top of major search engines, such as Google, Yahoo!, and Microsoft. These systems exploit the traces of search engine users (such as search logs, user clicks) for a wide range of tasks (such as spelling correction, finding synonyms, flu epidemic prediction, and keyword generation for ads[6]). Other examples include exploiting user purchases to recommend products,[26] and exploiting click logs to improve the presentation of a Web site.[19]

CS SYSTEMS ON THE WEB

We now build on basic system types to discuss deployed CS systems on the Web. Founded on static HTML pages, the Web soon offered many interactive services. Some services serve machines (such as DNS servers, Google Map API server), but most serve humans. Many such services do not need to recruit users (in the sense that the more the better). Examples include pay-parking-ticket services (for city residents) and room-reservation services. (As noted, we call these crowd management systems). Many services, however, face CS challenges, including the need to grow large user bases. For example, online stores such as Amazon want a growing user base for their services, to maximize profits, and startups such as epinions.com grow their user bases for advertising. They started out as primitive CS systems, but quickly improved over time with additional CS features (such as reviewing, rating, networking). Then around 2003, aided by the proliferation of social software (for example, discussion groups, wiki, blog), many full-fledged CS systems (such as Wikipedia, Flickr, YouTube, Facebook, MySpace) appeared, marking the arrival of Web 2.0. This Web is growing rapidly, with many new CS systems being developed and non-CS systems adding CS features.

These CS systems often combine multiple basic CS features. For example, Wikipedia primarily builds a textual KB. But it also builds a structured KB (via infoboxes) and hosts many knowledge sharing forums (for example, discussion groups). YouTube lets users both share and evaluate videos. Community portals often combine all CS features discussed so far. Finally, we note that the Semantic Web, an ambitious attempt to add structure to the

Web, can be viewed as a CS attempt to share structured data, and to integrate such data to build a Web-scale structured KB. The World-Wide Web itself is perhaps the largest CS system of all, encompassing everything we have discussed.

CHALLENGES AND SOLUTIONS

Here, we discuss the key challenges of CS systems:

How to recruit and retain users? Recruiting users is one of the most important CS challenges, for which five major solutions exist. First, we can *require users* to make contributions if we have the authority to do so (for example, a manager may require 100 employees to help build a company-wide system). Second, we can *pay users*. Mechanical Turk for example provides a way to pay users on the Web to help with a task. Third, we can *ask for volunteers*. This solution is free and easy to execute, and hence is most popular. Most current CS systems on the Web (such as Wikipedia, YouTube) use this solution. The downside of volunteering is that it is hard to predict how many users we can recruit for a particular application.

The fourth solution is *to make users pay for service*. The basic idea is to require the users of a system *A* to "pay" for using *A*, by contributing to a CS system *B*. Consider for example a blog website (that is, system *A*), where a user *U* can leave a comment only after solving a puzzle (called a captcha) to prove that *U* is a human. As a part of the puzzle, we can ask *U* to retype a word that an OCR program has failed to recognize (the "payment"), thereby contributing to a CS effort on digitizing written text (that is, system B). This is the key idea behind the reCAPTCHA project.[34] The MOBS project[12,13] employs the same solution. In particular, it ran experiments where a user *U* can access a Web site (such as a class homepage) only after answering a relatively simple question (such as, is string "1960" in "born in 1960" a birth date?). MOBS leverages the answers to help build a data integration system. This solution works best when the "payment" is unintrusive or cognitively simple, to avoid deterring users from using system A.

The fifth solution is to *piggyback on the user traces* of a well-established system (such as building a spelling correction system by exploiting user traces of a search engine, as discussed previously). This gives us a steady stream of users. But we must still solve the difficult challenge of determining how the traces can be exploited for our purpose.

Once we have selected a recruitment strategy, we should consider how to further encourage and retain users.

Many *encouragement and retention (E&R) schemes* exist. We briefly discuss the most popular ones. First, we can provide *instant gratification*, by immediately showing a user how his or her contribution makes a difference.[16] Second, we can provide an *enjoyable experience* or a *necessary service*, such as game playing (while making a contribution). [32] Third, we can provide ways to *establish, measure, and show fame/trust/ reputation*.[7,13,24,25] Fourth, we can set up competitions, such as showing top rated users. Finally, we can provide *ownership situations*, where a user may feel he or she "owns" a part of the system, and thus is compelled to "cultivate" that part. For example, zillow.com displays houses and estimates their market prices. It provides a way for a house owner to claim his or her house and provide the correct data (such as number of bedrooms), which in turn helps improve the price estimation.

These E&R schemes apply naturally to volunteering, but can also work well for other recruitment solutions. For example, after *requiring* a set of users to contribute, we can still provide instant gratification, enjoyable experience, fame management, and so on, to maximize user participation. Finally, we note that deployed CS systems often employ a mixture of recruitment methods (such as bootstrapping with "requirement" or "paying," then switching to "volunteering" once the system is sufficiently "mature").

What contributions can users make? In many CS systems the kinds of contributions users can make are somewhat limited. For example, to evaluate, users review, rate, or tag; to share, users add items to a central Web site; to network, users link to other users; to find a missing boat in satellite images, users examine those images.

In more complex CS systems, however, users often can make a far wider range of contributions, from simple low-hanging fruit to cognitively complex ones. For example, when building a structured KB, users can add a URL, flag incorrect data, and supply attribute-value pairs (as low-hanging fruit).[3,5] But they can also supply inference rules, resolve controversial issues, and merge conflicting inputs (as cognitively complex contributions).[25] The challenge is to define this range of possible contributions (and design the system such that it can gather a critical crowd of such contributions).

Toward this goal, we should consider four important factors. First, how *cognitively demanding* are the contributions? A CS system often has a way to classify users into groups, such as guests, regulars, editors, admins, and "dictators." We should take care to design cognitively appropriate contribution types for different user groups.

Low-ranking users (such as guests, regulars) often want to make only "easy" contributions (such as answering a simple question, editing one to two sentences, flagging an incorrect data piece). If the cognitive load is high, they may be reluctant to participate. High-ranking users (such as editors, admins) are more willing to make "hard" contributions (such as resolving controversial issues).

Second, what should be the *impact* of a contribution? We can measure the potential impact by considering how the contribution potentially affects the CS system. For example, editing a sentence in a Wikipedia page largely affects only that page, whereas revising an edit policy may potentially affect million[s] of pages. As another example, when building a structured KB, flagging an incorrect data piece typically has less potential impact than supplying an inference rule, which may be used in many parts of the CS system. Quantifying the potential impact of a contribution type in a complex CS system may be difficult.[12,13] But it is important to do so, because we typically have far fewer high-ranking users such as editors and admins (than regulars, say). To maximize the total contribution of these few users, we should ask them to make potentially high-impact contributions whenever possible.

Third, what about *machine contributions?* If a CS system employs an algorithm for a task, then we want human users to make contributions that are easy for humans, but difficult for machines. For example, examining textual and image descriptions to decide if two products match is relatively easy for humans but very *difficult for machines.* In short, the CS work should be distributed between human users and machines according to what each of them is best at, in a complementary and synergistic fashion.

Finally, the user interface should make it easy for users to contribute. This is highly non-trivial. For example, how can users easily enter domain knowledge such as "no current living person was born before 1850" (which can be used in a KB to detect, say, incorrect birth dates)? A natural language format (such as in openmind. org) is easy for users, but difficult for machines to understand and use, and a formal language format has the reverse problem. As another example, when building a structured KB, contributing attribute-value pairs is relatively easy (as Wikipedia infoboxes and Freebase demonstrate). But contributing more complex structured data pieces can be quite difficult for naive users, as this often requires them to learn the KB schema, among others.[5]

How to combine user contributions? Many CS systems do not combine contributions, or do so in a loose fashion. For example, current evaluation systems do not combine reviews, and combine numeric ratings using relatively simple formulas. Networking systems simply link contributions (homepages and friendships) to form a social network graph. More complex CS systems, however, such as those that build software, KBs, systems, and games, combine contributions more tightly. Exactly how this happens is application dependent. Wikipedia, for example, lets users manually merge edits, while ESP does so automatically, by waiting until two users agree on a common word.

No matter how contributions are combined, a key problem is to decide what to do if users differ, such as when three users assert "A" and two users "not A." Both automatic and manual solutions have been developed for this problem. Current automatic solutions typically combine contributions weighted by some user scores. The work[12,13] for example lets users vote on the correctness of system components (the semantic mappings of a data integration systems in this case[20]), then combines the votes weighted by the trustworthiness of each user. The work[25] lets users contribute structured KB fragments, then combines them into a coherent probabilistic KB by computing the probabilities that each user is correct, then weighting contributed fragments by these probabilities.

Manual dispute management solutions typically let users fight and settle among themselves. Unresolved issues then percolate up the user hierarchy. Systems such as Wikipedia and Linux employ such methods. Automatic solutions are more efficient. But they work only for relatively simple forms of contributions (such as voting), or forms that are complex but amenable to algorithmic manipulation (such as structured KB fragments). Manual solutions are still the currently preferred way to combine "messy" conflicting contributions.

To further complicate the matter, sometimes not just human users, but machines also make contributions. Combining such contributions is difficult. To see why, suppose we employ a machine *M* to help create Wikipedia infoboxes. [35] Suppose on Day 1 *M* asserts population = 5500 in a city infobox. On Day 2, a user *U* may correct this into population = 7500, based on his or her knowledge. On Day 3, however, *M* may have managed to process more Web data, and obtained higher confidence that population = 5500 is indeed correct. Should *M* override *U's* assertion? And if so, how can *M* explain its reasoning to *U*? The main problem here is it is difficult for a machine to enter into a manual dispute with a human user. The currently preferred method is for *M* to alert *U*, and then leave it up to *U* to decide what to do. But this method clearly will not scale with the number of conflicting contributions.

How to evaluate users and contributions? CS systems often must manage malicious users. To do so, we can use a combination of techniques that block, detect, and deter. First, we can block many malicious users by limiting who can make what kinds of contributions. Many e-science CS systems, for example, allow anyone to submit data, but only certain domain scientists to clean and merge this data into the central database.

Second, we can detect malicious users and contributions using a variety of techniques. Manual techniques include monitoring the system by the owners, distributing the monitoring workload among a set of trusted users, and enlisting ordinary users (such as flagging bad contributions on message boards). Automatic methods typically involve some tests. For example, a system can ask users questions for which it already knows the answers, then use the answers of the users to compute their reliability scores.[13,34] Many other schemes to compute users' reliability/trust/fame/reputation have been proposed.[9,26]

Finally, we can deter malicious users with threats of "punishment." A common punishment is banning. A newer, more controversial form of punishment is "public shaming," where a user *U* judged malicious is publicly branded as a malicious or "crazy" user for the rest of the community (possibly without *U's* knowledge). For example, a chat room may allow users to rate other users. If the (hidden) score of a user *U* goes below a threshold, other users will only see a mechanically garbled version of *U's* comments, whereas *U* continues to see his or her comments exactly as written.

No matter how well we manage malicious users, malicious contributions often still seep into the system. If so, the CS system must find a way to undo those. If the system does not combine contributions (such as reviews) or does so only in a loose fashion (such as ratings), undoing is relatively easy. If the system combines contributions tightly, but keeps them localized, then we can still undo with relatively simple logging. For example, user edits in Wikipedia can be combined extensively within a single page, but kept localized to that page (not propagated to other pages). Consequently, we can undo with page-level logging, as Wikipedia does. However, if the contributions are pushed deep into the system, then undoing can be very difficult. For example, suppose an inference rule *R* is contributed to a KB on Day 1. We then use *R* to infer many facts, apply other rules to these facts and other facts in the KB to infer more facts, let users edit the facts extensively, and so on. Then on Day 3, should *R* be found incorrect, it would be very difficult to remove *R* without reverting the KB to its state on Day 1, thereby losing all good contributions made between Day 1 and Day 3.

At the other end of the user spectrum, many CS systems also identify and leverage influential users, using both manual and automatic techniques. For example, productive users in Wikipedia can be recommended by other users, promoted, and given more responsibilities. As another example, certain users of social networks highly influence buy/sell decisions of other users. Consequently, some work has examined how to automatically identify these users, and leverage them in viral marketing within a user community.[24]

CONCLUSION

We have discussed CS systems on the World-Wide Web. Our discussion shows that crowdsourcing can be applied to a wide variety of problems, and that it raises numerous interesting technical and social challenges. Given the success of current CS systems, we expect that this emerging field will grow rapidly. In the near future, we foresee three major directions: more generic platforms, more applications and structure, and more users and complex contributions.

First, the various systems built in the past decade have clearly demonstrated the value of crowdsourcing. The race is now on to move beyond building individual systems, toward building general CS platforms that can be used to develop such systems quickly.

Second, we expect that crowdsourcing will be applied to ever more classes of applications. Many of these applications will be formal and structured in some sense, making it easier to employ automatic techniques and to coordinate them with human users.[37–40] In particular, a large chunk of the Web is about data and services. Consequently, we expect crowdsourcing to build structured databases and structured services (Web services with formalized input and output) will receive increasing attention.

Finally, we expect many techniques will be developed to engage an ever broader range of users in crowdsourcings, and to enable them, especially naïve users, to make increasingly complex contributions, such as creating software programs and building mashups (without writing any code), and specifying complex structured data pieces (without knowing any structured query languages).

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