TWITTER, FACEBOOK AND TEN RED BALLOONS:

SOCIAL NETWORK PROBLEM SOLVING AND HOMELAND SECURITY

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ABSTRACT:

The winner of the Center for Homeland Defense and Security (CHDS) Essay Contest in 2010, this essay looks at how homeland security could benefit from crowd-sourced applications accessed through social networking tools such as Twitter and Facebook. Christopher M. Ford looks at the apparent efficacy of two such endeavors: the Defense Advanced Research Projects Agency's (DARPA) competition to find ten 8-foot balloons moored across the continental U.S. and Wired Magazine challenge to "find" author Evan Ratliff. Based on these and other crowd-sourced applications, Ford suggests that the U.S. government could utilize the internet and social networking sites to potentially solve an array of discrete problems through the active participation of interested citizens.

INTRODUCTION

On December 6, 2009, the Defense Advanced Research Projects Agency (DARPA) held a competition designed to, in their words, "explore the role the Internet and social networking plays in the timely communication, wide area team-building and urgent mobilization required to solve broad scope, time-critical problems."[1] The competition required participating teams/individuals to find "10 8-foot balloons moored at 10 fixed locations in the continental United States."[2] Just before the competition opened, the balloons were surreptitiously floated at random locations in nine states, including: California, Tennessee, Florida, Delaware, Texas, Virginia, Arizona, Oregon, and Georgia.[3]

The winning team, comprised of five students from the Massachusetts Institute of Technology (MIT), found all ten balloons in less than nine hours. Their performance roundly beat the other 4,000 participants in the challenge and shocked DARPA, which had scheduled the competition for two weeks. Incredibly, the team learned of the competition only four days before it started, and in less than two days they had a plan, a website, and more than 5,000 signed up to help them.[4] They then applied that network to an extraordinarily complex problem spanning the United States. The results were shockingly accurate and swift. The significance and potential application of their system is remarkable. In a period of less than one week, five students constructed a productive, precise, layered, networked enterprise involving thousands of citizens. This essay proposes that the U.S. federal government apply the techniques developed by the MIT team into a

nation-wide program designed to address discrete security issues.

The "New" Models: Social Network Problem Solving

Naturally, the system developed for the DARPA challenge does not perfectly correlate with all homeland security challenges. For example, the system would do little to physically capture a wanted individual. The system could, however, be used to locate a wanted person. It could also be applied to assist in securing physical sites, borders, cyberspace, and infrastructure. The team leader, Dr. Riley Crane, speculated on a broad range of possible applications:

> Can we use this technology we've developed to find missing children or something along those lines where there's an incentive for people to really participate and help out? Often, the police will offer a reward for finding a missing child. Can we restructure that in a way that we tap the vast resources of this network? . . . Or during an emergency, maybe we need to find 10 people in a region who can operate heavy machinery, maybe a building collapsed.[5]

This approach to problem solving is potentially expansive. Indeed, the tool is so broad and powerful, that it is difficult to pigeonhole individual uses. Suffice to say, the potential application extends to any defined, discrete issue/problem.

At the core of the system is its incentive structure, which was structured to encourage the development of a large network of interested persons. DARPA offered a total of $40,000 in prize money. The MIT team allocated this evenly between each of the ten balloons, giving each a "value" of $4,000. They gave $2,000 to the person who found each balloon. This was hardly unique; most other participating teams offered some sort of reward for finding balloons. What set the MIT team apart is that they then gave a $1,000 to the person that referred the balloon finder to their website (assuming there was a referral – if there was no referral, the finder received $2,000 and the other $2,000 went to charity). Then they gave $500 to the person who referred the referrer, $250 to the person that referred them, and so on. This diffuse incentive structure essentially propagated itself over existing social networks: people were incentivized to get as many friends working for the MIT team as possible – almost like a pyramid scheme. The speed with which this propagated itself is remarkable. Each of the five members of the team sent out an e-mail explaining the competition and the incentive structure. Within forty-eight hours, they had 5,000 people signed up to assist them.

Another interesting modern illustration is the Vanish Competition presented in an article in the August, 2009 edition of *Wired Magazine*.[6] The competition accompanied an article by Evan Ratliff, which examined instances in which people had attempted to make themselves disappear. The competition had Ratliff go into hiding for thirty days. During that time, he traveled around the United States in disguise, not making contact with family, friends or editors. He ditched his cell phone, credit cards, and online accounts. He used physical disguises and masked his movement and communications online using various technical tools.[7] A $5,000 prize was awarded to the first person to identify

Ratliff, take his picture, and say the word "fluke".

Almost instantly, thousands of people became actively involved in the hunt. The participants self-organized into dozens of teams, pooling resources to find Ratliff. The teams and individual participants extensively used social networking tools such as Facebook and Twitter to connect and share information. It took twenty-five days for a team to track Ratliff down on a street in New Orleans – more than 2,000 miles from where he started. Throughout his time on the run, Ratliff continuously checked up on the social networking sites to track the trackers. He was eventually caught by team members who were able to identify him online and hack through the measures he had set up to protect his identity. Other team members, physically located in New Orleans, approached him and ended the contest.[8]

The Vanish competition provides several lessons which affirm the lessons learned from the DARPA challenge. First, thousands of individuals can be incentivized with a fairly small monetary incentive. Though the incentive function was slightly different in the two competitions, both rely on social network mechanisms. In the DARPA challenge, the incentive structure was self-propagating. In the Vanish challenge, the monetary incentive sparked the creation of teams and social networking groups. Once sparked, the teams appear to have developed a strong social cohesion – individuals likely became interested in participating and assisting because they wanted to help the group. For the technically-oriented members of the team, professional pride may have been a strong motivating factor. One member would come up with a clever way to track Ratliff's movements through FaceBook, and another would respond by improving the tool. This highlights another important lesson learned: not only did teams form naturally, a seemingly efficient division of labor developed as well. In both challenges, existing social networks were used extensively to share information towards the completion of the challenge. Finally, the winning team in the Vanish challenge was able to find Ratliff despite abundant misinformation provided by both other teams and Ratliff himself. The team devised a way to vet information and team members, thereby guaranteeing the accuracy of information received from team members.

Crowd-Sourcing Applications

The DARPA and Vanish challenges incorporate many of the mechanisms seen in popular crowd-sourced projects. The term "crowd-sourced" is a generic term applied to describe projects whose design and construction are implemented by a community of people rather than a single corporation. The internet is replete with websites dedicated to crowd-sourcing individual items or services. The concept has been successfully applied to the design and sale of t-shirts (Threadless),[9] cars (Local Motors),[10] and small consumer products (Quirky).[11] It has also been used to write computer programs (Linux)[12] and make loans (Kiva),[13] and in a host of other applications.

For instance, at Quirky, individuals submit inventions that they would like to see developed. The members of the

Quirky community vote on each project. Aspects of the project are then completed by experts in their respective fields (e.g., a professional graphic artist does the graphic design, a mechanical engineer designs the item's mechanics, etc.). Inventors receive a percentage of all sales, as do members who worked on a given project. Further, individual members are publically recognized when the product comes to market. The Quirky online store shows a breakdown of which members get how much of the money spent on the item. The incentive structure for participation – at Quirky and other crowd sourcing sites – is both monetary and social.

The "Old" Models

To fully understand the potential of the new social media models, it's useful to look at traditional systems that seek to employ broad public support towards a single public goal. Crowd-sourced applications have existed for years. Perhaps the most well-known mechanism is the FBI's "Most Wanted List." The list was created in 1950 as a mechanism for enlisting the public's help in capturing the most dangerous fugitives.[14] Over sixty years, 494 fugitives have been listed.[15] Of those, 463 have been captured – an impressive statistic.[16] However, of those captured, only 152 (or 32 percent) where captured as the result of direct public cooperation.[17] This is hardly a commendable success rate given the fact that the list is perpetually displayed in more than 30,000 post office locations throughout the country, online, and integrated in radio and television campaigns.

One of those campaigns has been to integrate the "Most Wanted List" with another traditional mechanism for applying public participation to solve a public safety problem: the television show *America's Most Wanted*.[18] The show has resulted in the capture of approximately 1,100 wanted persons over the course of approximately 1,000 episodes.[19] The show (recently at least) averages six million viewers per episode; given the cost of production and advertising, this is not necessarily the most efficient method of capturing criminals.[20]

Though popular, *American's Most Wanted* is "old media." People watch the show, but they are not *vested* in the show; a certain percentage of the viewership is simply watching for entertainment. This type of crowd-sourced application is different from the newer applications in that people can passively participate (watch and be entertained without engaging). Perhaps recognizing that the social network structure used in the "new" models of crowd-sourcing are more effective, *America's Most Wanted* has made efforts to establish itself in the social network universe. At the beginning of 2011, their Facebook group has approximately 137,000 members, and the Tweet feed for the show has 3,400 followers.[21]

NATIONAL SECURITY APPLICATION

It could be argued that the social networking model of problem solving is not as efficient as it appears. In both the Vanish and DARPA challenges, there were hundreds of unsuccessful teams.

Each unsuccessful team logged countless hours and expended prodigious talent and energy, with no apparent benefit. While it's true that the losing teams gained little personal benefit – they didn't win a prize – the system gained significant benefit from their participation.[22] The potential strength of the social networking model of problem solving lies in the sheer volume of participants.

The Balloon Challenge and Vanish Challenge suggest that with little funding, *de minimis* incentive, and a strong social cohesive element, individuals can create efficient, layered, and accurate organizations that are able to accomplish complex objectives. Applying these systems to homeland security is a natural development.

Critics of the social networking approach would argue the system could be easily corrupted. Individuals targeted by the system could manipulate the system by providing false information. This critique presumes the targeted individuals would be aware that they (or their activities) are being publically hunted. As an initial matter, individuals may never realize they are being sought. They are simply not paying attention, or they don't realize they are part of the enterprise being targeted. Or, just as likely, sought individuals may be reluctant to corrupt the system because they are concerned about digitally revealing their location. Indeed, this is precisely what led to the discovery of author Evan Ratliff.

The MIT team anticipated the issue of system corruption and developed a tool to allow them to quickly cull through tremendous amounts of information and a great deal of misinformation (intentional and unintentional). During the first hours of the competition, many of the 4,000 teams engaged in misinformation campaigns designed to obfuscate and confuse their opponents. The MIT team employed an undisclosed technique which allowed them to identify fact from fiction. Their success evidences the application of an extremely successful tool which was able to manage and verify, or discredit, vast amounts of information. Such an application is critical to the success in the use of social networks in homeland security applications.

The DARPA and Vanish challenges both illustrate the power of the social networks when applied to discrete problems. When properly constructed, tools can harness the power of social networks towards a singular goal. They have the potential to do this with alarming efficiency and speed. Socially networked problem solving is not (for the most part) purely altruistic. There must be some incentive in place to facilitate involvement and action. The incentive may be monetary or social (e.g., earning respect from cyber peers), or a combination of the two. The incentives need not be robust; both DARPA and Vanish demonstrate that complex goals can be accomplished with only the smallest of incentives. The most powerful incentives combine social and monetary elements, and are structured so that they self-propagate.

The U.S. government can, and should, apply the principles underlying these programs to a homeland security paradigm. Most obviously, these models could be used to locate wanted individuals – criminals, witnesses, persons of interest, individuals with particular skills, etc. This functionality, however, barely scratches the proverbial

surface of the myriad of homeland security applications, both physical and cyber. For instance, a challenge could be issued to find the security flaws in a given government website. Or, programmers could be issued a challenge to build a website for a particular function.

The modern models created for the challenges can be successfully adapted by the government *if* adapted properly. The models share three commonalities which contribute to their success. First, they are simple programs utilizing existing technologies (e.g., simple web pages, Twitter, Facebook, etc.). Second, the models are structured to answer a single discrete question (e.g., where are the balloons?). Third, the models are fueled by their powerful incentive structures. Indeed, a government program would further benefit from another equally powerful incentive: patriotism.

A simple website, integrated with social networking sites, issuing discrete challenges, and offering small cash rewards – in short, a properly structured program has the potential to solve an array of discrete problems using a vast and powerful enterprise of active, engaged, and networked citizens.

ABOUT THE AUTHOR

Major Christopher M. Ford currently serves as the group judge advocate, 1st Special Forces Group (Airborne), U.S. Army. His work has published in a number of journals, including Military Law Review, Military Review, Parameters, and The Army Lawyer. Major Ford received his Juris Doctor from the University of South Carolina and his bachelor's degree from Furman University. He may be contacted at christopher.ford@soc.mil.

[1] Defense Advanced Research Projects Agency (DARPA), "DARPA Network Challenge," https://networkchallenge.darpa.mil/Default.aspx.

[2] Ibid.

[3] Ibid.

[4] Lance Whitney, "MIT Floats Ideas in DARPA Ballon Challenge," *CNET News* (December 8, 2009), http://news.cnet.com/8301-1023_3-10411211-93.html?tag=mncol;title.

[5] Ibid.

[6] Evan Ratliff, "Author Evan Ratliff is on the Lam. Locate Him and Win $5,000," *Wired Magazine*, August 2009.

[7] Evan Ratliff, "Writer Evan Ratliff Tried to Vanish: Here's What Happened," *Wired Magazine*, November 2009.

[8] Ibid.

[9] Threadless, http://www.threadless.com.

[10] Local Motors, http://www.local-motors.com.

[11] Quirky, http://www.quirky.com.

[12] Linux, http://www.linux.org.

[13] Kiva, http://www.kiva.org.

[14] Federal Bureau of Investigation (FBI), "The FBI's Ten Most Wanted Fugitives Q&A," http://www.fbi.gov/wanted/topten/tenfaq.htm#11.

[15] Ibid.

[16] Ibid.

[17] Ibid.

[18] Ibid.

[19] America's Most Wanted, http://www.amw.com/.

[20] In this regard efficiency is judged as the cost versus benefit, where the "benefit" is the criminals captured, and the "cost" is the volume of persons watching and the production costs. This rudimentary calculation of efficiency does not take into account the fact that America's Most Wanted exists for a purpose other than to catch criminals. At base, it is a television show which provides an entertainment benefit, generates revenue for the network and advertisers, and employees a significant number of person.

[21] Twitter, http://twitter.com/1800crimetv.

[22] It could be argued that even losing teams benefit from an opportunity to hone their professional skills and make professional contacts within their respective industries.