

ACM's Computing Professionals Face New Challenges

Technologists can make a difference on so many critical fronts.



The ACM community is in a position to take a leadership role in responding to the challenges brought by last fall's terror attacks. Some of us have already been contacted to

contribute designs for improving security at airports, verifying identity at check-in, or redesigning cockpits to give more options to pilots and ground controllers. Others will be asked to redesign systems that trace financial transactions across international borders or examine email patterns among loosely affiliated groups. These efforts win the broadest support when our decisions about how to pursue safety and security are coupled with a strong defense of civil liberties and privacy.

I hope the ACM community will show inspirational and international leadership by stepping forward in this time of international transformation. It can do more than respond to requests for help; it can initiate innovative computing-related efforts to serve the needs of citizens in developed and developing nations. ACM members have relevant expertise that could be focused to develop sociotechnical systems that prevent terrorism, cope more effectively with attacks, and eliminate the circumstances that breed support for terrorist movements. Some efforts will have immediate payoffs; others are longer-term investments in transforming infrastructures at home and abroad.

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sary tradeoffs that sacrifice too many of our valued liberties. We can also promote clear goal statements with measurable criteria so that we can gauge improvement and understand costs. Finally, while promoting sociotechnical solutions, we need to recognize the importance of human participation and responsibility in any system, and to be wary of unrealistic claims by technology promoters.

I propose four challenges:

- 1. Prevent future terrorism.** Initiate internal discussion about how information and communication technologies can contribute to public safety by preventing terrorism while preserving the values of open societies. ACM should join other professional societies (for example, IEEE, AAAS, and IFIP) already discussing the pros and cons of national identification cards, refinements to existing identification methods, and other security topics. We can contribute to discussions about how improved sociotechnical systems can reduce the dangers of false positives in face recognition, biometrics, baggage checking, and biosensor networks. We can help clarify the utility of authentication (verifying registered individuals) compared with the difficulties of surveillance (broad searches based on profiles). Then we can work to determine if there are sufficient benefits to narrow-focus monitoring technologies, for example, scrutinizing selected email authors, identifying suspicious financial transactions, and comparing airline manifests against watch lists. Innovative solutions might avoid the tradeoffs we abhor. An even more positive outcome would be to improve transparency by increasing citizen rights to access,

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update, and view the usage logs of their financial, travel, or other records.

A systematic approach to terror prevention might emerge by developing process models of how terrorists act: from their recruitment, training, choice of targets, travel plans, border crossing, gaining identity cards, local preparations, and then their implementation. Interrupting this form of supply chain might be accomplished by more active early interventions and by repairing a nation's vulnerabilities. Modern information visualizations, already used by some law enforcement agencies, could be extended to support terror network activity analysis. Better tools could facilitate investigators who sift through the hundreds of thousands of citizen tips and other leads that emerge during investigations and interceptions.

Cyberterrorism is a specific threat we are most capable of dealing with. ACM should encourage increased research and raise the national priority of virus prevention software, server protection technology, and network reliability.

2. Strengthen communities. Strong communities would be more vigilant to threats, generate greater cooperation during attacks, and be more coordinated in coping with man-made or natural disasters. Since computer-mediated communications systems are a key technology, ACM can promote research conferences on open, yet safe, discourse methods. Such systems could strengthen physical communities by enlarging shared understandings and the common ground on which generalized reciprocity—the willingness to help others—flourishes.

Firefighters and law enforcement organizations that have well-developed experience with appropriate communications technologies are more effective in times of crisis. Responders to natural disasters, such as the Red Cross, have refined strategies for using communications tools to coordinate prompt

and effective action. Better systems for interagency communication systems that also respect the unique needs of each agency while giving credit and clarifying responsibility could increase cooperation.

Communicating is difficult enough with cooperative participants, but even greater challenges involve building systems that support users with opposing viewpoints. The ability to sustain consensus building leads to agreed-upon courses of action. Technologies to facilitate rational discourse would build public trust by enabling users to verify claims, limit disruptive rumors, provide summaries for newcomers, and record decision processes and votes.

We need to understand how to build more effective online communities that are safe places for constructive discussions. Improvements might include better authentication of senders (or controlled anonymity), mechanisms to support broad participation (turn-taking, required responses), and appropriate moderation tools (to filter out flames and off-topic notes).

How can information be made more trustworthy, especially in times of crisis when rumors and misinformation may circulate rapidly? Trust is the key to public confidence and constructive cooperation. Can we measure progress as designs of these socio-technical systems are improved? Are there best practices that can be drawn from existing systems?

3. Broaden participation. Develop design principles for universal usability to achieve broad participation in information and communication technologies. Broad participation can help encourage activity among community groups to increase their vigilance and cooperate in times of emergency. In designing systems we find that diversity promotes quality; designing for and testing with multiple user communities often results in higher-quality products for all users.

To promote participation in the information society, ACM can do a great deal to ensure that new designs accommodate a diverse set of users (novice and expert, young and old, well-educated and poorly educated, coming from different cultures and using different languages). Equally important, ACM members can expand their efforts to accommodate a wide range of technologies, including slow and fast networks, old and new computers, desktop and portable devices, and small and large screens. Further projects would expand efforts to convert Web sites from text to voice or from one language to another. A key contribution could be increased research on online help, tutorials, helpdesk services, and other methods to bridge the gap between what users know and what they need to know.

The international dimension is important, but even within a single country there is a need to accommodate poorly educated users, poor readers, and those with low motivation. How can we foster research on the impact of technology in different cultures to understand how to design sociotechnical systems more responsive to different cultures?

There is strong evidence that open systems, such as Linux, offer alternative social mechanisms that generate a high degree of participation, pride, and protectiveness. The diversity and breadth of the Linux developer community intensifies its devotion to building better and more secure systems. Can it be true its commitment to openness in code and discussion generates greater robustness? Can we derive principles from such software development experiences that apply in larger social spaces?

4. Reduce inequities. Since terror and violence often emerge from troubling inequities, ACM should encourage appropriate infrastructure development for information and communications technologies in all countries. Many citizens are in desperate need of food, safety, or medical care. They don't need computers, but the organizations that can help them could benefit from improved technologies that operate in difficult physical and social environments. Lower-cost computer technology, such as the proposed Indian simputer (a simple low-cost, yet

rugged machine for high-volume production) or Brazil's plan for building an information society should receive strong support from ACM members. Brazil's Rodrigo Baggio has fostered a network of almost 400 community centers in which access, training, and cooperation in technology are successfully practiced.

Software designs for developing nations would have a core set of reliable services whose instructions and help were written so they could be translated easily to multiple languages (much like what Caterpillar does for its construction equipment). Installation would be simplified and updates would guarantee backward compatibility. This would require substantial research, development, and testing, but it is a worthy and realizable goal.

Conference reports, Web sites, and publications featuring pilot projects that refine technology for disaster relief, community centers, and health clinics would provide better understanding of best practices. Improvements to educational facilities, local news sources, and networked communities in developing nations might be the best long-term hopes for economic growth and social improvement. Lessons from these projects also apply to the developing regions of the developed nations.

There are international development organizations already promoting technology projects and engaging computing professionals as volunteers or paid staff. The United Nations Development Program is at work on projects to which ACM members can contribute: democratic governance, poverty reduction, crisis prevention and recovery, energy and environment, and HIV/AIDS prevention/treatment. Other agencies include the UN's Information Technology Service; the UN's Food and Agricultural Organization; UNESCO's Management of Social Transformation (MOST); Volunteers in Technical Assistance (VITA); United States Agency for International Development; The Global Tech Corps (U.S. State Dept Program); Ashoka (international social entrepreneurs); and British Partnerships Online.

Initial versions of Web sites on these four challenges have already been established:

www.hcibib.org/preventterror
www.hcibib.org/communities
www.hcibib.org/participation
www.hcibib.org/development

Conclusion

The descriptions of these four challenges provide starting points for discussion and refinement. They may lead to promising technologies that would not only prevent some immediate terror threats, but also reduce the feelings of estrangement and alienation that raise sympathy for terrorism. Sociotechnical systems that respect human values, support economic development, and promote political participation can convert willingness to destroy into energy for development. Wherever poverty, civil war, and oppression limit aspirations, appropriate sociotechnical systems could be useful tools for those who strive to make their countries better.

These four initiatives could be launched immediately by electronic discussions within ACM and its varied special interests groups, which in turn may lead to panel discussions at conferences (such as SIGCHI where such discussions are already on the agenda for its upcoming CHI2002 conference in April). Moreover, ACM press releases could describe our initiatives and identify ACM members who would speak to the press or policymakers.

ACM could focus attention on these initiatives by

ACM Outreach Possibilities

In response to terrorism, ACM can focus its energies internationally by

- Establishing internal electronic discussions;
- Encouraging ACM conference organizers to directly address such issues as preventing future terrorism, strengthening communities, broadening participation, and reducing inequities;
- Developing informative Web sites on selected topics;
- Promoting research funding from corporate and government sources;
- Issuing position statements and press releases about these activities; and,
- Educating policymakers, business leaders, and the general public.

proposing new topics for existing conferences as well as initiating entirely new conferences. Indeed, a truly ambitious effort would be a conference on information technologies in developing nations. The USACM (www.acm.org/usacm) should be commended to bringing ACM's positions to the policy community, and their experience will help in presenting ACM expertise to other arenas.

To support the four initiatives, ACM should encourage more research and development on these topics from universities, corporate sources, and government agencies. ACM might offer student fellowships in these areas and honor professionals who volunteer with appropriate organizations. Since ACM is an international organization, its white papers might be directed at funding agencies such as the U.S. National Science Foundation, Asian sources, or the European Commission. Letters signed by ACM in cooperation with other professional societies would have greater influence.

Skeptics may argue these problems are not primarily issues of computing technology. This is true, but appropriate sociotechnical systems can be part of the solution. Others will point out that terrorists can also benefit from advanced technologies. This is certainly a risk, but by our visible efforts in building constructive applications, we can do our part to shift the balance toward positive outcomes. Computing technology has been used for military applications, but it is also crucial for peacekeeping efforts such as detecting underground explosions, which helped bring about the Nuclear Test Ban Treaty.

These challenges may not attract every ACM member, but for those willing to respond to them, the Association should be a source of support. New ideas often take time to be widely accepted. Our contributions to constructive solutions to these serious problems will inspire others. The ACM community will be remembered for its role in increasing security and reducing social and economic inequities. This is our time to step forward and lead the way. **C**

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