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Straining communications systems to the limit.

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BODY:
WHEN tragedy strikes, people want to communicate -- immediately and copiously. After the attacks on the World Trade Center and the Pentagon, how well did our publicly available communications networks perform? So far, the reviews are mixed. And there are lessons that the public, communications executives and policy makers should learn from.

The star performers were online: e-mail, instant messaging and bulletin boards. But Internet news sites and the wired and wireless telephone networks could stand improvement. And it is clear that there need to be new ways to set up emergency information systems. Within minutes of the attacks, traditional telecommunications were stretched and overloaded. In New York, the collapse of the towers took out a big telephone switch and nearly a dozen cellular antenna sites in Lower Manhattan, but that was only part of the problem. Phone networks are not so much destroyed as congested into uselessness.

Phone traffic more than doubled for many routes. Cellphone calls often quadrupled. Long-distance service on the East Coast often became an ordeal for voice callers, though it worked well for data traffic.

As long-distance travel ground to a halt, communications use rose. Long-distance phone companies pleaded for people to make only essential calls, and gave priority to outgoing calls from emergency areas. Some people learned how to beat the system by calling collect, which often worked, but at a price. Others were left wondering what had happened to the network capacity glut to which Wall Street analysts had attributed the poor financial performance of long-distance companies.

International communications experienced the greatest problems. Trans-Atlantic telephone traffic from Britain was reportedly 10 times its normal volume. Less than half the telephone calls from Finland to the United States got through, and only about 10 percent of calls from Sweden and Taiwan. Even with the vast increase in international communications capacity over the last few years, other bottlenecks evidently remain.

No network can be economically designed for extreme load spikes. Nor would it be conceivable to jack up prices in the midst of tragedy to ration the existing capacity, when callers are least sensitive to economic signals.

The better alternative for sudden spikes is to rank the priorities of various types of traffic, and divert the lowest-priority communications to other network providers that may have excess capacity, or to other types of networks. For example, voice calls that cannot get through could be replaced by voicemail messages that could be converted to compressed digital files and delivered as conditions allow.

Cellphones were put to heroic uses, from under the rubble and from hijacked planes. Rescuers were issued free ones to aid their efforts. It seems hard to imagine how after this experience people would ever want to step out without their electronic security blanket. But cellphones also showed limitations, as people walked down city streets, cellphones glued to their ears, tears in their eyes, but frustration on their faces as they encountered busy signals or no signals at all, or eventually ran out of battery power.

In Manhattan, many resorted to pay phones, which seemed to be mostly working, demonstrating the importance of such an old-fashioned backup system. And making pay phones temporarily free of charge in New York was a nice gesture by Verizon.

But the chronic problems of getting through wirelessly demonstrated the need for more spectrum capacity on urban cellular networks -- something the carriers have been trying to obtain through a federal auction process that has hit numerous snags in Washington, leaving the United States behind Europe and Japan in telecom mobility. Yet even if the carriers do eventually receive more wireless spectrum space, they need to institute a better emergency priority system. One solution might be for the industry to adopt a contingency plan in which, during emergencies, carriers could automatically cut off mobile calls after a certain number of minutes. Cellphone text messaging might also become a more popular feature; the day of the disaster, brief text messages sent wirelessly typically made it through even when wireless voice calls did not, because such messages take up much less of the network's carrying capacity.

These experiences also suggest that consumer organizations or others should test the traffic-jam vulnerabilities of different networks, so that individuals can make intelligent choices when they sign up for service. One day, their life may depend on it.

Private business communications networks performed quite well. Financial firms and big companies are sophisticated users of information. Their data is backed up, and their networks are configured to adjust instantaneously to emergency conditions. Thank you, hackers of the world, for having kept everyone on their toes. But we need still more work to protect ourselves against cyberterrorism and information warfare that aims more deliberately to disrupt communications and data.

With the Internet, the experience was mixed. The high-capacity backbones functioned well, if slowly at times. Making voice phone calls over the Internet worked surprisingly well. But the Internet showed its limitations as a mass medium, when the masses logged on, as the most popular news Web sites were all but inaccessible in the first hour after the trade center attacks.

The lesson is that if one wants to rapidly provide information of interest or urgency to millions of people, more or less at the same time, two great technologies are readily available. They are called broadcasting and cable. Afficionados of news Web sites may protest this characterization, but during peak need-to-know periods, Net news sites are less efficient. In the early going, the sites may best serve specialized audiences, or people for whom broadcast news sources are not available or are inadequate.

Where the Internet excelled was in e-mail, instant messaging and bulletin boards. E-mail messages may have sometimes taken longer than usual to arrive, but they typically did arrive. And they diverted billions of voice calls from the long-distance telephone networks, freeing up vital network capacity. A five-minute voice phone call consumes as much transmission capacity as about 4,000 e-mail messages of typical length.

The Internet's singular contribution was bulletin boards. People posted news that they were well, or said how they could be reached. Other boards listed unofficially the names of people reported missing. Still others included requests for help locating missing friends and relatives -- postings that were hard to read with dry eyes.

The emergence of these Net tools and practices provides lessons for the future of official emergency communication systems. It is time to revise the basic emergency communication philosophy of official public-safety agencies, which have traditionally employed military-style chains of command in which information is coordinated before being released to the public.

A similar philosophy also permeates the federal Emergency Alert System (formerly known as the Emergency Broadcast System), in which official bulletins are being issued over all broadcast stations and cable systems (though not Web news sites). The system might be useful in sounding the alarm when the population is facing imminent missile strikes, tsunamis or radiation leaks. But it cannot (and did not on Sept. 11) do much by way of coordination once the calamity has struck.

A more effective approach would be to adopt Internet practices and technologies and supplement the 911 emergency telephone service by what might be called an "811" system. By dialing 811 over telephones, cellphones or computers, individuals would gain access to a regional "emergency portal" with links to a variety of official, nonprofit and ad hoc Web sites that spring up during a crisis.

Much of the information would also be available to distant parties, thereby reducing the workload on telephone hot lines that are chronically busy when they are needed most. Such a service could be used to give news organizations detailed data and sources, could link worldwide donors with actual needs and provide access to specialized databases -- on how to deal with toxic substances, for instance. When necessary, secrecy of data could be controlled through special levels of access authorization.

In fact, the aftermath of the World Trade Center disaster shows that such a system is emerging spontaneously on the Internet. But the public agencies are still far behind the public in making use of this medium and contributing much to it beyond official announcements.

The data packets of the Internet find their own way around disasters, just as their creators in the 1960's envisioned when they financed the development of the Internet's precursor to deal with an earlier threat -- Soviet missiles. Technology is not the solution to the problem of terrorism. But what we have seen in the last two weeks is that the multifaceted communications system is more resistant to attack than skyscrapers.
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GRAPHIC: Drawing (Igor Kopelnitksy)

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