Knowing NGO communication capabilities and how they collect and use information is essential to understanding how they operate in support of humanitarian assistance and disaster relief (HA/DR) emergencies.

Communications are essential during emergencies. NGOs must be able to relay and receive information about constantly changing conditions, needs, operational challenges, and warnings. During emergency operations, information is not only extremely valuable but highly perishable. Timeliness, clarity, and effectiveness of communications are critical when lives are at stake. As a result, NGOs rely on technology to function and perform well.

Within the international community, the collective technical infrastructure of hardware, software, and telecommunications is often referred to as information and communications technology or, more simply, ICT. Many NGOs perceive ICT as an important tool to optimize operations and conduct information exchanges.

This chapter provides a basic overview of NGO information management techniques and constraints along with an inventory of ICT tools commonly used by NGOs. Overall, the intent is to bring about an increased awareness of an NGO’s capacity for using technology to gather and share information and communicate during an emergency.

Information Management

NGOs are independent entities that manage a variety of programs in emergency settings. They require a broad base of information to secure appropriate resources and carry out operations in harmony with many other organizations. They depend on a variety of information:

- weather and geographical conditions
- political, social, and economic developments in a region

Executive Summary

- NGOs use a vast array of technology and communications systems to manage emergency operations.
- NGOs almost exclusively use commercial off-the-shelf (COTS) products that any civilian can readily obtain for a minimal outlay.
- NGOs implement field programs using satellite and cell phones, and manage intricate Internet networks designed specifically for multisite applications.
- Software packages that specifically assist NGOs in their work in their early development, with very few projects reaching scale.
- Although technology is an integral part of daily operations for most NGOs, no two NGOs have the same communications and technology systems.
- Rarely do NGOs use true communications systems. Most often they use whatever technology is readily available to communicate from emergency settings, and the development of systems often depends on field conditions and operational tempo.
• market prices for commodities, transportation, and shipping
• NGO and UN activity
• military activity, plans, or violence
• population activity, numbers, movement, and trends
• internal logistical, security, and planning needs

NGOs collect data from a wide variety of sources including other NGOs, donor units in the field, military reports, newswires, local government officials, and even victims themselves. Because NGOs do not normally have the ability to obtain all the data necessary, they have an incentive to join into NGO associations to rapidly acquire additional information and facilitate information exchanges.

The quantity and complexity of information in many humanitarian operations can be overwhelming. This can make it difficult for NGO staff to digest, evaluate, and convert information into actionable data to ensure appropriate logistical, financial, programmatic, and personnel support.

The information a particular NGO seeks depends on its area of focus. A food-aid NGO will need to know about roads, port and airport operations, commodity prices, warehouse security, and shipment information. A health-care NGO, in the same emergency, may need to know about population health, immunization programs, local health-care facilities, mortality rates, medical supply stockpiles, and so on. And both will likely want the most current information available on factors such as population movements, epidemics, food aid movement, violence and battles between combating parties, displacement, weather, and the like.

**Information Flow and Decision-Making**

When an NGO enters an emergency, it must be able to exchange information internally as well as externally with the communities and countries involved in coordinating the relief effort. Also vital to any humanitarian operation is the need to communicate with donor agencies and the media to create public awareness of the humanitarian needs in a given area.

On arrival, NGOs begin communicating with other NGOs, UN agencies, police, fire rescue, and others to understand what programs are already being implemented, what areas are being covered, and what needs still exist. In areas of armed conflict, they seek military reports to obtain security updates, information about safety zones, seek convoy protection, and request logistical support.

Almost immediately, information begins flowing from the field up to regional or NGO headquarter offices to provide situational awareness of the location and movement of field staff as well as to provide information on needs. At the HQ level, NGOs normally post desk officers or program staff on specific emergencies to serve as the point of contact for field staff members. Field-based program officers often either report to the field-based management team (or person) or directly to the HQ desk officer. All communication coming from the field is often sorted through this one desk officer and then coordinated with appropriate personnel. HQ depends on field staff members
to send updated information, lists of needs and conditions so managers can make the appropriate resource allocations and decisions regarding effective interventions. Accurate and timely information helps fine-tune interventions, avoid costly mistakes and inappropriate use of scarce resources. Likewise, information from HQ also flows down to the field. The HQ office can assist field personnel with research, procurement, shipping and commodity management, financial management, travel arrangements, coordination with other NGOs, and donor relations.

Over time, coordination with private and individual in-country donors, private companies, diplomats and embassies (not donor agencies specifically), armed groups, rebel movements, citizen groups, civil society organizations (CSOs), and others often take up a large part of an NGO’s communication activities.

Given that communications between HQ and the field can be sporadic and the paramount need for swift and decisive field-level action, NGO management structures are designed to operate in a decentralized framework that empowers local decision-making. Country officers or other management personnel are trusted to act within the scope and capacity of the organization. Field staff armed with recent news and information, contextual knowledge, and program-specific strategies are believed to be best equipped to make fast decisions about where to move commodities, where to position personnel, who to partner with, and which grants to apply for.

As a result, the most critical need for effective information and communication capabilities in the field. Although NGOs have the ability to communicate and share information with others, they are selective as to whom they will engage—particularly in an electronic format. Many prefer face-to-face interaction, but also use e-mail, telephone, and fax to share information. Some will exchange information with military units but others will not out of concerns over the perception of real or perceived impartiality, neutrality, and independence. Preferences will need to be determined in the field on an NGO by NGO basis.

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**Application of Information & Communications Technology**

A response to a humanitarian aid operation is characterized by a large number of unrelated organizations descending simultaneously on a given location. To operate safely and successfully carry out their mission, NGOs not only need to receive information from a wide variety of sources, but also must provide information to others as well. Ensuring both the internal and the external flow of such information depends on an NGO’s ICT infrastructure.

Hundreds of NGOs throughout the world focus on emergency relief operations. Most NGOs use some type of technology to manage information and communications in what are often remote, chaotic, and unsafe areas. The types of technology used in a relief scenario are generally dictated by the phase of the emergency, type of mission, remoteness of the location, availability of network infrastructure, and the internal capacity and capabilities of the NGO to use the technology.
The following general examples of the types of information collected and how information and communications technologies are applied in the hours, weeks, and months of an NGO’s engagement in an emergency are representative.176

- At the onset of an emergency, the foremost requirement beyond rescuing and treating survivors is coordinating the relief effort. Relief organizations are busy conducting assessments and surveying damage. Descriptive information and pictures about conditions are transmitted to headquarters. Local communications capabilities are almost always destroyed, inoperable, or nonexistent after a disaster strikes, making the need for rapid provisioning of both voice and data communications is urgent. This stage tends to be characterized by highly individualized, highly mobile, temporary and transient computing, communications, and alternate sources of power like solar, battery, and so on.

- In the weeks ahead, as priorities shift from saving lives to preserving lives and additional personnel and supplies arrive, continuous infrastructure monitoring, disease reporting, comprehensive assessments, management of relief supplies, personnel security, applying and reporting donated funds, along with uploading case studies, pictures, and relief reports are all necessary. This stage tends to be characterized by mobile teams in conjunction with stationary personnel collecting data and delivering services. These transient and temporary operations require a combination of mobile solutions along with compact easy-to-set-up and tear-down computing resources, additional software applications, increased bandwidth capacity, faster communications, and more substantial power solutions.

- As further progress is made toward reconstruction and development, the focus is on delivering more services, building infrastructure, establishing warehouses to support supply and food distribution, water purification, and becoming a part of the community. At this stage, NGOs tend to operate out of more permanent fixed facilities with an ability to install more robust full-scale ICT infrastructures and stable and faster broadband communications and power solutions.

Although this description of the phases of a typical emergency scenario is general, the variability in how these phases evolve and what technology NGOs actually use is tremendous.

### Types of Technology NGOs Use

NGOs have been using technology since the earliest international humanitarian emergencies, have used the same types of equipment as host nations, and have often been on the forefront of technology when unique or especially challenging requirements have arisen. This continues today as NGOs become more sophisticated in accessing and leveraging technology and working collaboratively with other NGOs to achieve enhanced capabilities in specific regions.

NGOs depend on technology that is rugged, reliable, and affordable. Given advancements in private sector technology development, NGOs have many options and can adopt the latest technology without

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having to develop internally or invest heavily in specialized equipment. An example of this is the use of high-frequency radios (HF), very-high-frequency radios (VHF), laptop and desktop computers, and cell phones, all of which are readily available worldwide and can be repaired and replaced locally. At field sites from Afghanistan to Somalia, NGOs rely heavily on local suppliers and expertise to establish, manage, and repair communications networks and equipment.

During rapid onset emergencies and responses to resource insecure areas, NGOs bring most of the equipment needed to be self-sufficient for a limited period. Depending on the level of the emergency and proximity to cities with active commerce, NGOs may vary the amount of equipment they bring by procuring locally.

Although some NGOs may use hardware and software similar to the military's, their equipment packages do not undergo stringent information assurance review or operate on military-grade secure networks. NGOs therefore do not have the capacity to keep communications confidential or secure. Whereas military communications systems are designed to keep information secret, NGO communication systems are meant simply to work well. Little attention is given to securing data and information sent over digital or analog lines. NGOs do value the protection of data, of ideas, of proposal leads or contacts, but typically no major technology systems are in place to keep information encrypted or secure. Passwords on computers, Internet e-mail accounts, log-in prompts for websites and e-mail accounts and the like are more common than any other form of information security.

Depending on the type and severity of the emergency, various communications equipment will be deployed. For smaller NGOs, some communications equipment is prohibitively high in costs, whereas for larger NGOs, the newest and most advanced equipment can be procured and deployed.

**Technology Inventory**

NGOs use a broad range of technologies to manage information, conduct operations, and deliver services (see table 16.1). At the field level, the laptop and HF/VHR radio and satphone or cell phone are by far the most popular tools during emergency relief efforts. Internally, e-mail through cell and satellite phones connections is the most common way of exchanging data between HQ and field offices and is quickly replacing voice communications in even the most dire emergencies.

With the appropriate connectivity, ICT users can communicate point to point (that is, cell phone to cell phone) or access the Internet to expand their options:

- e-mail
- VOIP applications (such as SKYPE)\(^{177}\)
- intranets
- blogs
- social networks

\(^{177}\) VOIP (voice over Internet protocol) is a general term encompassing technologies that deliver voice services through the Internet rather than over traditional telephone lines or wireless modalities.
A more in-depth view of how NGOS use some of these technologies provides additional insight into current practice.

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**Hardware**
NGO staff members carry significant data with them at all times. They also generally use laptops in the field to record assessment data, findings, survey analysis, and then to write reports or analysis about humanitarian conditions. Laptops are easily connected to the Internet and data lines with modems or network cards, and e-mails and documents then sent anywhere. This makes an NGO staff member a vital part of a global operation and allows different program managers to easily exchange information, updates, and plans. Laptops are relatively inexpensive, easy to procure, and adaptable to a number of uses and conditions. They can usually be repaired or purchased in local markets worldwide. With the exception of officially sanctioned countries, there are generally no problems entering a country with
a laptop and other basic computer equipment. NGO personnel normally do not have difficulty moving such equipment within or out of an emergency-affected country or region.

Over the past several years, humanitarian workers have begun using hand-held, personal digital accessories (PDAs) for data collection, storage, and communication needs. PDAs are inexpensive and offer relief workers in the field a highly mobile platform for word processing, spreadsheets, e-mail, and database management. Although they are now quickly evolving to a new level (smartphones), PDAs are still commonplace in the NGO community.

**Handsets**

*Radio*. Despite advancements in global cellular service and satellite coverage, NGOs rely on legacy radio technologies to deliver much of the required connectivity. Radio services are extremely efficient and operational in all but a very few conditions. Radio communications are therefore often one of the first priorities in setting up communications infrastructure during an emergency.

High-frequency (HF) and very-high-frequency (VHF) radio systems are used extensively by the NGO community during an emergency. HF radio systems are used for regional and local communication, often connecting a base camp with refugee camp operations, a regional field office and trucks or satellite locations. Codan is now the more popular of services for long-range and mobile voice communications.

For shorter range communications, VHF radio systems are used. With line-of-site ranges of up to approximately 10 to 15 miles, NGO employees can carry small battery operated walkie-talkies. For extended distances in austere or remote locations, NGOs can extend radio reception with repeaters and relays that forward or strengthen signals. These are extremely useful during or following natural disasters, when existing communication infrastructure has typically been destroyed, and for regional communications.

HF and VHF signals are not secure and generally do not enable NGOs to communicate with military radio systems. Local governments often provide a portion of bandwidth for what is often called amateur radio or for emergency radio services. Often the UN will set up service stations and then monitor and regulate which NGOs can use which frequency channels, and in what quantities. Depending on the type of emergency response efforts, the UN may limit radio frequency use at nighttime to allow emergency-only communication to have priority.

If the UN or other coordinating body is managing the radio system for the humanitarian community, which is often the case, the UN and NGO community may use the radio to communicate new dangers, developments, meeting times, and other announcements along with the daily use of inter-NGO communications. Normally at least one channel is set aside for general announcement and monitoring purposes.
Satellite phones. Satellite phones are now extremely common among the NGO community, typically used to communicate in emergency settings or austere environments when no other local or international communication is available. If an NGO employee has a satellite phone, he or she can establish a voice, data, or even video connection to almost any similar connection on earth. Generally, only extremely harsh weather, service failure, or limited line-of-site can restrict the reception of a satellite phone. Per-minute charges are somewhat high, ranging from $1 to $3 per minute, depending on the type of data being transmitted (voice versus data, specifically).

Satellite phones are now (late 2009) extremely efficient and lightweight. The Thuraya is about half a pound and roughly equivalent to the size of a Blackberry. The Thuraya and similarly sized Iridium phones are used extensively throughout the NGO and UN community. The NGO price for a handset is about $1,000 and airtime services are available on a prepaid basis, further limiting the barrier to entry for these technologies. Because they can be used as phones and as data-forwarding devices, NGOs will use satphones for both voice communications and Internet use. NGO employees will often draft a series of e-mails while the satphone is offline and then send a burst once connected for short periods.

Satellite phones, unlike laptops or other generic computer equipment, sometimes require local registration when brought into a country. Many countries make it illegal to import such technology and will confiscate satphones from NGO staff members at the airport or port. Still, NGO use of satphones is increasing, and their value to communications systems in the field is extremely high.

Cell–mobile–smart phones. The explosive spread of mobile networks across the world along with the increased functionality of cell phones and smartphones is offering more opportunities for NGO use of these mobile devices. A recent survey of 500 NGO workers found that 86 percent are using mobile technology to do their work. Workers mainly use cell phones for voice, short-message service (SMS) text messaging but also take advantage of the ability to collect and distribute photos and video and to collect data. The main benefits described included time savings, the ability to accelerate the mobilization of resources and extend their reach. Most viewed the cell phone as having a positive impact on their work. Some called it revolutionary. Seventy-six percent of workers indicated they would be increasing their use of the cell phone in the future.

A rapid growth in mobile phone networks has been made possible by the proliferation of GSM (Global System for Mobile communications), now the global standard for mobile communications. According to the GSM Association, its networks currently cover 219 countries and territories serving more than 3 billion people.

Most cell phones are an inexpensive and efficient alternative to satphones or weak local telephone infrastructure. Cell phones can often be procured within an emergency setting, or in cities nearby that NGOs pass through or use as a procurement and travel hub. Cell phones are often cheaper per minute, less difficult to get, and often have a significant range that covers areas affected by disasters.
With advancements in open source smartphone technology, much of the initial promise of the PDA has now been passed on to these new more flexible handheld platforms. Smartphones such as the HTC G1 Android phone (Google Phone) and the Apple iPhone have great potential for providing an always-on, flexible, powerful, and readily available handheld computing and communications platform for NGOs. Intense development is ongoing, with particular focus on open source systems, on which NGOs, universities, and private companies can develop the next generation of humanitarian applications for mobile use without excessive licensing, deployment, and maintenance costs.

**Connectivity**
In emergencies, local phone lines typically are destroyed or not reliable. In most cases, NGOs obtain their communications equipment and capacities from private vendors or organizations dedicated to offering such services. A number of vendors serve the NGO and humanitarian community.

- A limited liability company (LLC) based in London, Inmarsat was the first and is now one of the largest providers of mobile satellite communications for individual and corporate use ([www.inmarsat.com](http://www.inmarsat.com)).
- The Iridium satellite constellation is a large group of satellites used to provide voice and data coverage to satellite phones, pagers and integrated transceivers over the earth’s entire surface. Iridium Satellite LLC owns and operates the constellation and sells equipment and access to its services ([www.iridium.com](http://www.iridium.com)).
- Codan Limited is a manufacturer and supplier of communications, metal detection, broadcast and electronic equipment, headquartered in Adelaide, South Australia ([www.codan.com.au](http://www.codan.com.au)).
- The Open Mobile Consortium (OMC) is a thriving community of mobile technologists and practitioners working to drive open source mobile solutions for more effective and efficient humanitarian relief and global social development ([www.open-mobile.org](http://www.open-mobile.org)).

In terms of long-term more robust communication strategies that incorporate the use of VSAT equipment—a type of two-way satellite connection—NGOs are required to work with government authorities for approval of satellite licenses, customs waivers, and so on. At times, deployment of this equipment can be significantly delayed or denied by host nations.

**Internet**
Some of the largest advancements in NGO technology have and will continue to be made online. With the increasing availability of high speed connections and the expansion of mobile-based services, media-rich, real-time data sharing, and voice-data communications will become easier and more reliable.

By connecting to the Internet through satphones, local telephone lines, Internet cafes, or shared UN or specialized service connections, NGOs can manage e-mail, exchange documents, store data, and even carry on live communications. In many emergency settings (some famines, rural floods, or fire), urban area infrastructure remains functional enough to support these avenues of communication. And when other, more established systems don't exist, Hotmail, Yahoo!, and other browser-based free e-mail providers are available to fill the gap.
If a city does not offer Internet connections over local telephone lines, NGOs must either use Internet cafes (if they exist), satellite connections, or long-distance connections to out-of-region ISPs that may provide service. In Kosovo, NGOs were using satphone data connections and dialing to Macedonia for Internet access much of the time until local ISPs cropped up within Kosovo. For most of Burundi’s history until 2001, only one ISP existed within Burundi, and service was often down. On the other end of the spectrum, in Kenya, Sudan, Afghanistan, and elsewhere, 3G mobile networks are available widely and can provide mobile broadband access at affordable rates.

Currently, Internet-based NGO management systems are in the works in a variety of forms. Microsoft and Google both have large teams developing applications and plug-ins for humanitarian use. Private sector technology consulting firms have also increasingly recognized the needs and market potential of the NGO sector. NGOs themselves have also begun to invest more heavily in in-house expertise and solutions for specific needs within the organization. Many NGOs create their own intranet that allows staff members to track e-mail, pay, job descriptions, pertinent intraoffice or organizational communications, and other information. Only a handful of the largest NGOs are using intranets that are truly functional for field-based employees.

Although NGOs exchange most information and documents by e-mail, an emerging trend using blogs and online social networking sites to create and exchange content and engage in peer-to-peer conversations. These tools have also been used by global activists to relay information and pictures about humanitarian crises when government-controlled internet and telecommunications networks have been heavily monitored or shut down.

### Power Supplies

Power supplies are critical for relief workers and NGO operations. Without power, communications can’t work.

After a natural disaster or during a complex humanitarian emergency, NGOs are often faced with a lack of electricity or power sources to keep communications technology running and the lights and heaters working. Computer equipment and radio and satphone terminals can operate on battery power for some time but will soon require recharging. For temporary power needs that may exist on a survey outing or assessment field expedition, NGO staff members may be able to tap the battery power of their vehicle. With 12 volts of power in many trucks, this is enough to keep a computer, satphone, or radio system working for hours at a time. With the engine running or turned on in intervals, the vehicle’s battery can stay charged and capable of powering other devices.

For more permanent operations in areas with no electricity, NGOs need to use generator sets. Generators are considered a main part of an NGO’s critical infrastructure for establishing and maintaining communications during an emergency. NGOs often attempt to procure power generators sets that run on diesel, and set them up near (but not too near because of noise and fumes) to their...
field office or facility. Portable generator sets can produce up to 3000 watts. Anything above this is too large to be considered mobile. Having more than one generator is a good idea for many NGOs because one is bound to fail. NGOs can normally keep generators running as long as fuel supplies are stable. Although gas-powered generators are lighter and cleaner, diesel can generally be found in more places within the developing world.

Over the past decade use of solar panels for back-up power to support 24/7 communications has increased. As solar technology has improved and cost has declined, solar installations are becoming more commonplace in rural settings that have no access to a reliable power grid. Solar panels can be found at hospitals, clinics, police stations, community centers, and NGO offices to provide a constant supply of power during outages or when generators are turned off for refuel or repair.

### Challenges in ICT Use

NGOs have varying capacities to use ICT based on costs and internal expertise. Given the lack of data standards and technical standardization of telecommunication packages, exchanging information efficiently is challenging.

**ICT Investments**

Although nearly all relief NGOs use some form of low-cost, commercially available technology as an integral part of daily operations at both the central office and the field level, very few are in a position to procure, implement, and sustain more advanced systems on an organization-wide basis.

Most of the larger international NGOs tend to use advanced technology more than their smaller locally based counterparts, though of course the degree varies considerably even across the largest organizations. This is in part because NGOs do not receive grants for infrastructure investment. Donors would rather see funding spent on direct aid to victims. Therefore, NGOs are under constant pressure to keep overhead costs down and generally spend less than 1% to 3% of operating revenues on ICT, which is below that of government agencies and other industry ICT investments. Underinvestment in ICT is also the result of decentralization, whereby NGOs often implement only what is necessary to keep field programs running.

Given inadequate infrastructure, NGOs ultimately depend on other organizations for assistance with technology and communications. For example, most NGOs are unable to host their own Internet service in-country and sometimes cannot even manage their own area-wide radio networks. Assistance from the UN, militaries, private-sector telecommunications companies, and others is essential. In many cases, smaller NGOs are often stuck when the power goes out, when phone lines are down, satellite phones don't work, or local radio systems are inoperable or nonexistent. Without redundant communication systems such as those of the government or military units, NGOs are often challenged with changing conditions. This is not always the case, of course, but it can leave an operation isolated.
**Lack of Standards**

Data standards for neither information exchange nor communication equipment within the humanitarian field have been established. Differences in data, systems, styles, and equipment often make communication one of the more challenging tasks during an emergency.

Although many forms of communications technology are manufactured to industry specifications and standards, there is virtually no standardization among NGOs as to what types of ICT they use or how and when those technologies are used. As noted earlier, every NGO is an independent organization. ICT technology platforms are often influenced by many factors unrelated to technology, not the least of which is using affordable or donated systems and equipment.

An ongoing dialogue within the humanitarian community focuses on information management and coordination practices between agencies. Although debate has been vigorous, little consensus has emerged on how to actually implement global standards and structures for communications and information management, especially because NGOs, UN agencies, and the like have vastly different management structures and capabilities. NGOs are ground-level operators that rely on fast, low-level staff decision-making, whereas UN and other donor agencies depend on a hierarchical structure of management with information coming from below and making its way upward for decision-making.

NGOs thrive on the flexibility of using various types of equipment and by not being burdened by protocol or requirements during complex, changing emergencies. Over the past decade, some standardization has occurred within some applications. Examples include standard VHF and HF radio networks for voice traffic and mobile assets. With the emergence and spread of cell phone use and a heavy reliance on data networks, this gain in interoperability may be short lived. This is not to suggest that NGOs and other operators in emergencies would not benefit from standardized equipment and communications platforms, but only that it will be some time before they achieve it.

### Conclusion: Emerging Trends for Increased Use of ICT

Although the humanitarian sector has lagged behind other industries in adopting technology, NGOs are increasingly becoming more sophisticated in their use of technology—particularly wireless technology such as mobile phones—and are openly collaborating with a range of partners.

To promote the expansion of technology and achieve uniformity of technology packages, some larger NGOs have formally joined consortiums such as NetHope. This type of organizing allows groups to pool resources and coordinate requirements in hopes of saving costs and maximizing benefits. Other NGOs are engaging in variety of partnerships with the private sector, academia, and other NGOs.

In summary, communicating with NGOs during an emergency may be difficult at times. This may be due to the lack of technology or a reluctance to interact with the military. No assumptions or generalities can be made about how to communicate with an NGO in any given situation. An approach and strategy will need to be developed locally and in the context of each emergency.