

Appropriate Response, when and where it is needed: Communications for Decision-making in Disaster Management.

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1. Introduction

News about natural disasters, terrorist attacks, and wars travel no faster than other news, but they attract the attention of a much wider audience - one needs not be a specialist in order to be touched by human suffering. And, at least for the mass media, good news does not sell.

The availability of real-time information about events at any point on earth affects the decision-makers on all levels in a number of ways. The following analysis will show that what telecommunications technology and services offer is not always appropriate for use in support of humanitarian assistance. While solving some of the problems, new technologies and their applications also raise new questions, some of which are not yet fully recognized, and even less understood.

With the massive increase of information, and with equally increasing commercialization of the entities, which create and handle it, information analysis becomes increasingly important. Information is a commodity, and as such is subject to the rules of supply and demand. The process of information confectioning starts on-site, where the observer concentrates his attention on those aspects of the event which are likely to interest the ultimate users of his product. Independently of its significance for the overall situation, a TV reporter will focus on the optically most spectacular detail, independently of its significance for the overall situation. In the same way other eyewitnesses will focus on their own priorities. This demand-driven selection process repeats itself throughout the information channels. Its final product will consequently reflect the agenda and the possible prejudice not only of the on-site observers, but of all those who handle or consolidate the information on its way to the ultimate user.

The above limitations apply in various degrees to all information available to decision-makers in crisis response. The usefulness of data available to the decision-maker is diminished by the subjective filters applied en-route. The resulting need for a potentially time-consuming process of re-establishing the best possible objectivity affects its real-time character. An increase of bandwidth all the way from

the event location to the information consumer does not change this situation; it only shifts the selection process to a later stage or a higher level.

The widespread availability of personal mobile communications has the potential to shorten the route from the event location to the "consumer" of information; but contrary to what one might expect at first sight, cutting out the middleman does not always facilitate the provision of an objective image. Verification of any and all information remains necessary, in particular if information is to be applied in a decision making process on issues such as provision of appropriate disaster response.

2. A Historical Perspective

Telecommunications have changed the way disasters are perceived. Information about many of the greatest disasters which ever struck mankind, have reached people outside the affected region only centuries, if not millennia later, when traces of such tragedies were discovered by researchers applying methods developed only recently.

Before the twentieth century, news about earthquakes, volcanic eruptions, storms and other dramatic events traveled far too slow to allow for what we know today as international assistance. Disasters were history, by the time they were brought to the attention of the world.

No longer so: In the 21st century, the news about an airplane crashing into one of the World Trade Center traveled so fast, that minutes later people in all continents were the horrified real-time eyewitnesses of the attack on the second tower. Equally fast was the response, nation-wide and world-wide.

The speed by which information travels is the decisive element in the response to a sudden-impact event. It determines the number of potential providers of assistance which can be reached timely, and thus may well decide how many lives can be saved.

The telegraph had brought the first dramatic change, initially for privileged regions, and gradually

for most of the world. The "telegram style", as a decidedly un-personal communications link with little bandwidth, ensured a certain degree of objectivity, until the telephone allowed to convey emotions by a live voice from person to person. The evolution of the "wireless telegraph" into voice broadcast established an inevitably emotional link from the site of a dramatic event to an ever-increasing audience. This development, from reporting facts only to relaying emotions, culminates in today's multi-media landscape.

The ever-increasing complexity of communications infrastructures results in their higher vulnerability, which is only partially compensated by a diversity of modes and networks. Systems of apparently totally different character, such as the public telephone network, television, and the Internet, depend, to a large degree, on the same, often centralized, multi-media telecommunication infrastructure. ISDN and the multiple applications of modern GSM phones are just two examples. The ever increasing number of users, most visibly that of subscribers to publicly accessible networks, results in overload whenever an unusual event takes place. The value of such systems for the provision of information to the decision-maker is thus reduced just at the time when they are needed most.

An only partial remedy for this problem was the introduction of global satellite communications over the past 20 years. A telecommunication satellite may be far outside the reach of, and immune to terrestrial disasters; it is, however, exposed to other hazards, and it depends on a sophisticated control infrastructure on the ground.

3. Delegation or Micro-Management ?

The initial responsibility for disaster preparedness, and, even more so, for disaster response, lays in any case with the local authorities. Human suffering can not be quantified, and whatever can be done to prevent or to alleviate it, will be undertaken by the ones who have the possibility to do so, independently of the overall dimension of the event.

On the local, personal level of response, information is solely first hand observation. The decision process is most commonly reduced to a brief and often purely emotional, consideration of risk versus chance of success.

On subsequent levels of response, the decision on what is needed is based on the size and character of the event, and the appropriateness of the response depends largely on the quality of information. Electric fire alert systems preceded public telephone networks in many cities. Providing no information beyond the fact that assistance is required, they did not involve a

remote decision process. An alert conveyed with more details, such as a telephone call to an emergency service, changed this. Today, the decision on appropriate response requires the analysis of increasing quantities of information not necessarily objective, received from observers not necessarily qualified.

The decision-making process becomes more complex with each of the higher levels of intervention. Whenever the means at the disposal of one service are not sufficient to cover the needs, information will have to be provided for the mobilization of resources available within a wider area - from community level to district or national level, from there to the regional and ultimately to international and global dimensions. Depending on hierarchical and administrative structures, either command-and-control or delegation of responsibilities will dominate. In either case the overall concept is predominantly vertical. In international humanitarian assistance, the site of an event may be linked to the headquarters of the assistance provider through a field office, an organization's representative in the capital of the affected country, and a regional office. Hierarchical layers within each of these entities, as well as their departmentalization, add to the complexity by creating organizational multi-path communication links.

The co-ordination of international humanitarian assistance in response to a major emergency involves not only the above mentioned levels, but typically a number of partners for each of them. The overall concept resembles a matrix formed by the horizontal lines of coordination within one level and the vertical, hierarchical lines within each participating organization. Decision making on each level must be based on vertical information flow as well as on horizontal consensus, with the latter, in turn, depending on the organization-specific and not necessarily identical information received through proprietary, vertical lines. Extensive work on this subject has been undertaken in recent years, and has resulted in co-ordinations mechanisms, which are still far from perfect.

Ideally, the vertical communication channels would provide the decision-makers on each level with exactly the type and amount of information which corresponds to the scope of their decisions. In practice, the capacity of the communications channels has a tendency to become a decisive factor for effectiveness of the system, and may negatively affect decisions made at the higher levels, through lack of information, or by encouraging micro-management by providing excessive amounts of details and non-consolidated data. A good example is faxing only locally relevant logistics data from the event site to the procurement section at headquarters. This service needs to know, what quantities of goods can be accepted, stored and handled within in a given period,

but is not concerned with the means used to implement these tasks locally.

The same applies for the flow of information, including instructions, in the opposite direction, when on-site disaster managers are either not sufficiently informed about the overall concept of the operation, or distracted from their primary task by the need to extract relevant information from non-essential, large-volume bulk information. An over-capacity and an under-capacity of the horizontal lines of communication have equally adverse effects on the decision making at each level. Such cases occur, when parallel activities are not fully coordinated on each level, or when key information is hidden within voluminous reports and appeals issued at headquarters' level.

Ideally, the communications network would be defined by the management structure and would thus support the decision making process, practically the capacity of the telecommunications links might take priority and lead to unintended and possibly undesirable changes in the latter. In international humanitarian assistance, this is caused primarily by lack of priority given by headquarters and donors to the funding of appropriate and fully compatible telecommunications.

A sound knowledge of available means of communication, of their uses and their limitations, is a primary requirement for a workable concept of coordination. While technical details are not within the scope of this analysis, some practical implications shall be considered in the following chapters.

4. Quantity versus Quality

From the above considerations it results, that at least theoretically, unlimited access to an ever increasing volume of data, as well as the technical capability to exchange information in a multitude of formats, is not by itself a solution to problems encountered in the process of decision making. Two practical examples may serve to illustrate this point:

Telemedicine, which has seen very rapid development over the past years, allows, among other options, the access to specialized information and the consultation of specialists by a medical practitioner at the site of a humanitarian crisis. This can, as experience has shown during the operations in Somalia, greatly enhance the capabilities of a field hospital. As an extra benefit, it saves cost, by avoiding medical evacuations in cases where consultation with a specialized hospital allows for a more sophisticated differential diagnosis than the facilities on location would permit. However, in the case of a mass casualty event, such as an earthquake, a terrorist attack or the

acute phase of civil strife, saving lives it is the primary (and often exclusive) task of any medical practitioner present on site. The difficult but often dramatic task of "triage" needs to be performed, in order to optimize the use of available human and other resources. This process identifies those patients whose life can be saved by immediate intervention with available means, versus those with a very small chance of survival even if most or all available resources would be concentrated on them over an extended period of time. As participants of a recent conference on telemedicine concluded, "the doctor who needs to consult specialists during his work at the site of a mass casualty is the wrong person in the wrong place". The same applies, *mutatis mutandis*, to the disaster manager on each level, and to other rescue activities. To optimize the use of available resources must be the primary aim.

When analyzing the information flow from the local level to headquarters, we find a similar limitation: Information gathered at field level comes typically from a wide variety of sources. Its interpretation requires a familiarity with those sources, as each of them is likely to have its own, obvious or hidden, agenda and priorities. A telefax link with the disaster site can provide the decision-makers at headquarters with copies of multiple lists of urgent requirements, established by different partners in the local operations. There will typically be contradictory assessments of the situation, resulting in widely diverging quantities for any single commodity. The consolidation and interpretation of such data needs knowledge, which can only be obtained on location. After an earthquake, one source may estimate the number of tents required as 500, another source as 5000, and a third source may request no tents but blankets and plastic sheeting - all for the same number of persons affected by the same disaster. The decision on the quantities to be dispatched can not be taken without knowledge of the reasons for the diversity of estimates, and their simple forwarding to headquarters is thus of little value. The assessment by and the resulting request from the disaster manager at the site must be accepted as-is, and will be reviewed in an evaluation of the operation.

Forwarding the *properly consolidated* requirements needs only a minimum of telecommunications capacity, such as provided by e-mail or other data links even with narrow bandwidth. Proper Consideration requires only a limited set of key data; interpretation converts them into information, which experience and knowledge can then transform into appropriate action.

The analysis of information is therefore of equal importance within the flow of communication in both directions. Communications are a tool, but should never be the priority task of the disaster manager as the decision-maker at any level. There was a time when it

was a status symbol for a disaster manager, to carry one or more walky-talkies and cellular phones. Today this would signal the opposite: Correct decisions require the consolidation of the information gathered by specialized support staff.

The essential prerequisite for an effective flow of information is therefore not, as often presumed, the availability of the largest possible bandwidth all the way to the possibility of "surfing the web" right at the scene of the disaster, but the existence of institutionalized consolidators of information. Instruments for this task have been created in the United Nations over the past years:

The members of the United Nations Disaster Assessment and Co-ordination (UNDAC) teams are specifically trained in the consolidation of information at each level. Such specialized information compliments the news of a general nature, such as available from the news media. At the same time, "ReliefWeb", a moderated and continuously up-dated web-site maintained by the United Nations under the mandate of coordination of humanitarian assistance, acts as the consolidator of data gathered from a wide variety of sources. These include consolidated reports from the field, as well as "open sources" such as the media.

Specialized agencies have developed their own tools, and the Inter-Agency mechanisms of the Working Group on Emergency Telecommunications (WGET) allow the sharing of information, knowledge and resources. The immediate appointment of a Telecommunications Coordination Officer (TCO), under the terms of reference developed by the WGET, ensured a coherent telecommunications strategy of all partners in international humanitarian assistance for Afghanistan. The work of the TCO is supported by the FITTEST (Fast IT and Telecoms Emergency and Support Team) concept, developed and implemented by the World Food Programme (WFP), providing the necessary assessment of the situation in every major location in the region affected by this enormous humanitarian crisis.

5. Barriers

The data flow in the information systems depends on the availability of reliable telecommunication channels under the often adverse conditions of an emergency situation. With the exception of "traditional" private radio networks, which can be maintained with an absolute minimum of equipment, that needs to be available only at the points of origin and destination of the information, all systems depend on potentially vulnerable infrastructure "en route". These infrastructures are often owned by several third parties.

In each and every major event there is an overload of all public access networks such as the public telephone network, affecting, contrary to some general opinion, also the Internet. Mobile telephones (including related services such as paging, SMS or e-mail) are no exception to the rule. The number of simultaneous users within any specific area, as well as in the network as such, is limited to what the service provider considers to be the average and therefore economically appropriate utilization. Any traffic jam, with dozens or hundreds of travelers within a small area, attempting to contact their offices or families by cellular phone, can serve as an example.

The physical vulnerability of telecommunication infrastructures is equally obvious. Experience shows that in earthquakes fiber optics may provide a somewhat higher survival capability than wires or coaxial cables, but an event with major physical impact will still disrupt them. Again contrary to some common belief, links via satellite are not immune to the impact of extraterrestrial natural events, namely the high levels of radiation resulting from phenomena like solar storms.

An "administrative vulnerability" of public telecommunication systems results from ownership of the infrastructures by entities which are likely to have their own agendas and interests in a case of conflict. Commonly, the telecommunication network is among the first targets in any civil strife, and, while military forces in most cases dispose of their own independent telecommunications infrastructure, any party to a conflict may consider it necessary to prevent the use of a public service by an adversary. Again, this applies not only to terrestrial networks, but equally to satellite based systems, which are not only subject to the will of the owner or operator of the telecommunications satellite, but also to that of the ground stations providing the link to terrestrial networks.

To the physical and operational vulnerabilities, terrorist attacks add a potential technological element, which can be summarized under the term of "cyber warfare". Telecommunications and information technology infrastructure are potential high-profile targets, and little is known so far about the potential impact of hostile activities of this kind.

In the age of deregulation of telecommunication services and of the introduction of Global Mobile Personal Communication Systems (GMPCS), one major barrier may appear as an anachronism, but is still very real: National regulations frequently hinder providers of international assistance from making optimum use of the tools of modern technology. The requirement for a national radio license issued by the authorities of the disaster affected country may still deprive disaster managers not only of

a key tool for their job, but severely affects the safety and security of the relief workers who risk their lives in the service of humanity.

The cost of telecommunications through commercial networks may be of secondary concern at least for major organizations. The value of a human life can not be expressed in figures, and during the, typically short, acute phase of an emergency operation, the speed and effectiveness of the response take, to a considerable extent, priority over financial considerations. This results in the frequent use of land-mobile satellite terminals, and the need to accept considerable communications cost for limited periods.

Disaster mitigation, preparedness and prevention however, are continuous processes, and related decision-making depends on communications no less than that on emergency response. The resulting cost over long periods is not only a heavy burden on the usually very limited budgets for disaster prevention and preparedness, including monitoring and early warning systems, but the use of foreign owned telecommunications satellites and related terrestrial stations requires payment in "hard" currency. For many of the most disaster-prone countries, this requirement remains a major obstacle to the implementation of effective schemes for early warning, and for the decision-makers at international level this can cause a serious information bottleneck. This economic implication limits the role of most of the presently operational and of planned satellite-based systems in all types of development and disaster prevention activities.

6. Future Developments

Technological development is a self-motivated process, and a continuous stream of innovations will be offered in respect to information management tools for decision making. It has been stated, many years ago already, that "telecommunications is an industry in search of applications", and humanitarian assistance is one of them.

There are still barriers, which prevent the full use of what is available. Removal of these hindrances needs to remain a major element in the advocacy for humanitarian needs. The adoption of the "Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations" by the Intergovernmental Conference on Emergency Telecommunications (ICET-98, Tampere, Finland, June 1998) was a major step in the right direction. In its unanimously adopted Resolution 36, the ITU Plenipotentiary Conference (Minneapolis, 1998) has called upon all Member States to sign and ratify the Convention as soon as possible. More than

50 States have meanwhile done so, but this is still only a small part of the States, which are likely to either require or provide international humanitarian assistance. Both providers and recipients have equal benefits from being parties to this international treaty, even as its principles are already applied as the standard guidelines among governments and providers of assistance even in countries that have not yet acceded.

The work on further regulatory developments needs to take into consideration the needs of both traditional and advanced communications. New technologies, including wideband and broadband networks, have their place in addition to the narrowband systems most widely in use in emergency response, they will be a valuable supplement, but can not be a substitute. It is in this sense, that the work towards implementation of Resolution 645 (WRC-2000) by WRC-2003 should proceed.

Equally important is the further development of information processing mechanisms, from the site of a humanitarian crisis up to the higher echelon decision-makers in disaster response and back to the on-site disaster manager.

Success on these issues will depend on an ongoing commitment from the side of the humanitarian organizations and on the political will of the international community. It will also require support from the telecommunications industry, equipment manufacturers as well as service providers: They need to develop appropriate technologies and make them affordable.

Beyond this, the private sector is expected to take an increasingly active role in disaster communications under the concept of corporate citizenship. This overview may help to enhance the understanding for the needs of the partners in humanitarian assistance among the policymakers in governments, administrations and the private sector. If it does so, it has fulfilled the aim of all work in emergency telecommunications:

To contribute to the work of those who are dedicated to the most noble of causes, the prevention and the alleviation of human suffering caused by disasters.

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Mr. Zimmermann's earlier assignments included long-term posts in Lebanon, Ethiopia, Pakistan, Afghanistan, Iran and Liberia, and assessment and evaluation missions in Somalia, Namibia, Pakistan, Nepal, the Balkan Region and in other countries affected by natural disasters or complex emergencies. Mr. Zimmermann is a trustee of the International Institute of Communications (IIC), and member of the Pacific Telecommunication Council (PTC) and other international and regional institutions. He is a Swiss national, and his academic background is in political science.

Further information about Emergency Telecommunications is available at URL

<<http://www.reliefweb.int/telecoms>>