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# Envisioning the Future of International Humanitarian Service Activity and a Research Agenda to Help Get Us There

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# Preface

This project conducted an international workshop in Kenya in June 2006 on the future of humanitarian service systems and how research can help us get there. The workshop focused in particular on the need for and the role of research in developing new knowledge and fostering cooperative activity towards the effective design, deployment and use of humanitarian information and communication systems. The workshop brought together practitioners, academic researchers, and government officials in a setting which fostered constructive dialog.

The initial award for the Kenya workshop was supplemented by two additional grants (with an accompanying extension to the end date of the project). One supplement supported a second meeting in Washington, D.C. in January 2007 to further the conversation around an appropriate agenda in the emerging research area we now called "humanitarian service science and engineering." The second supplement supported the presentation of preliminary results at a conference of the International Council for Science (ICSU) held in Kampala, Uganda, in July 2007.

Additionally, the work under this project led to a second award (funded by the Service Enterprise Engineering Program) for a third NSF workshop, held in Seattle, Washington on October 8, 2007 to expand the research community and clarify key issues in the emerging research frontier of Humanitarian Service Science and Engineering (HSSE).

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# Executive Summary

## Lake Naivasha, Kenya

On June 8-10, 2006, representatives from government,[1] academia,[2] NGOs,[3] donor agencies,[4] and industry[5] met in Nairobi, Kenya, to envision the future of humanitarian action and to plan a long-term research and development agenda for moving toward that vision. On the first day, presentations and discussions helped to develop a shared understanding of the current situation and approaches. On the second and third days, intensive working group activities and reports to the group as a whole led to a clear common vision of a desirable future for humanitarian action as well as a coherent set of research goals to help bring about that future. East and Central Africa was explored as a possible area for field research and demonstration projects.

The following guiding principles, critical strategies, and tactics are top-level outcomes of the workshop:

## Guiding Principles

We envision a humanitarian sector where:

[1] Kenyan Office of the President, Kenyan Office of e-Government, and Rwanda ICT Authority
[2] Georgia Institute of Technology, University of Washington, Moi University, University of Southern California, University of Mississippi, Kinchasa School of Public Health, and Harvard
[3] World Vision International, VillageReach
[4] USAID/FFP, USAID/OFDA, UN OCHA
[5] IEEE, Centurion Systems Ltd.

- action and decision-making occur at the lowest possible level;
- direct action by humanitarian organizations and international agencies is replaced by capacity building, standards setting, and monitoring;
- the distinction between relief and development has disappeared, replaced by integrated stages of humanitarian action to build capacity and meet needs;
- collaboration among stakeholders is open, extensive, and supported by effective, appropriate infrastructure and systems;
- all programs and systems are socially, culturally, and organizationally appropriate;
- and there is a scientific approach to understanding the role of localized, indigenous knowledge

## Critical Strategies

To realize our vision, we propose a 10-year research and development agenda that understands, designs, and demonstrates the value of:

- a shared, open GIS-based information infrastructure;
- shared, continually optimized logistics systems;
- user-centered humanitarian action systems for coordination and sector management;
- and internationally accepted standards and monitoring methods that are developed and reviewed by teams of experts.

## Tactics

Tactical objectives to support our critical strategies include an integrated set of research projects to:

- Obtain knowledge that is fundamental to the design of complex, multi-stakeholder, action support systems. Critical issues include:
  - Trust
  - User studies and the role of user knowledge and expectations
  - Usability
  - Adaptability
  - Security
  - Adaptable-tagging ("folksonomy")
  - Standardized terminology and formats
  - Participatory design
  - Ability to reconfigure
  - Interaction with the technical infrastructure
  - Interaction with social, cultural, organizational, political and other non-technical environments
- Understand what works and does not work in current humanitarian action systems
- Conduct both fundamental and field research into humanitarian supply chain, supply scheduling, and tracking tools
- Apply service science principles to international humanitarian service delivery

- Extend service science by generalizing principles of effective international humanitarian service delivery
- Design and develop a permanent, open, and secure information sharing framework
- Apply action research methodologies to address humanitarian system issues
- Identify and engage relevant players (stakeholders) in a region
- Identify barriers to information sharing and demonstrate the benefits of overcoming them
- Investigate common conditions for sharing and how to establish them
- Employ participatory design techniques to develop a multi-stakeholder requirements document for a permanent regional information sharing system
- Test and validate indigenous knowledge to understand how it can be incorporated into humanitarian systems
- Develop a multi-hazard risk estimation tool; evaluate risk in selected locations; understand and address issues in effective risk mitigation
- Investigate issues associated with the design and deployment of effective early warning systems
- Develop measures and methods for post-action assessment of interventions
- Understand and address tensions between local empowerment strategies and external funding mechanisms

## Washington, D.C.

On January 26, 2007, leaders from the service science field, humanitarian organizations, United Nations and the military met in Washington, D.C., to build on the results of the Kenya workshop and to explore the application of current service modeling and metrics to the needs and conditions of managing complex emergencies. There was a spirited and enlightening all-day discussion of the challenges of applying quantitative methods and tools to the complex environments and interdependencies of real-world humanitarian disasters. Especially fruitful was the interplay between those with field experience (e.g. NGOs or the military) and those with relevant academic research experience. In the end, all participants saw considerable potential in a major initiative that would focus on an emerging, interdisciplinary field that we called Humanitarian Service Science & Engineering (HSSE).

This meeting clarified that Humanitarian Service Science & Engineering is an emerging frontier in engineering and science that explores how our ability to effectively design, evaluate and predict the behavior of systems can be extended into service areas that are chaotic, disrupted and complicated by complex parameters and goals. For example, Operations Research predominantly focuses on systems where efficiency and profit are accepted goals to be optimized, where service "is a kind of action, performance, or promise that's exchanged for value between provider and client,"[6] and where other interdependent systems (e.g. infrastructure) are generally reliable. Under these

[6] http://www.foxnews.com/wires/2007Jan25/0,4670,UNGlobalUnemployment,00.html page 72.

conditions, the impact of adjustments to activities like fleet movement can be modeled and predicted accurately enough to optimize the overall activity.

But in many service activities (government services, humanitarian efforts, military service activities), the goals and parameters are far less clear and stable, the people paying for the services are not the same as those receiving them, and the need for services stems from the disruption of infrastructure and previously available systems. Following are a few of the many questions that were identified as central to this emerging research area during the NSF planning meeting.

- Can existing modeling and predictive techniques be extended to handle cases like these, perhaps through interaction with social, behavioral, economic, political, anthropological and other research communities?
- Could unintended consequences be predicted and mitigated?
- Are more descriptive techniques better suited to understanding and improving these complex service situations?
- Can simulation and gaming be used to analyze and improve performance?
- What are the metrics of analysis and evaluation?
- What data is needed and how can it be gathered?
- What is the role of cyber-infrastructure in this effort?
- How can multiple institutions with diverse missions, practices and cultures share a clear, common picture of an evolving situation?

## Background

Each year millions of people are affected by humanitarian emergencies ranging from natural disasters that create sudden and catastrophic results to slow onset and complex political emergencies that present long-term threats to the welfare and stability of entire communities. People all over the globe—in developed and developing countries—are keenly aware of the life-threatening effects of humanitarian emergencies. Unfortunately, we have less understanding of the complex, interdependent nature of challenges impeding humanitarian response.

Many challenges to humanitarian relief organizations (HROs) stem from a lack of capacity for interagency information and communication sharing. Of particular importance is the ability to access and use timely and reliable information from a wide range of disparate sources and for a variety of purposes before, during, and after a crisis. However, the information and communication environments in which HROs operate are extremely complex and present many barriers to the effective application and management of advanced information technology.

In order to comprehend and mitigate the challenges of information-sharing among organizations, the University of Washington's Interdisciplinary Program in Humanitarian Relief (IPHR), the East Africa and Great Lakes Region Inter-Agency Emergency Preparedness & Response Working Group (IAG), the Faculty of Information Sciences at Moi University (Eldoret, Kenya), and the U.S. Agency for International Development's Regional Economic Development Services Office Food for Peace Program

(USAID/REDSO/FFP) initiated a proposal for an East African Workshop on Humanitarian Relief Research & Education. This workshop was to focus on applications of advanced information technology to emergency response.

The overall objective of the workshop was to define research—and develop a cadre of scientists and domain experts to conduct that research—that would both (1) enhance the ability of regional humanitarian relief agencies to respond to emergencies and (2) serve as a model of ICT infrastructure in support of interagency collaboration for the entire humanitarian relief sector. The team agreed to seek out additional stakeholders and to plan a collaborative research activity to understand and develop solutions to critical issues associated with developing such an interagency infrastructure. These would likely include theoretically sound yet practically applicable operational models, business models, process standards, information management frameworks, technology platforms and a regional validation project to test our solutions.

It was agreed that workshop discussion would include the application of state-of-the-art user-centered design approaches to a collaborative research activity focused on the development and management of a regional emergency response information and communication system. The research goal was to produce new knowledge such as (1) a more thorough understanding of the needs, information requirements, and environments of key user groups; (2) a more complete process map of emergency response information flow; (3) a deeper understanding of how to increase local capacity for emergency response; (4) the identification of synergies and economies of scale that can be achieved

through information sharing and (5) the articulation of a strategic framework that encourages these synergies.

The workshop proposal built on previous collaborations among IPHR, IAG, and USAID, but also sought to expand this partnership to include regional academics, researchers and educators. Initial key collaborators included Dr. Cephas Odini, Dean of Information Sciences at Moi University (Kenya); George Fenton, Associate Director, Supply-Chain Management, Humanitarian & Emergency Affairs, World Vision International; and Alex Deprez, USAID Regional Economic Development Services. The workshop was planned for the first half of 2006 in Nairobi, Kenya. East Africa was seen as an ideal location for this research due in part to the large number of organizations already exploring cooperative efforts in humanitarian relief and development. For example, the IAG represents 26 of the most active NGOs in East Africa and the Faculty of Information Sciences at Moi University in Kenya, deliver education and conduct research on relevant information and communication issues in Africa. Planning called for wide dissemination of the workshop results through journal and conference articles, as well as presentations to NGOs and interested U.S. and African governmental agencies.

# The Kenya Workshop

## Planning, Preparation, and Organization

After the NSF grant was received, planning on the workshop began in earnest. Setting up the workshop required significant communication using communication technologies such as email, a wiki, and a website. Further, multiple face-to-face meetings of sub-groups were held in Kenya as well as in Seattle, Washington. In order to ensure that the workshop would represent participants of various nationalities, as well as people from various sectors, including the private sector, academia, government, non-governmental organizations and donors, the workshop planning process began with a scoping exercise.

An executive steering committee comprised of members of the University of Washington's Interdisciplinary Program in Humanitarian Relief (IPHR), The East Africa and Great Lakes Region Inter-Agency Emergency Preparedness & Response Working Group (IAG), the Faculty of Information Sciences at Moi University in Eldoret, Kenya, the Faculty of Commerce at Kabarak University, Nakuru, Kenya, officials from Catholic Relief Services, and World Vision International and staff from the U.S. Agency for International Development Regional Economic Development Services Office Food For Peace Program (USAID/REDSO/FFP) participated in the planning

process for the workshop. This committee met approximately six times between November 2005 and May 2006. The committee's mandate was to develop a list of participants who spanned all sectors of society, that included participation from around East and Central Africa, and that was balanced by gender, ethnicity and nationality. In addition, the committee helped develop the themes that practitioners in the field of humanitarian action value and wished to see researched.

The themes developed by the executive steering committee represented a first effort at creating a research agenda. In addition, the meetings and discussions among steering committee members represented an immediate incorporation of User-Centered Design (UCD) in the workshop formulation process itself. Indeed, to the extent that the research agenda is expected to be relevant to humanitarian action organizations it was important that those organizations be involved in creating a product—in this case research—that was relevant to user tasks, goals and environments. (Maiers, Reynolds, & Haselkorn, 2005)

The major themes developed by the executive steering committee, which was largely a practitioner group, included the following:

1) How can ICT promote humanitarian relief efforts?
2) How can technology help humanitarian organizations learn from each other, increase efficiency and avoid duplication of efforts?
3) How can technology strengthen humanitarian networks both horizontally and vertically?

4) How can technology help ensure that all appropriate actors are included, including local governments, community based organizations, and indigenous people's representatives?

5) What technologies are appropriate and sustainable for what settings?

6) What implications do local and regional regulatory regimes and governance factors have for using technology effectively to support humanitarian relief?

The work of the executive steering committee which was based in the field in Nairobi Kenya, was followed by high level meetings with the University of Washington's Interdisciplinary Program in Humanitarian Relief in Seattle, Washington. Selected members of the executive steering committee liaised with members of IPHR to sketch out an agenda for the June 2006 workshop and to consider ways to ensure that the workshop produced an interdisciplinary basic research agenda appropriate for National Science Foundation support.

Following is a summary of what occurred duing each day of the workshop.

# Workshop Sessions – June 8

## Workshop Welcome

**Joseph Kiplang'at, Moi University**

Presenter Bio: Dr. Joseph Kiplang'at is a Senior Lecturer in the Department of Library, Records management, and Information Studies, School of Information Sciences, Moi University, Kenya. He obtained his Ph.D. in May 2004 from the University of Zululand, South Africa, and his thesis investigated the diffusion of ICTs in communication of agricultural information among agricultural researchers

and extension workers in Kenya. Dr. Kiplang'at has published extensively in refereed journals and his area of interest is "diffusion of ICTs in the rural areas." In 2003, Dr Kiplang'at was a winner of a grant on Gender, Agriculture, and Rural Development in the Information Society (GENARDIS) project funded by IDRC, CTA, and IICD. His project investigated the use of ICTs by rural women in Kwa-Zulu Natal, South Africa. Dr Kiplang'at has also received research funding from various organizations including universities. Currently he is carrying out research to investigate the effectiveness of the strategies used in the provision of tourism information in Kenya. He is the current chair of the organizing committee for the IAALD African Conference to be held in Kenya in May 21st - 26th, 2006. He is a member of the International Association of Agricultural Specialists (IAALD), International Federation of Library Association (IFLA, the Kenya Association of Information Specialists) and the Kenya ICT Federation.

Planning for this workshop began over two years ago with a proposal jointly coordinated by Moi University, the USAID Food for Peace program, and the IPHR from the University of Washington in Seattle.

The Great Rift Valley Resort in Naivasha was chosen as the venue because many important peace initiatives, such as the Sudan Peace Accords, have originated here. The theme of this workshop reflects the priorities of East African nations and brings together many of the relevant stakeholders for humanitarian action in this region.

Mr. Kiplang'at invited the workshop participants to share their ideas for moving forward in this area.

# Introduction

## Information and Communication Systems in Humanitarian Action: Developing an Agenda for Active, Interdisciplinary R&D

**Mark Haselkorn, University of Washington**

Presenter Bio: Mark Haselkorn is professor and founding chair (1985-97) of the Department of Technical Communication in the College of Engineering at the University of Washington. His work has spanned more than two decades of leadership in interdisciplinary technology areas such as assessment of information technology in organizations, design of electronic communities and online services, the and management of knowledge and communication in large organizations. Dr. Haselkorn's current focus is improving information and communication systems for global humanitarian relief efforts and health care. He is Director of the University of Washington's Interdisciplinary Program in Humanitarian Relief. Past efforts include a wide range of activities concerning the Y2K problem and over $5 million in funding (1989–1995) in the area of intelligent transportation systems, including development of the first Web-based real-time traveler information system (Traffic Reporter, 1990). Dr. Haselkorn is active in the IEEE, is Vice-President of the Professional Communication Society (PCS), and is the PCS ISO Standards representative.

Information and Communication Systems (ICS) are primarily about people, organizations, and missions.. Technology is part of ICS, but it is not the central focus. Systems have to do with how we do our work, what we use to get things done, and what data or knowledge we use to do what we do. Governments don't lack technology as much as they lack the broader systems to implement technologies that help diverse agencies and institutions coordinate to achieve common goals.

We use the term “humanitarian action” because we care about the actions we take to meet people’s needs in a disaster context. It is more than just relief or response; it includes risk assessment, capacity building, response, mitigation, relief, and recovery.

The outcome of this workshop should be an agenda, not a project or a series of projects, but rather a long-term plan or a program that is visionary and looks ahead at least 10 years. This research should be active research where practitioners and researchers conceive, conduct, and develop the agenda because practice and research inform each other.

Practice and research have a complex relationship. As an example, Dr. Jennifer Turns and a group of researchers from the University of Washington conducted some educational research and used this research to create curriculum materials, which were made available to teachers. As an alternative, the researchers directly shared their research findings so that teachers could develop their own materials, rather than adopting the solution developed by the researchers. The teachers were more receptive and enthusiastic about this alternative approach. (Turns, et al. 2004).

Research in humanitarian action should also be problem-based, holistic, and neutral. It should embrace a systems theory approach that involves the collaboration of partners with multiple perspectives, goals, and applications.

The humanitarian sector is about $20 billion per year, yet it does not have a dedicated research journal, professional conferences or a degree program. The sector needs better mechanisms to manage change. It needs a body of knowledge, tools, strategies, and techniques that apply to current programs but also focus on continual improvement. Very little research has been done and “lessons learned” do not have

appropriate substance to impact the sector. In fact, Dr. Haselkorn and his students conducted a study of 59 source documents from the humanitarian relief sector that included 685 lessons learned statements and found that only 42% had an actionable outcome and only 16% identified a corresponding actor (Ontko, 2007).

After completing his presentation, Dr. Haselkorn explained how the workshop would proceed. On Day 1 (June 8) we would hear presentations from various participants about the current state of affairs in the East African humanitarian sector and begin exploring areas for improvement. On the second day (June 9) the plenary group would divide into four distinct groups to explore ICT areas that might serve as candidate areas for research.

The suggested research threads for exploration included:

- Service Science and Engineering for better delivery of services.
- Information and Communication for coordination and sector management so that the sector can learn about and manage change.
- Critical infrastructure and tools such as GIS.
- Socially, culturally, and organizationally appropriate technology.

The plenary group agreed that these areas were good candidates for the exploration of possible research projects. Dr. Haselkorn explained that each group would explore the boundaries of their candidate area in the context of a larger R&D agenda, articulate a vision for improvement, and discuss goals and methods for conducting research. The purpose of each group would not be to advocate any one perspective, but rather to share multiple viewpoints through questions, discussion, and brainstorming.

Day 3 (June 10) would consist of a recap of the previous day's accomplishments, the presentation of each group's suggestions for research projects within their area, and a general discussion about how to combine the threads into an integrated, cohesive, and long-term research agenda. Following the workshop, a report would be written to capture the workshop process and outputs and then disseminated to the NSF, the participants, contributors, and other relevant parties.

Dr. Haselkorn concluded with some comments about why this is a good time to pursue this type of multidisciplinary effort and why this group was chosen to lead it. First, this is an opportune time to begin this type of collaboration because the humanitarian sector knows it needs to improve capacity to deliver better and more timely services. In order to accomplish these goals, R&D is needed that helps humanitarian action evolve from reactive responses to proactive planning and coordination based on systematic and empirical research. Second, this group is a unique combination of multidisciplinary organizations from the humanitarian sector, academia, industry, and government that can forge a coordinated approach for improving humanitarian action.

## Views from the Host Kenyan Organizations

### Salim Shaambani, Office of the President - Kenya

Dr. Salim Shaambani works for the recently-formed Kenyan Information and Communication Technology (ICT) department within the Office of the President. Dr. Shaambani pointed out that there is always a gap between university research and its adoption, e.g., by government. Sometimes the gap can be as large as 30 years.

Governments are the largest collectors of data and statistics, but in the developing world much of it is not analyzed. This is not a matter of technology; it is a lack of systems for analyzing and disseminating information that could help inform decisions, i.e., timely and accurate information that needs to get to the right place at the right time doesn't get there.

The Kenyan government has embraced technology and is trying to create and implement better systems for information and communication, particularly for improving the delivery of services (e.g., in relief situations). They are currently developing a strategy to address these issues.

**Ambrose Orwa, Kenyan Office of e-Government**

Mr. Ambrose Orwa was asked to attend the workshop by the Secretary of the newly formed Kenyan Department of Information and Communication Technology. The Kenyan government is anxious to obtain, analyze, and distribute information.

Mr. Orwa reiterated Dr. Shaambani's statement that the Kenyan government has begun implementing reforms to improve the effectiveness and efficiency of public services. The government is currently in the process of implementing a new policy for information communication that includes:

- Better service delivery.
- Connectivity of all government offices to each other, Kenyan citizens, industry, and other governments.
- Web-enabling of all government agencies by 2015.

At the conclusion of his presentation, Mr. Orwa handed out a brochure describing what his department is attempting in this area. More information about the policies and programs described in the brochure can be obtained by visiting the following web sites:

- www.health.go.ke - The use of ICT in the health sector to improve the quality of health services in Kenya, especially in rural areas.
- www.education.go.ke - The use of e-learning at Kenyatta University to train students in computer literacy and improve educational infrastructure, and the creation of a digital library.
- www.e-government.go.ke - The use of ICT to improve socioeconomic development in Kenya.
- www.planning.go.ke - The use of VSAT technology to improve information access at the grassroots level to better allow district institutions to respond to needs for services and funding.
- www.ardhi.go.ke - Online land registration and management.
- www.kra.go.ke - Computerization and modernization of port services in Mombassa to expedite manifest processing and declarations.

## Conducting Research in the Horn and Central Africa

**Cephas Odini, Moi University**

Dr. Cephas Odini began his presentation by discussing the transmission of knowledge and skills through research and how educational institutions enable this

function. He talked about how educational institutions in Kenya formerly had to apply for permits to conduct research—often a lengthy process.

While reforms are in work, more are still required. These include:

- More training for junior researchers.
- An environment that facilitates research efforts.
- Collaborative research between universities and international organizations.

Dr. Odini pointed out that the current perspective on conducting research in this region is that indigenous knowledge should not be ignored. Science and technology can only create value to the extent that social groups consider them valuable. Current information systems have the following deficiencies:

- They are poor in quality, marginalized, piecemeal, fragmented, and do not take into account users' needs.
- A complete and systematic understanding of the users' needs does not exist. There is no "big picture" of their information needs.
- A limited amount of empirical research in ICT has been applied to humanitarian needs.

Moi University has opened a second university in Kenya and now has 13 schools, including the School of Information Sciences. The university's research policy is to:

- Motivate staff.
- Provide professional leadership.
- Maintain a strong relationship between research and teaching.

- Support the principles stipulated by the University Research fund; misconduct in research is not tolerated.
- Adhere to internationally-recognized ethical principles.

**Joseph Kiplang'at, Moi University**

Dr. Kiplang'at provided an overview of humanitarian action research activities that have been conducted in Kenya. Most African nations either have been or are involved in intrastate conflicts due to natural and manmade disasters. These conflicts exact large human and economic tolls. Some of the major conflicts have included the 1994 Rwanda Genocide where 800, 000 people were killed, conflicts in Somalia and Eritrea, and the current situation in Darfur, Sudan.

Humanitarian Action research to address the problems engendered by these conflicts has included, but not been limited to:

- The economics of displacement.
- Peace-keeping with military interventions.
- International intervention and forcible intervention.
- Gender roles among refugees.
- Environmental impact assessments.

The focus of this research has included:

- The lack of comprehensive domestic legislation.
- Humanitarian action.
- Operations research.

- Legal issues.

Only a minimal amount of research has been conducted about information flows among actors in humanitarian activities of the region.

#### Gregory Wanyembi, Moi University

Dr. Gregory Wanyembi wrapped up the Moi University presentation with the following conclusions:

- Eastern and Central Africa are prone to disasters.
- Limited empirical research has been conducted to mitigate or prevent these disasters.
- A research environment that would be conducive to this type of research now exists.
- Research should produce new knowledge that can be applied to the improvement of humanitarian action. User-centered research is now being encouraged.
- The pool of tribal or indigenous knowledge is of use for both local and international applications.

## Views from the Field

#### Moussa Sangara, World Vision

Moussa Sangara works for World Vision, one of seven non-governmental organizations (NGOs) that comprise the IWG consortium, and are also the lead agency in the regional consortium.

Mr. Sangara works for the Emergency Response and Disaster Management (ERDM) branch of World Vision. ERDM practitioners work under high-stress conditions in the field. Their work involves:

- Assessment using primary and secondary data.
- The use of early warning systems from both indigenous sources and the World Vision scientific offices.
- Capacity building where gaps exist.
- History mapping.

One of the main functions of ERDM is the facilitation and building of capacity through emergency preparedness so that actual responses are carried out as much as possible by local communities. To achieve this goal, World Vision helps communities create a response plan and provides training so that these communities can carry out their own responses to disasters. World Vision believes it is unique in focusing on community capacity building in this manner.

The ERDM consists of two groups: a Global Response Team and a Regional Response Team. The Global Response Team is well-informed on events at the global level and maintains contacts with local offices. The Regional Response Team meets every nine months with the other IAWG NGOs for training, information sharing, and other collaborative efforts. One of their most important activities involves reading after-action reviews and discussing the lessons learned.

**Mary Mukwavi, World Vision – Zambia**

**Patricia Gimode, World Vision – Kenya**

Mary Mukwavi and Patricia Gimode discussed the challenges World Vision has faced in providing effective humanitarian action.

Ms. Mukwavi noted that effective communication is a challenge and that they do not have enough Information Technology (IT) staff. Mr. Gilbert Ambani from USAID interjected that IAWG agencies are responding but they are not coordinating well, standardizing procurement, or using a shared warehousing system to streamline the receipt or distribution of supplies. In addition, they are duplicating efforts.

Ms. Gimode added that they would like to get development staff to start thinking more about relief efforts. Currently, development staff notice indications that a disaster may be happening or approaching, but they don't think about using an early warning system.

## The Role of Humanitarian Information Centers

**Joe Crowley, UNOCHA**

Joe Crowley manages the information management unit of OCHA in Sudan. His organization employs an innovative approach to provide services and systems for coordinating humanitarian efforts—Humanitarian Information Centers (HICs). HICs support the coordination of humanitarian assistance during and after disasters by

providing agencies with common tools and services. Mr. Crowley's information management unit in Sudan was used as a research laboratory for evaluating the effectiveness of HICs.

The HICs include kiosks that are set up in disaster areas and are a one-stop-shop for providing disaster information to relief agencies. They are, in effect, brokers for information and focal points for data. In addition, the HICs provide the following:

- The simplification and expediting of data sharing and coordination.
- A framework for geospatial data.
- Thematic maps as visualization aids for consensus building.
- A web site that serves as a front-end for a "who's doing what where" database that drills down to the district level.
- Meeting schedules.
- Standardized rapid assessment forms describing recipient needs (shelter, water, sanitation), what is needed, and which agencies can help and how.

Mr. Crowley consults with UNICEF on population numbers because they perform cluster surveys and use reasonable growth models.

## User-Centered Design in Humanitarian Systems

**Kate Hulpke, VillageReach**

Presenter Bio: Kate Hulpke tracks and analyzes field operations for VillageReach, where she develops tools for the field team to record delivery activity and immunization data. She uses this information to pinpoint and address supply chain problems, improve operations, and chart progress over time. She has a B.A. from the University of Oregon in combined majors in physics,

linguistics, and English. In June 2005, Kate completed her M.S. in Technical Communication from the College of Engineering at the University of Washington. During the summer of 2004 Kate conducted fieldwork in Mozambique, sponsored by the UW's Interdisciplinary Program in Humanitarian Relief.

Kate Hulpke talked about how smaller, startup NGOs can be very innovative in solving humanitarian relief problems because they are able to use a more participatory or user-centered design approach.

In her healthcare work in Mozambique, Ms. Hulpke has been involved in the distribution, storage, and disposal of vaccines for children. Her field workers visit clinics every month to replenish supplies and let the people know they are cared for.

Her team uses a participatory approach that involves interviewing and investigating information directly from users to develop a system to track and order supplies. Only 5% of the clinics serviced by her team have run out of supplies after a participatory approach was implemented (down from 50% – 70% before).

## Views from the Research Community

## Understanding Action Research

### Steve Lappenbusch, University of Washington

Presenter Bio: Steve Lappenbusch is a PhD student in the Technical Communication department at the University of Washington, College of Engineering. He is also one of the co-authors of the NSF grant that funded the workshop in Nairobi. Mr. Lappenbusch has worked as a manager in the for-profit sector, taught students from middle school to adult and for the past two years has worked as a research assistant at the UW. His work as a research assistant

involves a variety of fieldwork, interviews, and the analysis of field data to better understand how engineers plan and learn. His dissertation interest area is relief communication systems, specifically the difficulties relief organizations face in designing and maintaining reliable communications to and from the field.

Action research is a methodology that seeks to discover and improve the use of new knowledge and embed it in practice. This approach is unified and holistic and attempts to eliminate the artificial distinction between researchers and practitioners.

The steps for performing action research include the following:

1. **Define the problem** with all the stakeholders. All stakeholders are to be equal partners in the effort. The focus of this step is to reflect on how practice can be improved. A key question to ask at this stage is what are the indicators that this problem has been solved? The answers to this question will provide the criteria.
2. **Identify the alternatives** that could be used to solve the problem using all the stakeholders' perspectives. Keep track of who said what in case the team needs amplification later on.
3. **Choose an alternative.** Stakeholders must be committed to this alternative.
4. **Evaluate the chosen alternative.**
5. **Specify what has been learned** and how the team can move forward.
6. **Repeat the process beginning with Step 1.** This process is based on continual improvement and evolution.

## Cultural Patterns of ICT Adoption

**Beth Kolko, University of Washington**

Presenter Bio: Beth Kolko is an associate professor of technical communication at the University of Washington. Her current research focuses on cross-cultural applications of information and communication technologies. She works on issues related to technology design for digital inclusion, investigating how ICTs can be designed to more effectively accommodate the usage patterns of diverse populations. She currently leads a National Science Foundation grant measuring the effect of the Internet on society in Central Asia, and she leads a research group on digital games. She has also worked on projects in Cambodia and Afghanistan related to how ICTs overlay with preexisting patterns of information seeking and communication.

Dr. Beth Kolko advocates the idea of involving community members as grassroots responders in humanitarian action efforts. Dr. Kolko has been involved in research on how diverse Asian populations adopt and use Information and Communication Technologies (ICTs). Two possible areas for researching grassroots involvement include:

- Adapting systems to fit with how people traditionally communicate within their communities rather than expecting them to adapt to an ill-fitting technology.
- Drawing on preexisting patterns of information seeking and communication because these patterns significantly affect how people use new technologies.

Web 2.0 technologies such as blogs, wikis, e-mail lists, and web sites open a whole new host of innovative, peer-to-peer means of communication that could be ported to mobile devices. For example, mobile devices could be used to send SMS broadcasts or "smart mobs" (tools for social mobilization).

## GIS Introductions and Possibilities

**Glenn Brooks, University of Washington**

Presenter Bio: Glenn Brooks has 25 years of project management and organizational development experience in the public and private sector. He developed and lead Mercy Corps' South Asia GIS Response Team, including 100 Pacific Northwest GIS volunteers engaged in Tsunami relief activity for Sri Lanka and Aceh Province, Indonesia. Mr. Brooks also developed the City of New Orleans GIS strategic reorganization plan following Hurricane Katrina. He previously organized and lead strategic development of GIS programs for City of Woodinville and the Seattle Public Utility.

Geographic Information Systems (GIS) assemble, store, manipulate, and display geospatial data that can be used for search and rescue as well as other location activities in humanitarian relief activities.

Mr. Brooks pointed out that GIS is a leadership tool, not a decision support tool. It provides:

- Modeling of the best alternatives.
- A visualization of the whole geographical context.

- A common operating picture.
- Granular household-level data as well as global, top-level data.
- Remote sensing.

## GIS and Humanitarian Action

**Greg Easson, University of Mississippi**

Presenter Bio: Greg Easson is an Associate Professor of Geology and Geological Engineering at the University of Mississippi where he has taught GIS and Remote Sensing classes for 11 years. Dr. Easson is Associate Director of the Enterprise for Innovative Geospatial Solutions, a university-wide program to coordinate research activities in Geospatial Information Science and Technology (GIS&T). He is also Director of the Geoinformatics Center, a NASA-funded interdisciplinary research and educational initiative designed to increase the use and awareness of GIS&T. Dr. Easson received his Ph.D. from the University of Missouri, Rolla, in Geological Engineering in 1995. His research involved the use of Artificial Neural Networks (ANN) to interpret geologic data for landfill suitability determination. He received his Master's degree in Geology also from the University of Missouri, Rolla in 1984 and a Bachelor's degree from Southwest Missouri State University in 1981. Dr. Easson has more than 15 years experience in the application of GIS&T in federal and state government, with employment at the Missouri Department of Natural Resources and the U.S. Geological Survey.

Dr. Greg Easson gave an overview of his GIS work in El Salvador which included:

- Testing of digital field mapping.
- Surveying of 16 ADP districts in El Salvador.
- Development of a complete GIS database for emergency planning.
- Provisioning of data through the Internet.

The training he conducted included an introduction to both GIS and GPS, ArcIMs, mobile GIS, the use of survey tools, and the synchronization and uploading of e-mail from palm devices.

Dr. Easson's findings are summarized in the following table.

| Area | Findings |
|---|---|
| Issues/Problem Areas | • Lack of base maps<br>• Ownership of software and data<br>• Ownership of handheld devices<br>• Web hosting |
| Data Standardization | • Difficulty in:<br>o Agreeing on standardization<br>o Using standardized terminology<br>o Country-to-Country and regional sharing |
| Data Integration | • Data sharing saves resources, but what is the best way to do it? One possibility is a clearinghouse with open access.<br>• Data integration presents trust issues between the actors. |
| Data Updating | • Issues in data updating include:<br>o Maintenance<br>o The rapidity of situation changes<br>o The different ways that data can be updated<br>o Questions about who should support the updates |
| Lessons Learned | • Survey mods are needed<br>• Technology costs must be considered<br>• Everything must be tested |

**Table 1: GIS and GPS findings from El Salvador**

## Operations Management, Logistics, and Supply Chain

**Anton Kleywegt, The Georgia Institute of Technology**

Presenter Bio: Dr. Anton Kleywegt is an Associate Professor in the School of Industrial and Systems Engineering at the Georgia Institute of Technology. He conducts research in optimization and stochastic modeling with applications in transportation, distribution, and logistics, especially in the following areas: vehicle routing and scheduling, inventory routing, distribution operations, fleet assignment, vendor managed inventory, distribution network design, yield management, terminal design and operations, logistics planning and control, multi-modal transportation, and intelligent transportation systems.

Dr. Anton Kleywegt focused on the role of operations management and supply chain management in humanitarian relief efforts. These disciplines seek to answer the following questions:

- What decisions should be made to satisfy the objectives?
- What information is needed to make those decisions?
- What needs to be done with the information?
- How is the information used to make decisions?

Two approaches used in operations research may be used to answer these questions:

- Descriptive methods (e.g., queuing systems).
- Prescriptive methods (e.g., optimization which takes into account decision variables, objectives, and constraints).

Using an inventory selection sample, Dr. Kleywegt demonstrated how the needs for different item types during different disaster scenarios could be analyzed using optimization formulas.

## Critical Infrastructure in Humanitarian Aid

**Richard Little, University of Southern California**

Presenter Bio: Richard G. Little is Director of the Keston Institute for Infrastructure at the University of Southern California where he conducts research and develops policy studies aimed at informing the discussion of infrastructure issues critical to California and the nation. Prior to joining USC he was Director of the Board on Infrastructure and the Constructed Environment of the National Research Council (NRC) where he developed and directed a program of studies in building and infrastructure research. He has directed NRC study activities, participated in workshops and panels, and written extensively on the provision of infrastructure services, hazard mitigation, and critical infrastructure protection. Mr. Little has over 35 years experience in planning, management, and policy development relating to public facilities, including 15 years with local government. He has been certified by examination by the American Institute of Certified Planners and is a member of the American Planning Association and the Society for Risk Analysis. He holds a B.S. in Geology and an M.S. in Urban-Environmental Studies, both from Rensselaer Polytechnic Institute.

Richard Little opened his presentation by asking why critical infrastructure matters in humanitarian crises. Infrastructure matters because it assumes a holistic role in the following critical areas:

- Prevention
- Advance warning (in terms of predictions, warnings, and evacuations)
- Hazard-resistant construction
- Rapid response and recovery

The humanitarian relief sector currently focuses mostly on rapid response and recovery.

Mr. Little defined "infrastructure" as the socio-technological systems (and the people who know them) that deliver services. "Critical infrastructure" consists of those systems that, through incapacitation or destruction, can induce humanitarian crises. These interconnected and interdependent systems include, but are not limited to: transportation, water supplies, electricity, and telecommunications.

## Breakout Sessions – June 9

On the second day of the workshop, the plenary divided into four groups to discuss in depth four research threads for exploration and how they could each contribute to a coherent set of actionable research goals. The groups were divided into the following areas:

- Critical infrastructure and tools.
- Systems for coordination and sector management.
- Socially, Culturally, and Organizationally Appropriate Technology
- The Science and Engineering Humanitarian Service Systems

The groups were given three assignments to stimulate discussion and provide a common framework for reporting their ideas back to the plenary:

- **Assignment 1:** Imagine you're forming a new department of global humanitarian studies in a university, with four specialty areas. Describe what your specialty area does.
  - What real-world problems will this specialty area address?
  - What questions will this specialty area seek to answer in order to solve those problems?
  - What methods will this specialty area use to investigate those questions?
  - What are the research goals in this speciality area?
- **Assignment 2:** Imagine that you have all the money you could need to carry out a 10-year research program to transform global humanitarian

action. After a highly successful, decade-long research program, what will the humanitarian sector look like?

- **Assignment 3:** Based on your answers to the two previous assignments, describe some actionable research projects that you can share with the plenary group.

As presented below, there is some variation in how each of the four groups chose to address these assignements.

## Group 1 – Infrastructure and Tools

### Real-World Problems

Infrastructure, as defined in this working group, is the moving of goods, services, and data. This may include physical things such as roads or electronic systems (i.e., cables) or it may involve processes and data (information systems).

During humanitarian crises, information infrastructure is often interrupted or it is lacking to begin with. One or more of the following may be contributing to these problems:

- Lack of resources.
- Lack of skills and training in effectively using infrastructure.
- Inappropriate infrastructure for handling crises.

In the humanitarian response area it is often not the tools, but the data (software) that causes problems. Information infrastructure in humanitarian crises must be robust yet

adaptable. While redundancy should be built in for multiple failures, alternatives must also be available.

### Solutions to These Problems

Questions that will need to be answered to solve these problems involve seven broad areas:

- Logistics and planning
- Information management and dissemination
- Transportation management
- Geographic Information Systems (GIS)
- Leadership and authority
- Cultural skills, language barriers
- Coordination

Based on our discussion of the current problems of infrastructure in humanitarian crises, we came up with the following vision:

*Research, develop, and implement a global infrastructure with tools capable of delivering the goods, services, and information needed to reduce humanitarian crises*.

The components of this vision would include:

- Global connectivity and bandwidth down to the grassroots (local) level.
- Multi-directional, real-time information and delivery.
- Reduction of barriers to sharing information (not just from a technological perspective, but from an organizational one).

- Better planning, mitigation, and response.
- Empowerment through local capacity building.
- State-of-the-art logistics and technology (e.g., RFID).

### Methods, Tools, and Approaches

Possible research methods include:

- Sociological field-based research
- Software design and tool development
- Interdisciplinary research
- Decision support tools
- User-Centered Design and participatory approaches

Other methodologies should be considered as the research agenda moves forward.

### Implementation Impact on Humanitarian Sector

**Phase 1:**

Many countries will subscribe to international laws relating to human rights for disasters. Bottlenecks will be addressed such that there will be more facilitation and less regulation of information flows. Isolated local communities will be equipped, trained, and organized to handle disasters in their area. Information sharing will be collaborative and transparent and will occur among all stakeholders.

**Phase 2:**

International agencies will collaborate to avoid duplication and eliminate gaps.

### Research Goals

The research goals to realize the vision would include:

- Improvement of supply chain management and tracking to facilitate and improve delivery.
- Data fusion for decision support tool development. This involves using what is locally available as well as improving planning before a disaster event so that responses are more proactive and strategic rather than reactive and short-term.
- The use of culturally-appropriate technology that takes into account diverse cultural needs and the existing conditions of each response area.

### Candidate Research Projects

1. **How do indigenous early warning systems correlate with technological solutions?**

   This type of research would be especially applicable to humanitarian crises such as droughts where longitudinal studies over a period of several years could be conducted. Collaboration and buy-in of indigenous populations would have to be a precondition for successfully conducting this type of research.

2. **What are the linkages between disaster prediction and rural cultural traditions?**

Time-series analyses and correlations would be the primary means for capturing and analyzing this kind of data.

3. **What is the current state of tracking technology and where does it need to be?**

This research would be conducted with the goal of cost reduction and miniaturization.

4. **What is the best method for rapid assessment of disasters via remote sensing and information extraction?**

Assessment would include physical, building, and environmental damage information.

5. **How should user needs analysis of all stakeholders be conducted?**

This type of research would involve social network analysis and strategic planning.

6. **Which kinds of compression technologies would best optimize bandwidth and enhance connectivity to the field?**

Compression technologies would be examined with an eye toward the simplest and cheapest alternatives.

7. **How could a global multi-hazard estimation tool be created, implemented, and deployed?**

8. **What kind of information system would best build coalitions between humanitarian relief organizations and other stakeholders that would result in effective partnerships and better delivery of human services?**

9. **How do political systems contribute to human disasters and what kinds of adaptable information systems could improve data sharing and coordination during these types of disasters?**

## Group 2 – Systems for Coordination and Sector Management

### Real-World Problems

1. **Information is not effectively translated into meaningful action.**

There is no effective mechanism for applying lessons observed. The same lessons are observed over and over without change. How do we take what we learn in solving a discrete problem, and turn it into bigger knowledge for doing it better (or preventing it) the next time? This is what Dr. Haselkorn means by "managing sector change."

There is a lack of common information practices and systems. This inhibits coordination, slows response time, and wastes time and energy.

- Multiple entities reduplicate efforts (collecting the same information multiple times);

- Decision-makers have to sift through lots and lots of incoming information in order to zero in on the high-value information and to connect the dots;
- Someone has useful information, but it doesn't get where it needs to go, where it could be used to inform decisions.

It is difficult for decision-makers to know how best to set priorities – given the information coming in, what do you choose to respond to, when, how?

Information flows, but there is a lag between information and response.

High turnover within the sector – and within host governments – inhibits continuity of information and of best practices. This probably contributes to the fact that lessons get "learned" over and over again, by new people each time.

**2. Lack of coordination between the various entities involved impedes the effectiveness and efficiency of humanitarian action.**

Coordination is inhibited by a lack of trust between the various players (agencies, NGOs, suppliers, host governments, local authorities, citizens).

- Relationships between the players tend to be short-term – coming together to respond to crisis – which short-circuits the development of sound, trust-based relationships.
- Not all players are present for the thread of a discussion that leads to a decision – worse, that thread is not maintained / documented, so people could trace how and why the decision was made. When people feel that they had input into a decision – that their perspective was taken into

account – they can often support the decision even if they don't agree with it. Conversely, when their input wasn't called for, and they can't even refer to the thread to see, "OK, I understand why they decided that," they are left with no feeling of ownership in the decision. They are unlikely to go out of their way to help implement it.

During an incident, there is a lack of clarity as to who has authority to make what decisions. This can result in decisions being made slowly, or not at all, or multiple times in different (perhaps conflicting) ways. There is not an efficient use of resources (including time and people). This probably also inhibits improvement within the sector – because people who write "Lessons Learned" are hesitant to designate an "Actor" (as found in Mark's review of After-Action Reviews), when it's not even clear who is responsible for what. Who decides what to do about lessons learned?

Host governments are rarely, if ever, included in coordination and discussion. This doesn't help toward building trust or building capacity, AND it contributes to the lack of clarity about who has authority over what, AND it neglects a potential source of valuable information.

Diverse business practices and information practices inhibit coordination.

### Solutions to These Problems

Questions that must be answered to solve these problems include the following:

1. **Can "professionalizing" the sector improve response?**

By "professionalizing" we mean establishing a core of educated and trained staff, systems, and a shared knowledge base – infrastructure – for continuity among disasters/emergencies, rather than treating each response effort as a discrete project. Less like an ad hoc fire brigade, more like a standing fire department.

2. **If research shows that such a change would lead to more effective response,**
    - **What are the factors inhibiting the change? What are the incentives behind the current way of doing things?**
    - **How can the value of making the change be effectively communicated, so as to transform the incentives in people's minds – so that the change happens?**

3. **What coordination systems are needed to improve effectiveness and efficiency of response?**
    - Who needs to be involved?
    - Coordination at what levels? Between what levels?
    - What kind of coordination? How? (By what mechanisms?)
    - How should responsibility and accountability be distributed to best serve response?
    - Where is the "sweet spot" on the spectrum of coordination-partnership-control?
    - When / where should coordination begin and end?
    - How best to involve host governments and local authorities?

- How to build trust?
- How to maintain the thread of discussions toward a decision, for better buy-in?

4. **Regarding new coordination practices that could improve response,**
   - **What are the factors inhibiting this type of coordination? What are the incentives behind the current way of doing things?**
   - **How can the value of adopting this type of coordination be effectively communicated, so as to transform the incentives in people's minds – so that the change happens?**

5. **What information systems / practices are needed to improve effectiveness and efficiency of response?**
   - How do we change the humanitarian sector so that at the very least, there is continuity of information? What would be an effective common information platform, or system, or practice in order to:
     - Improve our ability to prioritize
     - Make effective decisions
     - Not waste time reduplicating efforts or sifting through information overload
     - Reduce the lag between information and response

6. **Regarding new information practices that could improve response,**

- **What are the factors inhibiting a shift to new information practices? What are the incentives behind the current way of doing things?**
- **How can the value of adopting new information practices be effectively communicated, so as to transform the incentives in people's minds – so that the change happens?**

7. **Besides faulty communication and coordination, what other factors contribute to the lag between information and response, and how can they be addressed?**

### Methods, Tools, and Approaches

Our specialty area should use:

- Reviews of existing research (e.g. reviews of After-Action Reviews, case studies).
- Action Research that involves all the players from the beginning so that:
  - The findings are based on reality.
  - The findings are a co-creation of researchers and stakeholders.
  - Capacity is built on both sides (researchers and stakeholders)—not just to solve the problem at hand, but to learn, grow, and change in ways that can be applied to solving and preventing future problems.
- Within the context of Action Research, we should practice user-centered and participatory design – any new processes or systems will be the co-creation of researchers and stakeholders.

### Research Goals and Implementation Impact on Humanitarian Sector

Our overall research goal is to improve service delivery in humanitarian action. The impact of a successful research program on the humanitarian sector will include:

1. **Capacity for disaster preparedness and response will reside at the most local level possible.**
    - If the ability to cope is overwhelmed, responders turn to the next level up, rather than going immediately to the international community in the following order:
        a. Individual
        b. Neighbors
        c. Community
        d. Local authorities
        e. Government and/or civil society
        f. Neighboring countries
        g. International community.
    - Civil society (e.g. community groups, women's groups, church groups) may play a key role, e.g. in situations involving failed states.
    - Regional offices for humanitarian action could consist of the countries of a given region.
    - Disasters will have a less devastating impact. Vulnerability will be reduced (compared with now), and response will be improved. Certain

- Governments will increasingly use local companies when contracting for services, supplies, etc., as part of building local capacity.
- There will be a shift away from a "dependency mentality."

**2. The humanitarian action sector will shift away from being implementers, toward being facilitators and capacity builders.**

The role of the international humanitarian sector will be to assist countries in assessing their own capacity, identifying and prioritizing areas for improvement, and building capacity.

Governments and/or civil society must be involved throughout the processes of defining what "sufficient capacity" is, defining how a government's capacity will be assessed, and defining what to do to build capacity. Standards and assessment tools will not be simply handed down from the international humanitarian sector. Such standards and tools must be a creation of those who will have ownership of them, and must include local knowledge.

**3. There will no longer be a distinction between development and relief.**

Humanitarian action will be strategic – with long-term thinking that reduces vulnerability and prepares to deal with problems, rather than just reacting to problems.

The donor mentality will no longer be that there is money to respond to a horrible disaster, but there's no money to work on reducing vulnerability before disasters.

**4. There will be a way of allocating resources to disasters and emergencies in accord with the severity and the need, rather than arbitrary whims.**

There will no longer be "forgotten disasters," that languish with no help from the international community while other disasters receive disproportional attention.

There will be greater coordination among donors, between the humanitarian sector and the commercial sector, and between the humanitarian sector and the media, so that resources and attention / goodwill flow effectively and efficiently, rather than "pooling" in certain places and leaving other places dry.

**5. Within a given response, roles, responsibilities, and deliverables will be clear.**

Meeting the Sphere standards, or some other standards that everyone agrees on, will be a normal part of humanitarian action.

**6. There will be regional common information hubs.**

By this we do not just mean a technological tool; we mean the human side. We mean processes that people agree on and use to share information throughout the region. There will be some common information platform that is somehow

neutral so that everyone can buy into it, and everyone has the necessary capacity to make use of it.

Early warning systems, preparedness strategies, and systems for sharing information will be developed in a participatory way, based on what already works. We will learn from existing effective systems, like existing early warning systems in Bangladesh and Mauritius, and existing information-sharing systems such as IGAD.

**7. Governments will assume greater integrity and transparency.**

Governments will respect their citizens equally, rather than favoring certain groups and disregarding others.

### Candidate Research Projects

1. Establish a baseline of the current state of activities and knowledge with regard to the role of host governments and local authorities in preparedness and response.
2. Determine whether there is a correlation between a stronger role on the part of host governments / local authorities, and better response.
3. Identify attempts to establish disaster-preparedness information-sharing systems; analyze which failed, which are succeeding, and why.
4. Determine whether there is a correlation between regional information-sharing for preparedness, and better response.

5. Investigate information-sharing systems that are working, and how such systems could be adapted for other settings.

6. Using Action Research, identify and bring together the relevant players in a given region to write a requirements document for a permanent regional information-sharing system.

7. Investigate factors differentiating response that solves only the immediate problem from response that helps prevent the next problem. Following a disaster, investigate whether practices that reduce vulnerability are being adopted (e.g. better building practices, safer choice of home sites). Compare places where vulnerability-reducing practices are being adopted with places where they are not; identify the factors that contribute to adoption vs. non-adoption of better practices.

## Group 3 – Socially, Culturally, and Organizationally Appropriate Technology

### Real-World Problems

1. **When it comes to technology one size does not fit all. The same technology does not function the same way in all settings.**
    - Maybe technologies are more accepted in some communities than in others.
    - Mobile phones are adopted easily?
        - Is that because of infrastructure use?
        - Is it because of cultural patterns?

2. **What is the culture of sharing information in humanitarian action?**

- Some groups hold information.
- Some organizations place a restriction on the use of information.
- The Kenyan government has no policy on data.
    - Which information is confidential and which is open?

### Solutions to These Problems

The following questions should be answered in order to solve these problems:

1. **How is technology use affected by infrastructure and cultural issues?**
2. **What are the key indicators of effective information sharing?**
    - What are preexisting patterns on sharing information?
    - How can we guide development of sector specific policy best practices?
    - What are some of the sector specific obstacles to sharing information such as flag planting?
    - What kind of research can we conduct to demonstrate the importance of an open sharing of information?
3. **How do people conduct monitoring and evaluation on their projects?**
    - What disincentives exist in the M & E process which inhibit participants from telling stories of project failures?
4. **How do we encourage open access to information?**
    - How can we structure an information environment to make it accessible?
    - How can we eliminate or mitigate invisible social barriers to access, such as gender, class, linguistic differences and literacy?
    - How can we identify what cultural capital is necessary to accomplish a specific task in the humanitarian action sector?

- What are the barriers to collaboration among stakeholders in the humanitarian relief sector?
- How can we identify who the relevant stakeholders in the sector are, using a broad and inclusive lens.

**5. How do we promote easy information flow?**

- How do we collect, analyze, and disseminate information to users and policymakers in this sector?
- Potential Field Project: In Cambodia, relief groups such as DANITA, DFID, USAID and others are all replicating each others' work. A Community Information Center could serve as a centralized dissemination point which could increase information availability.
- How is data turned into information?
- How is information turned into a usable resource or knowledge for stakeholders in the sector?

### Methods, Tools, and Approaches

Both quantitative and qualitative methods should be used. Quantitative methods would include:

- SPSS
- STATA
- Cluster analysis
- Modeling
- Programming

Qualitative methods would include:

- Ethnographic field work
- Interagency process evaluations
- User centered design
- Participatory design
- Case study method

**Research Goals**

1. Know how technology is used in this sector.
2. Know how information is shared.
3. Know how to facilitate information flow.
4. Know how to disseminate technology effectively.

Technological issues in the field to consider include:

- VSAT is expensive and possibly not legal. Sometimes humanitarian groups want to put a VSAT in budget to facilitate communication, and the donor refuses. Also, the host government may be hostile to letting technology come in.
- Radio is almost free of charge. However, it fails frequently, depending on the communication infrastructure in country.
- Turaya makes satellite telephones but they are also very expensive.
- Need generator because a community may not have electricity.
- B-GUN is a small satellite dish. It connects easily. But connectivity is very expensive and can go up to $25,000 a month for Internet with basic use.

**Research Goals and Implementation Impact on Humanitarian Sector**

1. Easy collaboration among people across sectors.
2. Cultural Capital is made available to people in sector to allow full participation.
3. A sector in which information is effectively shared regardless of which domain it is in or which organization generates it. Expectation that all information will be on the desk of your colleagues as well as other major stakeholders.
4. E-mail and internet at appropriate cost. The Gates Foundation has launched a satellite that is dedicated to Humanitarian Action.
5. Application of best practices to mitigate and prevent famine.
6. Resources are moved to where they are needed. Organizational and political obstacles to distribution are removed.
7. Value, strengthen and build relationships between and within all stakeholder groups to facilitate information flow.
8. Create office of disaster management unit in every president and prime minister's office. Make that contact information universally available. Make sure a duty office is available 24/7.
9. RFID tags for relief supplies so you know where they are and can avoid wastage.
10. Relief is culturally appropriate for place and community.
11. An openly available GIS database on food preferences and availability by district.

12. A CIC where communities get information. All stakeholders, including indigenous communities, are trained on methods of accessing information and use of ICT facilities.
13. Value, react and strengthen indigenous warning systems as a preventative measure for humanitarian crises.
14. Clear linkages from data to information to knowledge to action.
15. Education and sensitization for vulnerable groups, donors, and government.
16. Adequate infrastructure in place to mitigate crises..
17. Livelihood strategies and alternative sources of livelihood exist for vulnerable populations.
18. Technologies increase food production in disaster, including desalination and irrigation.
19. Adopt and adapt best practices.
20. A well-developed and extensive network of community workers who can identify and report to health centers, agricultural extension officers and other key communication centers.
21. Remote sensors deployed to track issues like deforestation, flooding and fire.

**Candidate Research Projects**

1. Identify and measure extent to which infrastructure and cultural issues affect technology use in the humanitarian sector. For example, what makes someone heed an evacuation message? (Method: ethnographic)

2. Use a case study approach to identify organizational barriers to sharing information in the humanitarian relief sector and also produce examples where sharing information led to successes.
3. Create a user-centered system for sharing and accessing information that would be used by a diverse constituency, including community members, planners, and decision makers. One component of the project would be identifying the constituencies. (method: user-centered design)
4. Test and validate indigenous knowledge regarding early warning systems.
5. Create a database based on GID that includes information such as food preferences, disease outbreaks, passable transport based on season, key organizational and community leaders, costs for goods, main actors. This database would bring together technical and social issues to help with response and prevention.
6. Comparative case study looking at government's interventions in their own humanitarian events, measuring the effectiveness of government's policies and interventions.

### Group 4 – The Science and Engineering of Humanitarian Service Systems

The group determined that Humanitarian Service Science should:

- Be analytically oriented.
- Be focused on scientific investigation of SCM in Humanitarian Action.

- Use scientific methods to improve the provision of services that are not market-based.

### Real-World Problems

As we meet, there is a famine in Northern Kenya. There is a drought--a cyclical "natural disaster"--but the famine is a "man-made disaster." There is food in other parts of the country and region, but there are no effective roads to bring it in. Relief efforts currently focus on food, not transportation infrastructure. Service Science does not focus on how to make roads, but it does focus on information and knowledge to generate options and facilitate decisions that lead to the most effective service solution. In this case from a long-term perspective, building roads would be more effective and cost-efficient than feeding the population every two to three years.

### Solutions to These Problems

The following questions should be answered in order to solve these problems:

1. **Where does service science fit in the traditional emergency management model of:**
   - **Mitigation**
   - **Preparedness**
   - **Response**
   - **Recovery**

2. **Can we extend service science to forecast and predict the best ways to prepare for XYZ conditions?**
3. **What are the performance measures for the humanitarian sector in terms of service science activities (e.g. SCM)?**
    - Service science should seek to generate, test, refine, and publicize these performance measures throughout the HR sector.
4. **What are the causal factors affecting various aspects of service science work in the humanitarian sector?**
    - Seek to identify and eventually quantify these factors so as to enable predictive models

### Research Goals

1. **Objective of Humanitarian Service Science:** Generally, the objective should be the creation of a knowledge base of service activities which could be drawn upon to help mitigate the impact of humanitarian crises through the preparedness, response, recovery, and mitigation activities.
2. **Approach Humanitarian Service Science as an academic discipline.**
    - Larger Problems in the sector that are relevant to Service Science include:
        - Lack of persistent human capital
        - The inability to forecast.
        - A lack of understanding about how to model root causes.

- Inappropriate incentives for coordination. NGOs say they want to coordinate, but the financial incentives are given to those who show individual performance, not to coordination facilitators, so the financial reward structure subverts the collaborative desires.

3. **Provide alternative incentive structures for the humanitarian sector.**
4. **Conduct a scientific assessment of humanitarian SCM activities (not market-based).**
5. **Investigate the issue of time, not just what ships but when it should ship.**
6. **Identify measures to determine effectiveness and efficiency.**
7. **Promote local development of technology**

- Seek ways to provide benefits without the costs of owning ICT or learning to use it

**Methods, Tools, and Approaches**

- Database design.
- Statistics.
- Supply Chain Mgt (SCM).
- Conflict Management
- Security (physical and cyber).
- Coordination and information design.
- Game Theory.

### Candidate Research Projects

1. Find a way to introduce a time dimension to field assessments so that shipments can be scheduled better.
2. Study enhancement of local procurement of food items (and non food items) through the development and use of a database of local capacities.
3. Find a way to include the political and social constraints in the models of supply chains.
4. Find a way to do quality assurance across the whole supply chain (a methodology that everyone could use)

# The Research Agenda

Taken as a whole, the summary reports of the four workshop groups presented in the previous section represent a major step towards a long-term plan of research on humanitarian service activities. In addition to discussing real world contexts as well as listing possible methods, tools, and solution, these summaries present a large number of distinct, actionable research goals (38) and candidate research projects (27) to achieve them. Here are these goals and projects in a single edited, abbreviated list (ordered as they appear in the report):

**Research Goals**

1. Improve supply chain management and tracking to facilitate service delivery.
2. Develop data fusion for decision support tool development.
3. Use culturally-appropriate technology that takes into account diverse cultural needs and the existing conditions of each response area.
4. Demonstrate that disaster preparedness and response is most effective when authority and decision making reside at the most local level possible.
5. Shift the humanitarian action sector from being implementers toward being facilitators and capacity builders.
6. Eliminate the distinction between development and relief.
7. Allocate resources to disasters and emergencies in accord with the severity and the need.

8. Within a given response, clarify roles, responsibilities, and deliverables.
9. Develop common regional information hubs.
10. Help governments assume greater integrity and transparency.
11. Promote collaboration among people across sectors.
12. Make cultural capital available to people in sectors to allow full participation.
13. Promote a sector in which information is effectively shared regardless of which domain it is in or which organization generates it.
14. Provide e-mail and internet at appropriate cost.
15. Apply best practices to mitigate and prevent famine.
16. Remove organizational and political obstacles to distribution of goods and services.
17. Value, strengthen and build relationships between and within all stakeholder groups to facilitate information flow.
18. Promote the creation of effective, linked offices of disaster management in every president and prime minister's office.
19. Employ RFID tags for relief supplies so you know where they are and can avoid wastage.
20. Assure that relief is culturally appropriate for place and community.
21. Employ an openly available GIS database on food preferences and availability by district.

22. Provide a CIC where communities get information; train all stakeholders, including indigenous communities, on methods of accessing information and use of ICT facilities.
23. Value and strengthen indigenous warning systems as a preventative measure for humanitarian crises.
24. Establish clear linkages from data to information to knowledge to action.
25. Provide education and sensitization for vulnerable groups, donors, and government.
26. Assure that adequate infrastructure is in place to mitigate crises.
27. Provide livelihood strategies and alternative sources of livelihood for vulnerable populations.
28. Employ technologies to increase food production in disaster situations, including desalination and irrigation.
29. Adopt and adapt best practices.
30. Establish a well-developed and extensive network of community workers who can identify and report to health centers, agricultural extension officers and other key communication centers.
31. Deploy remote sensors to track issues like deforestation, flooding and fire.
32. Develop a knowledge base of service activities which could be drawn upon to help mitigate the impact of humanitarian crises through the preparedness, response, recovery, and mitigation activities.

33. Approach Humanitarian Service Science as an academic discipline that addresses issues such as lack of persistent human capital, the inability to forecast, lack of understanding about how to model root causes and inappropriate incentives for coordination.
34. Provide alternative incentive structures for the humanitarian sector.
35. Conduct a scientific assessment of humanitarian SCM activities (not market-based).
36. Investigate the issue of time, not just what ships but when it should ship.
37. Identify measures to determine effectiveness and efficiency.
38. Promote local development of technology; Seek ways to provide benefits without the costs of owning ICT or learning to use it.

**Candidate Research Projects**

1. Correlating indigenous early warning systems with technological solutions.
2. Establishing linkages between disaster prediction and rural cultural traditions.
3. Assessing the current state of tracking technology.
4. Enhancing rapid assessment of disasters via remote sensing and information extraction.
5. User needs analysis of all stakeholders.
6. Using compression technologies to optimize bandwidth and enhance connectivity to the field.
7. Creating, implementing and deploying a global multi-hazard estimation tool.

8. Using information systems to build coalitions among humanitarian relief organizations and other stakeholders to achieve effective partnerships and better delivery of human services.
9. Assessing the role of political systems in human disasters.
10. Establishing a baseline of the current state of activities and knowledge with regard to the role of host governments and local authorities in preparedness and response.
11. Determining whether there is a correlation between a stronger role on the part of host governments / local authorities, and better response.
12. Identifying attempts to establish disaster-preparedness information-sharing systems; analyzing which failed, which are succeeding, and why.
13. Determining whether there is a correlation between regional information-sharing for preparedness and better response.
14. Investigating information-sharing systems that are working and how such systems could be adapted for other settings.
15. Using Action Research to identify and bring together the relevant players in a given region; develop a requirements document for a permanent regional information-sharing system.
16. Investigating factors that differentiate responses that solve only the immediate problem from responses that help prevent the next problem.
17. Investigating whether post-disaster practices that reduce future vulnerability are being adopted and why.

18. Identifying and measuring the extent to which infrastructure and cultural issues affect technology use in the humanitarian sector.
19. Using a case study approach to identify organizational barriers to sharing information in the humanitarian relief sector and also producing examples where sharing information led to successes.
20. Creating a user-centered system for sharing and accessing information that would be used by a diverse constituency, including community members, planners, and decision makers.
21. Testing and validating indigenous knowledge regarding early warning systems.
22. Creating and applying a geographical database that includes information such as food preferences, disease outbreaks, passable transport based on season, key organizational and community leaders, costs for goods, main actors.
23. Conducting a comparative case study looking at government's interventions in their own humanitarian events and measuring the effectiveness of government's policies and interventions.
24. Finding a way to introduce a time dimension to field assessments so that shipments can be scheduled better.
25. Studying enhancements of local procurement of food items (and non-food items) through the development and use of a database of local capacities.
26. Finding a way to include the political and social constraints in the models of supply chains.

27. Finding a way to do quality assurance across the whole supply chain (a methodology that everyone could use)

Workshop participants articulated a research philosophy to guide the conduct of these proposed projects. They stressed the need for action research which is co-created by researchers and field practitioners and focused on the specific needs of the practitioner. To use William Easterly's categories (Easterly 2006), they called for research that engages complex humanitarian service systems at the *Searcher* level rather than the *Planner* level. Planners formulate sweeping agendas with general solutions to broad problems; Searchers identify practical needs and opportunities and creatively meet them.

# NSF Planning Meeting January 2007

A supplement to this award made possible a follow-up planning meeting in Washington, D.C. On January 26, 2007, leaders from the service science field, humanitarian organizations, United Nations, the military and NSF program officers met at the National Science Foundation to build on the results of the Kenya workshop and to explore the application of current service modeling and metrics to the needs and conditions of managing complex emergencies. There was a spirited and enlightening all-day discussion of the challenges of applying quantitative methods and tools to the complex environments and interdependencies of real-world humanitarian disasters. Especially fruitful was the interplay between those with field experience (e.g. NGOs or the military) and those with relevant academic research experience. In the end, all participants saw considerable potential in a major initiative that would focus on an emerging, interdisciplinary field that we called Humanitarian Service Science and Engineering (HSSE).

On the following page is a list of Planning Meeting participants:

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| | | |
|---|---|---|
| Bruce Bole | Captain, Operations Officer/Public Safety/Program | Navy Region Southeast |
| Ann Campbell | Associate Professor of Management Sciences, | University of Iowa |
| Mark Haselkorn | Professor and Director, Interdisciplinary Program on Humanitarian Relief | University of Washington |
| Kate Hulpke | Program Officer, IT Systems | VillageReach |
| Ananth Iyer | Bulkeley Butler Chair in Operations Management | Purdue University |
| James Wachai | Graduate student | University of Washington |
| Anton Kleywegt | Associate Professor of Industrial & Systems Engr. | Georgia Institute of Technology |
| Richard Larson | Mitsui Professor of Civil & Environmental Engr. | MIT |
| Elizabeth Lyons | Program Manager, Office of International Science and Engineering | NSF |
| Nick Macdonald | Head of Creative Partnerships | Mercy Corps |
| Daniel Maxwell | Associate Professor for Food Security and Complex Emergencies | Tufts University |
| David Mendonca | Associate Professor of Information Systems | New Jersey Institute of Technology |
| Rein Paulsen | Director, Emergency Response and Disaster Mitigation | World Vision International |
| Matthew Realff | Program Manager, Service Enterprise Engineering (at the time of the workshop) | NSF |
| Rodolfo Siles | ECB, Information and Technology Requirements Initiative | CARE |
| Georges Tadonki | Senior Regional Information Adviser | UN Office for the Coordination of Humanitarian Affairs |
| John Peyrebrune | Program Operations Specialist | Office of Foreign Disaster Assistance |
| Roy Williams | President & CEO | Center for Humanitarian Cooperation |

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# The Way Forward

Under this award, the PI attended another related meeting sponsored by the International Council for Science (ICSU) that occurred in July 2007: the *International Workshop on Natural and Human-induced Hazards and Disasters*. The PI presented and represented NSF at this meeting held in Kampala, Uganda. Specific activities included (1) presenting preliminary results, (2) learning about and coordinating with what the organizing groups (ICSU, IUGG, UNESCO) are doing in this area, (3) connecting and interacting with new and existing African colleagues working in this area, and (4) confirming and extending the findings in this report.

Since that meeting, in response to the challenge of reducing human suffering and property damage from global disasters as well as the increasing need for more effective humanitarian service systems, a growing community of scientists, engineers, communications experts, and humanitarian practitioners have been coming together to explore innovative approaches to disaster management. This growing HSSE community represents numerous relevant research disciplines that are contributing to the evolving HSSE field, as well as humanitarian professionals involved in developing new methods and strategies for delivering humanitarian service. We are greatly appreciative to the support that the National Science Foundation has provided as we work to (1) define and extend the HSSE community, (2) define and extend HSSE issues and methodologies, and (3) articulate a common agenda for the emerging research frontier of Humanitarian Service Science and Engineering.

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# Appendix A: Acronyms and Abbreviations

- GIS Geographic information systems
- HIC Humanitarian Information Center
- HRO Humanitarian relief organization
- IAG East Africa and Great Lakes Region Inter-Agency Emergency Preparedness & Response Working Group
- IAWG
- ICT Information and Communication Technology
- IPHR Interdisciplinary Program in Humanitarian Relief
- IT Information Technology
- UCD User-Centered Design
- USAID/REDSO/FFP U.S. Agency for International Development's Regional Economic Development Services Office Food for Peace Program

# Appendix B Original NSF Kenya Proposal

## I. Introduction

Humanitarian relief organizations (HROs) take on the huge task of saving lives and reducing the suffering of people affected by a wide range of disasters in practically every corner of the world. Often the window of opportunity for disaster intervention is extremely narrow, making rapid response and coordination particularly important. Increasingly, non-governmental organizations (NGOs), who are often among the first responders at emergencies, are establishing divisions known as global or emergency rapid response teams. These teams are tasked with going into an affected area and providing immediate data on the level and location of impacts so that organizations can plan a rapid and appropriate intervention.

Acquiring accurate and timely information is critical, but equally important is the infrastructure to make effective use of that information, including shared systems, agreements, education, training, policies, practices and management frameworks. As Harley Benz of the USGS National Earthquake Information Service put it in the case of a South East Asia Tsunami warning system,

> Putting in the sensors is the easy part. The difficult part here would be coordination between emergency response agencies in the region. Then, you have to deal with education, preparedness and training issues.
> (Seattle Times, January 2, 2005)

The humanitarian relief sector is often forced to respond without sufficient capacity to accomplish the task at hand, and an insufficient information and communication technology (ICT) infrastructure is often an important component of this missing capacity. Lessons learned following the Rwanda crisis and other emergencies have long recognized the critical importance of accurate information and timely communication. Yet most

recently at an April 2005 Tsunami After-Action Review conducted by a consortium of the seven largest international relief NGOs, the lack of timely, reliable and useful information sharing was again identified as one of the top impairments to relief efforts. Participants agreed that insufficient information flow stemmed in part from lack of a comprehensive system within and between relief agencies.

Not only does insufficient information sharing adversely impact immediate relief efforts, but it also makes it more difficult to prepare for and mitigate future emergencies. ICT is also a tool for establishing shared knowledge management and learning environments that can promote disaster risk reduction efforts through improved information sharing, communication processes and enhanced learning mechanisms. ICT for knowledge management is an important component of the humanitarian relief sector's efforts to become learning, as well as doing, organizations. The development of a strategic, interagency ICT system is a critical step towards enhancing the HRO sector's ongoing capacity to collaborate more effectively in addressing the challenges of global emergencies.

Complex challenges exist to developing and managing an ICT system that provides relief agencies with timely and accurate information from a variety of disparate sources and for a wide range of purposes. These challenges stem largely from the complex environments in which these agencies operate. These challenges go far beyond the technology itself to include such disparate factors as the needs, culture and environment of user groups; differing perspectives on the role of ICT in emergencies; the availability, nature and

ownership of key information types; the evolving information requirements before, during and after a crisis; organizational missions and contexts; business processes and strategies; political constraints and interagency relations; and identification of priority areas for collaboration and integration of efforts.

Research is needed to address these challenges and overcome these barriers. Such research should include the study and articulation of theoretically sound yet practically applicable operational models, business models, process standards, information management frameworks, technology platforms and a regional validation project to test solutions. To develop these models and frameworks, preliminary research is needed to obtain (1) a more thorough understanding of the needs, information requirements, and environments of key user groups; (2) a more complete process map of emergency response information flow; (3) a deeper understanding of the availability, nature and ownership of key information types; (4) the identification of synergies and economies of scale that can be achieved through information sharing, and (5) an articulation of a strategic framework for managing an interagency ICT system. While this research must build on existing collaborative efforts, it must also identify new synergies and economies of scale, build additional partnerships, develop shared internal capacities and help standardize processes. Appropriate research to develop new knowledge and foster cooperative activity is a critical step towards the effective design, deployment and use of humanitarian relief information and communication systems.

To address these issues, we propose field-based research that crosses academic disciplinary boundaries and involves practitioners. In addition, while engineers can (and often do) develop systems from heuristic or intuitive first principles, those systems are ultimately used in complex organizations that are themselves embedded in elaborate institutional, sector and political landscapes. A user-centered design approach (e.g. Mao et al. 2005) is the best approach to creating complex information and communication systems that are locally useful, sustainable and scalable. Building relief systems from a user-centered perspective will involve scientists and engineers, communication specialists, organizational management scholars, policy analysts, and social scientists who understand the complex social landscape in which relief and recovery efforts take place. The proposed East African Workshop on Humanitarian Relief Research & Education is a critical step towards building the research community necessary to support the informed development of user-centered humanitarian relief information and communication systems.

**II. General Plan of Work**

In an effort to comprehend and mitigate the challenges of information-sharing among organizations, the University of Washington's Interdisciplinary Program in Humanitarian Relief (IPHR), the East Africa and Great Lakes Region Inter-Agency Emergency Preparedness & Response Working Group (IAG), the Faculty of Information Sciences at Moi University (Eldoret, Kenya) and the U.S. Agency for International Development's Regional Economic Development Services Office Food for Peace Program (USAID/REDSO/FFP) propose an East African Workshop on Humanitarian

Relief Research & Education. This workshop will focus on applications of advanced information technology to emergency response.

The overall objective of this workshop is to define research—and develop a cadre of scientists and domain experts to conduct that research—that will both (1) enhance the ability of regional humanitarian relief agencies to respond to emergencies and (2) serve as a model of ICT infrastructure in support of interagency collaboration for the entire humanitarian relief sector. We will plan a collaborative research activity to understand and develop solutions to critical issues associated with developing such an interagency infrastructure. These would likely include theoretically sound yet practically applicable operational models, business models, process standards, information management frameworks, technology platforms and a regional validation project to test our solutions. Our research will produce new knowledge such as (1) a more thorough understanding of the needs, information requirements, and environments of key user groups; (2) a more complete process map of emergency response information flow; (3) a deeper understanding of the availability, nature and ownership of key information types; (4) the identification of synergies and economies of scale that can be achieved through information sharing and (5) the articulation of a strategic framework that encourages these synergies.

This workshop builds on previous collaborations among IPHR, IAG, USAID, and other groups involved in African emergency response, but would also critically expand this partnership by bringing in regional academics, researchers and educators. The workshop,

planned for late 2005 or early 2006 in Nairobi, Kenya, would bring these diverse groups together to complete the early phases of planning, developing, and coordinating an international research activity in support of humanitarian relief in Africa. East Africa is an ideal location for this research due to the large number of organizations already exploring cooperative efforts in humanitarian relief and development. The IAG represents 26 of the most active NGOs in East Africa, and our new academic partners, led by Professor Cephas Odini, Dean of Information Sciences at Moi University in Kenya, deliver education and conduct research on information and communication issues in Africa. Workshop results will be disseminated through journal and conference articles, as well as presentations to NGOs and interested African and U.S. governmental agencies.

Since information and communication systems are primarily about people and organizations (Davenport 1997), this workshop is likely to be as much about organizational and individual behavioral change as it is about technology development. In the past, HROs have typically focused on their individual systems, thereby complicating efforts to share or coordinate information at the time of an event. The IAG consortium is a unique opportunity to break down these barriers. The proposed workshop brings IAG members together with the leading U.S. humanitarian relief academic program, leading East African academics in relevant disciplines, and the lead U.S. donor agency in an effort to identify desirable synergies across their combined capacities, establish processes and frameworks that support these synergies, and promote buy-in and joint ownership of an eventual shared relief information and communication system.

## III. Understanding the Challenges

Over the last two decades, the humanitarian sector has increasingly recognized the value of having a coordinated response to humanitarian emergencies. In 1991, the United Nations formed the Office for Coordination of Humanitarian Affairs (OCHA) to provide coordination among the various UN bodies responding to humanitarian emergencies.

> Humanitarian coordination is based on the belief that a coherent approach to emergency response will maximize its benefits and minimize its potential pitfalls - in short, that the whole will be greater that the sum of its parts."
> (UN OCHA website)

Despite this increasing recognition of the need for more effective coordination among the UN, NGOs and other humanitarian actors, there have been many barriers to the establishment of a strategic infrastructure that supports clear and effective interagency information and communication. Some barriers focus on technology, but as noted above, even more problematic are human, political and organizational aspects of effective, comprehensive information and communication systems (ICS). (The use of ICS rather than ICT emphasizes the importance of these non-technical system issues.)

ICS must support inter-organizational communication that is greatly complicated by a diverse landscape of players, including not only the NGOs, but also the United Nations, donor governments, multi and bilateral agencies, governments of countries affected by the crises, philanthropic foundations, corporations, the giving public, and most importantly those who have suffered during the crisis. A clear and comprehensive communication system is critical to managing relationships among the many players in a relief landscape.

Challenges arise in all aspects of evolving relief efforts, including preparedness and early warning, rescue, relief, and recovery. These efforts are themselves composed of complex, interconnected operations such as logistics, supply chain management, human resources, informal and formal agreements, evaluation and assessment, lessons learned and institutional learning. Perhaps most importantly, communication challenges exist between relief actors and the general public whom they are committed to serve.

There are many examples of the challenges that will be addressed in this project. Following are just a few.

**A. Balancing Coordination and Interoperability with Organizational Autonomy**

While NGOs all share the objective of alleviating human suffering, they are very diverse, with different constituents, missions, objectives and cultures. The maintenance of organizational autonomy is often cited as a barrier to increased coordination and interoperability. For example, field workers may recognize that a shared warehouse could increase their efficiency, but they may not participate if it means sacrificing the ability to respond independently.

For this project, we will view "interoperability" not as sharing common systems, but as "creating conditions that enable separate organizations to share information toward a common end." (Solomon and Brown, 2003) This definition of interoperability does not require NGOs to relinquish organizational sovereignty, but rather focuses on the underlying synergies that can make information sharing beneficial to all parties.

## B. Complications from a Decentralized Organizational Structure

NGOs operating in the developing world typically have a decentralized organizational structure in which field offices exhibit a high level of autonomy with minimal oversight by headquarters (HQ). The main advantage of this type of structure is that NGO field offices can develop a firm understanding of the local situation, needs, languages, politics and cultural nuances of the country where the disaster has occurred.

This in-depth understanding of the locality helps an NGO respond more rapidly and appropriately and is a critical success factor in disaster response. But while there are critical benefits of a decentralized structure, it also considerably complicates the implementation and management of an organization-wide or sector-wide ICS infrastructure.

Despite the need for an interagency ICS strategy, mandating such a strategy from HQ (top-down) is neither effective nor feasible. Many HQ offices function as non-operational, fundraising components of the organization with little or no oversight, making it difficult to field test and implement new communication strategies. In addition, mandating policy from an HQ level is not compatible with the consensus-building leadership style of NGOs (and non-profits in general). While NGO field offices often consider recommendations on all levels by HQ, they are rarely required to implement them. Incorporating field offices in a user-centered (and user-owned) design effort is critical to the success of this project.

**C. Difficult Information Management Environments**

An NGO's ability to store and manage information and knowledge is a critical component of organizational capacity, disaster response, post-disaster assessment and institutionalization of lessons learned.

Knowledge management tools and strategies are being increasingly recognized in the sector as potentially valuable ways to improve and refine performance for future disasters, but if NGOs are to move from a focus on doing well in the current emergency to adding the equally important job of doing a better job the next time, they will need to develop and apply ICS to the capture and application of past experiences.

Despite this growing recognition of the importance of information and knowledge management, this activity is especially difficult to accomplish in the humanitarian relief sector. It is critical to understand and address the extreme difficulties of operating in highly chaotic, resource and information poor environments. In such environments, information gathering is often seen as a distraction and it is too late to begin establishing the necessary ICS infrastructure, including agreements, policies, and practices, after an emergency has occurred. This project will help establish necessary agreements and infrastructure before emergencies occur.

**D. Lack of Funding for ICS Strategic Planning and Implementation**

Humanitarian relief organizations generally view ICS as overhead rather than as a fundamental activity. Perhaps more significantly, relief donors generally view overhead costs as detrimental to a proposed project, so these costs are kept to a minimum. In

addition, since most funding is project based, there are few if any program resources that can be used to address longer-term, organization-wide infrastructure needs.

This project brings together the resources of numerous NGOs, donor agencies and academic partners to address long-term issues affecting ICS infrastructure. It will develop a workable and effective management framework for designing, implementing and maintaining a strategic interagency information and communication infrastructure.

In addition to the challenges discussed above, the workshop will cover many additional related challenges including: employing ICS in local capacity building, providing appropriate personnel training, integrating incomplete information among various organizations, employing ICS to address increased security needs, balancing short-term and long-term objectives, encouraging cross-sector program development, addressing perceptions that technology initiatives are a distraction, and overcoming organizational reluctance to share information.

**IV. Research Direction**

The overall guiding framework we will use in creating our research agenda is user-centered design (UCD). UCD is a well established process that has been widely adopted by many organizations to deliver products that meet users' expectations and are suited to their environments. This process seeks to answer questions about users and their tasks, goals, and environments, and then uses these findings to drive system design and

development. (For a recent overview of the extensive UCD literature, see Mao et al. 2005.)

We will use state-of-the-art UCD approaches, specifically user-centered design principles and methodologies, to guide the early phases of a collaborative research activity focused on the development and management of a regional emergency response information and communication system (ERICS). Our approach in developing an ERICS will be highly interdisciplinary and holistic, involving exploration of such disparate factors as user groups, their information and communication needs, key information types, organizational contexts, technology infrastructure, business processes and strategies, communication patterns and political constraints. The outcomes of this workshop will guide a subsequent research project to acquire the necessary user-centered knowledge and apply it to ERICS design, development and testing.

We have chosen to approach the ensuing research from a UCD perspective for a number of reasons. First, experience has shown that designing a platform for relief field workers without a detailed understanding of their work results in systems which at best frustrate and at worst militate against emergency response. In many cases, field workers are the information sources for such systems, but the immediate benefits are useful only to headquarters. This is an unsustainable situation and has led to advanced IT projects in humanitarian relief being either, “abandoned or [having] limited impact in part because local needs were inadequately represented.” (Maiers, Reynolds, & Haselkorn, 2005)

Second, UCD is a non-prescriptive framework (Gould & Lewis, 1985) shown to result in more effective systems tailored to the use of distinct, dynamic populations similar to relief workers (Gaver, 1991; Gould & Lewis, 1985; Larsson, 2003; Mao, Vredenburg, Smith, & Carey, 2005) User-centered design provides overarching guidance. However, it does not dictate specific data collection or analysis procedures. It provides a flexible framework in which to organize and execute the research designs most appropriate to research questions and goals. User-centered design's flexibility and focus make it an ideal organizing principle for ERICS research, where research contexts and questions promise to be dynamic and unusual. In addition, current research indicates that ERICS have not been sufficiently studied to provide reliable frameworks for controlled experimental designs.

Finally, the contexts in which relief workers use ERICS are complex and varied. (Maiers et al., 2005) Maiers et al state that,

> In the NGO world, the local communication needs and contexts in the Africa offices are likely to be very different than those needs in the Latin America offices. In these varying environments, user-centered design becomes an even more critical but extremely challenging activity. The major challenge is to develop systems and strategies that can address diverse needs, users and conditions without becoming chaotic (i.e. developing systems that are flexible, but not ad hoc).

As a result, the research aims of generating new systems-level knowledge of whole processes and the unpredictable field context of our research will require empirical methodologies, which have a tradition of seeking new knowledge but are constructed to flexibly, progressively adjust. Certain, time-tested traditional qualitative approaches fit this description. Examples of these qualitative data collection and analysis methodologies include cognitive engineering to design for environmental constraints (Vicente, 1999;

Vicente & Rasmussen, 1992), contextual inquiry to analyze work tasks in the field (Beyer & Holtzblatt, 1998; Holtzblatt, 1996, 1999), communication flow frameworks to elicit models of information sharing (Kock, 2001, 2003) and to investigate knowledge work processes, grounded theory (Bryant, 2002; Glaser & Strauss, 1967; Ocker, 2005; Pace, 2004; Sarker, 2001). These studies offer intriguing research on process modeling and user experience frameworks focused on both communication and work activity. These methodologies could prove extremely useful in analyzing and understanding the knowledge-intensive and contextually chaotic aspects of humanitarian relief work. We will be able to determine exactly which research designs and methods will be used for empirical investigation of ERICS after the workshop researchers collaboratively discern the specific areas of future inquiry.

## V. Uniqueness of the proposed effort

The need to develop an effective information sharing system is not a new realization. This has been the subject of numerous conferences, task forces and initiatives for years. Lessons learned from nearly every major humanitarian event includes a call for intensified attention to information sharing. Indeed, many organizations have been born out of this need – NetHope, Humaninet, InterAction, LINGOS, and many others. Nevertheless, this proposal constitutes a distinctive and important new step towards addressing this need in the following ways.

(1) *Comprehensive commitment of regional NGOs*

The proposed workshop will encourage the NGOs of the East African Inter-agency Preparedness and Response Working Group (IAG) to develop a jointly owned, collaborative project. With the IAG members as our guides, we will view the issues surrounding humanitarian relief systems in light of general sector trends toward increased collaboration and organizational learning, with information and communication systems as part of a conscious effort to shape and accelerate these changes in ways that are beneficial to the sector as a whole. As such, this proposal is as much about sector change, organizational change and protocols for cooperation as it is about technology development and integration per se.

(2) *"Information and communication systems" vs. technology-first approach*

Many prior efforts in this area have approached the challenge through the lens of technology – these efforts have examined work flow and processes and arrived at a technological solution believed to solve the information sharing bottlenecks. However, we know from experience that the biggest challenge to technology integration and information sharing is differing organizational missions, policies, practices, environments and cultures. In acknowledgment of this, the proposed workshop will first examine how each of our organizations creates, shares, uses and manages information/knowledge without any reference to technology, and only after this review is completed will we consider appropriate technological pathways.

(3) *Learning Organizations*

In committing to this effort not as a narrow technological fix, but as a major driving force for sector change, we see one of the major goals to be the articulation of a framework and processes that support the transformation of relief organizations into "learning organizations." The workshop will support the evolution of agreements, protocols and organizational change – supported by appropriate technology –that will enable the humanitarian sector to better learn from, prepare for, mitigate and respond to humanitarian disasters.

(4) *Key Partnerships*

While the IAG NGOs are a focus of this effort, the non-NGO partners are equally critical and make this effort particularly unique. The University of Washington's IPHR experts will facilitate the workshop, bring important theoretical perspectives, report the results of foundational field study conducted in East Africa during the summer of 2004, and lead the capture and dissemination of workshop results. Researchers from Moi and other African universities will provide critical expertise and regional perspective, as well as leading the follow-up development of a regional research team. USAID personnel will represent the critical donor perspective and provide a potential source of support for follow-up efforts. (See supplementary documents for additional information on workshop partners.)

(5) *Openness*

The humanitarian relief sector is actively seeking foundations for collaborative effort, and we have an opportunity to help establish principles, protocols and practices that will

impact the sector's ongoing evolution towards increased cooperation and coordination. The outputs of the workshop will be actively shared and made available to other organizations in the sector, and we will seek to broaden the partnership to include other partners with complementary strengths and experiences. We have already opened discussion with the Interagency Working Group on Emergency Capacity; a consortium of seven of the largest NGO's involved in humanitarian relief. In addition, our systems perspective will lead to discussions with numerous other relevant groups, including the UN, donor agencies, the military, and local beneficiaries and their governments.

**VI. Workshop Plan**

The workshop will be approximately three days and will include an afternoon for site visits to relevant partner facilities. Dr. Haselkorn will serve as the workshop chair with Dr. Odini of Moi University, George Fenton of World Vision International/AIG and Alex Deprez of USAID/REDSO/FFP serving as co-chairs. In addition to these four individuals, the following participants will serve as discussion leaders: Mary Kay Gugerty (School of Public Affairs, University of Washington); Chris Coward (Director, Center for Internet Studies, University of Washington); Dr. Joseph Kiplagat (Information Sciences, Moi University); Dr. Gregory Wanyembi (Information Sciences, Moi University); Dane Fredenberg (Catholic Relief Services and IAG); Agnes Nyaguthie (CARE and IAG) and Dana Rose (USAID/REDSO/FFP).

In addition to the individuals listed above, other researchers will be identified and invited to the workshop. For example, we have identified two additional African researchers

(Stephen M. Mutula, University of Botswana and M. A. Tiamiyu, University of Ibadan, Nigeria) who have published relevant articles in the Journal of Information Science). Dr. Odini will lead the selection process for inviting additional researchers from Africa.

A tentative general agenda follows:

Day One:

1. Introductions and sharing of background information
2. Discussion of overall scope of the research including joint research goals and objectives
3. Presentations on general priorities, interests, expertise and objectives
4. Presentations on previous work that has led to this activity
5. Presentations and discussion of current sector and regional humanitarian relief issues
6. Discussion of agenda for remainder of the workshop and refinement of activities and goals
7. Social team-building event

Day Two:

1. Focus on current East African regional systems, including:
    a. Principal user groups and stakeholders
    b. Existing information, communication and knowledge management systems
    c. Existing processes that occur in support of emergency response
    d. Organizational and environmental requirements, tensions, and challenges
2. Identification of problems, issues and opportunities

3. Brainstorming on collaborative efforts that could address these issues and opportunities

4. Breakout discussion and report on the candidate collaborative efforts

5. Field trip to relevant regional facilities

Day Three:

1. Discussion of specific collaborative activities identified on day two

2. Selection and definition of a candidate project

3. Establish goals, methods, timeline and future directions

4. Clarify roles, collaborative relationship and individual tasks.

5. Discuss funding strategies for collaborative work

6. Agree on follow up structures and times in order to facilitate the growth of the research.

7. Concluding event

Specific collaborative activities to be discussed at the workshop will include:

1) Identification and assessment of sector-wide:

    a) current use of ICS in emergencies,

    b) needs, information requirements and environments of key information users,

    c) available information repositories,

    d) opportunities for synergies, and

    e) relevant organizational contexts.

2) Identification and assessment of IAG regional:

    a) Needs for information sharing

b) Needs for building capacity in the use of ICT

c) Cross-agency flow of emergency-related information before, during and after disaster response.

3) Exploration of the role of information and communication systems in local capacity building for disaster mitigation and identification of areas where collaboration can make this more effective.

4) Involvement of information users and other stakeholders in the high-level specification (operational components, process standards and strategic framework) of an interagency information and communication system in support of humanitarian relief.

5) Addressing the feasibility and technology requirements for implementing such a system.

6) Testing assumptions and models through a regional pilot project that would assess the validity of the system design, operations, processes, training, learning, and collaborative framework.

7) Defining objectives and metrics to measure progress, assess impact, and report outcomes.

Specific workshop outcomes will include (1) a written plan and subsequent proposal for a follow-up collaborative research project, and (2) a workshop report that will include recommendations on general areas for future research and suggestions for future expanded collaborations. Workshop results will be disseminated through journal and conference articles, as well as presentations to NGOs and interested African and U.S. governmental agencies. While East Africa is an ideal location for this workshop and

subsequent research (in part due to the large number of organizations engaged in humanitarian relief and development in the area), the knowledge generated will not only benefit the East African region, but will also serve as a model to the entire humanitarian relief sector.

## VII. Outcomes and Impacts

Upon completion of this workshop, we will be in the position to initiate research that will both provide critical new knowledge about the humanitarian relief sector and take critical steps toward the design, development and use of a regional interagency emergency response information and communication system. Such a system will enable participating relief organizations to (1) plan coordinated responses to current and future emergencies; (2) collaboratively build local capacity to mitigate emergency impacts; (3) realize efficiencies in the collaborative delivery of relief in response to emergencies; (4) collaboratively assess and learn from past emergency responses and (5) collaboratively apply lessons learned to organizational and sector change. All of these outcomes will increase the collective capacity of humanitarian relief organizations to meet future emergencies.

While the humanitarian relief sector can learn much from the private sector, ICS solutions cannot be taken off the shelf and expected to be completely applicable. NGOs face numerous unique and complex issues that require them to adapt available solutions to their own particular conditions and needs. Under this proposal, a consortium of 26 regional relief agencies will work with international and regional academic researchers

and USAID to establish frameworks, agreements, and collaborative plans in support of designing and developing a comprehensive, interagency ICS infrastructure.

The proposed workshop will begin the development of a framework for interagency learning to promote disaster risk reduction efforts. It will help identify desirable synergies across IAG members, promote buy-in and joint ownership of ICS development, and seek opportunities for developing local capacity to meet regional emergencies. It will take critical steps toward developing a comprehensive interagency ICS in support of humanitarian relief efforts. In order to make this happen, the University of Washington, IAG, Moi University, and USAID/REDSO/FFP will collaborate with each other, share knowledge, learn together and integrate their efforts. ICS are a logical area for this collaborative effort to occur, and we are all eager to work together and help make this happen.