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Cover photo: A member of a demining and unexploded ordnance clearance team in a field on the outskirts of Mariupol, eastern Ukraine
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Editorial photos: Volunteers in Freetown, Sierra Leone, put on personal protective equipment
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© Internews Europe

Middle: A mother holds her daughter at a health centre in the Karkaar region of Puntland, Somalia
© Save the Children/Colin Crowley.

Bottom right: Water points in Juba, South Sudan
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This edition of *Humanitarian Exchange*, co-edited with ELRHA Humanitarian Innovation Fund (HIF) manager Kim Scriven, focuses on innovation in the humanitarian sector. As Kim points out in his overview article, strategic interest in and funding for innovation has grown significantly in recent years. Nevertheless, more needs to be done to improve the evidence base, relocate innovation capacity from headquarters to the field, and develop tools and guidance for innovators trying to solve problems in the delivery of aid. In her article, Alice Obrecht proposes three success criteria for innovation based on case studies of HIF-funded innovation projects.

Technology innovation is an important theme in this edition. Nathaniel A. Raymond and Casey S. Harrity argue for clear ethnical and technical doctrine to guide its use. Rahel Dette and Julia Steets explore the role of technology in monitoring aid in insecure environments, and Monica Zikusooka and colleagues report on using technology to conduct simulated field visits in Somalia. Karen Kisakeni Sørensen highlights the challenges of innovating in the midst of armed conflict in her article on the use of technology in mine action in Ukraine. The opportunities and challenges posed by robotics are explored by Andrew Schroeder and Patrick Meier, and Josiah Kaplan and Evan Easton-Calabria look at the opportunities and hazards of military innovation for the humanitarian sector.

In their articles Ben Ramalingam and Elizabeth Gilmour share lessons on innovation in the Nepal earthquake response. Ronak Patel and Mihir Bhatt discuss a small-business micro-insurance programme in India, and Robert Hakiza and Evan Easton-Calabria elaborate on their research into urban micro-finance programmes run by refugees in Uganda. Caetano Dorea describes the development of a new water filtration product, and Eric James and Laura James explore the potential of 3D printing of humanitarian supplies in the field. The edition ends with personal reflections by Paul Currion on the rise and decline of Humanitarian Information Centres (HICs).

As always, we welcome any comments or feedback, which can be sent to **hpn@odi.org.uk** or to **The Coordinator, 203 Blackfriars Road, London SE1 8NJ**.

Residents of Panga, Nepal use aerial imagery to take part in a disaster damage assessment

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Humanitarian innovation

Humanitarian innovation and the art of the possible

Kim Scriven

The issue of innovation in humanitarian response has risen up the humanitarian policy agenda with remarkable speed. Recent years have seen a flurry of new initiatives to promote innovation within and across organisations, new collaborations and increased investment in developing and testing innovations at the operational level. As more of these initiatives and projects reach some form of maturity, this is an opportune time to reflect on the implications of the rise of innovation more broadly.

Innovation is in no way a new phenomenon in the humanitarian system. It is inherent to the will to overcome obstacles in order to provide relief and assistance to people affected by crises – though there are doubtless more than a few field-based humanitarians who have looked on incredulously as technological quick fixes are deployed from afar to combat essentially political blockages to the provision of aid. As the rise and decline of Humanitarian Information Centres (HICs) in the 1990s demonstrates (see the article by Paul Currion in this edition of *Humanitarian Exchange*), the sector has a tradition of developing new programmatic and operational responses, whether due to contextual need or technological opportunity, yet is less good at embedding them. What has changed in recent years has been the rise of innovation as a strategic concern for organisations, and for the sector as a whole.

The rapid rise of innovation

If innovation itself is not new, it is important to try and understand how and why it has become so prominent a feature in conversations about change and improvement. Since the first ALNAP study on innovation in 2009[1] accelerated the current focus on innovation, actors across the system have expanded the breadth and profile of their work in this area. Donors, notably the UK, the US and the Netherlands, have made funds available to support innovation, and developed policies that encourage innovation and the harnessing of new technologies.[2]

The availability of these new sources of funding has enabled new innovation initiatives to emerge, including the Humanitarian Innovation Fund within ELRHA, the first cross-sectoral mechanism to support humanitarian innovation. A number of research and policy efforts have diagnosed many of the systemic barriers inhibiting innovation, and innovation units have been created in a number of agencies, including the World Food Programme (WFP), the International Committee of the Red Cross (ICRC) and the International Federation of Red Cross and Red Crescent Societies (IFRC).[3] The UN High Commissioner for Refugees (UNHCR) and the UN Children's Fund (UNICEF) have built ambitious and externally facing organisational units which play an important role in positioning their organisations as relevant and dynamic. Perhaps most significantly, the theme of 'transformation through innovation' was selected as one of four initial themes for the World Humanitarian Summit.

The challenges of achieving change

Despite this rapid proliferation of innovation initiatives and funding, innovation has yet to be fully integrated within humanitarian operations. Emerging ideas get stuck at the pilot stage or siloed within a single organisation, unable to achieve scale and impact.

In order to change this, it is important to understand where this policy agenda has come from, and to see innovation as part of a wider conversation about strategic change and improvement in the humanitarian system. In this respect innovation shares many features with other efforts: moves to improve performance through greater use of evaluation; campaigns and initiatives to make the system more accountable (particularly to people affected by crises); and more generally ongoing attempts to develop a common framework for humanitarian effectiveness.

These efforts reflect the almost universal agreement that the humanitarian system faces a myriad of strategic and operational challenges, which perhaps threaten the basis of

1 B. Ramalingam, K. Scriven and C. Foley, *Innovations in International Humanitarian Action* (London: ODI, 2009).

2 The DFID Humanitarian Response Review and subsequent Humanitarian Innovation and Evidence Strategy is a good example of a donor supporting innovation: https://devtracker.dfid.gov.uk/projects/GB-1-203705.

3 See, for example, *CENTRIM, Strengthening the Humanitarian Innovation Ecosystem Study* (Brighton: CENTRIM, 2015); A. Betts and L. Bloom, *Humanitarian Innovation: The State of the Art* (Oxford: Refugees Study Centre, 2013); and Deloitte, *Promoting Humanitarian Innovation Exchange* (London: Deloitte, 2015).

the humanitarian enterprise itself. Despite many attempts at reform, a coherent response to such concerns is yet to appear. The past decade has seen the 'formal' sector grow to a $25 billion-a-year industry, affecting millions of people's lives, yet its institutional composition has persisted even as the nature and extent of crises have evolved.

Investment in innovation offers an enticing combination of opportunities to break this apparent inertia. It presents a new pathway to change, free from the political and institutional blockages curtailing other initiatives; creates potential access to new funding and resources, as well as links with dynamic partners in the private sector; and promises powerful new insights and action. However, while investment in innovation has delivered undoubted improvements in practice, innovation in itself will not deliver radical, system-defining change unless organisations that hold power in the system believe such change is in their interests. For example, the adoption of new technology like SMS messaging may help close the gap between aid giver and aid recipient, but it will not be sufficient to ensure that aid givers respond to the views and wishes of affected people.

Learning from experience

While this presents a challenge to the potential of innovation to lead to real change, we do now have a much richer body of experience to draw on to inform our collective thinking about innovation. At the project level in particular, a myriad of promising innovations are being developed and tested around the world. These pockets of good practice have much to tell us about the challenges and benefits of innovation, and can perhaps help guide future efforts to bring about change and improvement in the sector. But they also reveal a number of key issues that will have to be tackled in the coming years.

The first concerns the need to improve the use of evidence. As an increasing number of operational-level innovation efforts reach fruition, it will become increasingly important to demonstrate their impact at both the project and system level. This will include both measuring the performance of new approaches and improving the baseline data on existing practice. But questions around the impact of innovation should not be confined to the short-term horizons that characterise much humanitarian work. We must also take account of longer-term impacts and look beyond stated benefits to unintended consequences, for instance around how the growing use of drones and remote communication technologies in the humanitarian sphere may be contributing to the increased use of remote management practices, increasing the separation between agencies and those they seek to assist.

A second related challenge concerns the extent to which innovators and the humanitarian system are able to scale up those innovations that do offer improved solutions. Given the length of time it takes for innovations to take hold (particularly in a non-market system like the humanitarian sector), it is perhaps not surprising that we are seeing a proliferation of innovations at the pilot stage, yet limited examples of new ideas being widely adopted. This is not just a question of time. There is an increasing concern that, despite increased investment in innovation, institutional blockages and perverse incentives in the system present significant challenges to the growth of promising ideas.[4] These might include the tendency to prioritise the provision of material assistance regardless of context, or the challenges in shifting procurement and supply of standard relief items, even when new products offer improved performance. Fundamentally, accountability in the system is such that the performance of agencies has at best a partial relationship with their ability to raise funds and operate in future crises, limiting the imperative for continuous improvement and innovation.

A final area of consideration relates to the ownership of innovation. As outlined above, to date the drive for innovation has come from within the humanitarian sector. This has too often manifested as an effort by the 'old guard' of humanitarian actors to present themselves as dynamic and relevant while keeping control of resources and authority and maintaining barriers to entry into the system.[5] Although creating space for incremental innovation and improvement, this leaves little room for radical or disruptive change.

Entrepreneurial organisations such as Field Ready (see the article by Eric James and Laura James in this edition) may stand a good chance of overcoming these obstacles to adoption, able as they are to draw on personal expertise and networks from within the sector. The challenges may be greater for local organisations and crisis-affected communities, particularly as (almost by definition) they may be less focused on wider adoption or replication outside their specific contexts. But until the system creates (or supports the creation of) meaningful channels to integrate innovations from within affected populations and local organisations, it will struggle to move beyond tokenistic efforts and make the case that it is driven by the needs of affected people, or that it can offer radically new approaches to the provision of assistance.

The next phase of humanitarian innovation

Where then does this leave humanitarian practitioners, aware of the structural inadequacies of the system, but working within it to provide assistance and relief in some of the world's most challenging contexts? There is undoubtedly a real risk that the centralised innovation capacity that the system is developing will be detached and superficial, unable to meaningfully address key concerns about accountability, protection and access during conflict, or recognise and empower local responders.

4 The most detailed exploration of this to date is D. McClure and I. Gray, 'Scaling: Innovation's Missing Middle', ThoughtWorks, 2014, https://assets.thoughtworks.com.

5 Sometimes such barriers exist for good reason (such as concerns over the protection of humanitarian principles); in other cases, they appear more the result of closed perspectives that are counterproductive to real change.

In the short term, those who focus on innovation must do a better job of relocating innovation capacity from HQ to the field, providing tools and guidance to support those seeking to solve problems in the delivery of aid. Supporting the proliferation of a myriad of small positive changes to the aid system is a powerful tool in advocating for the potential of new approaches and business models, and highlighting broader inertia and intransigence. The longer-term impact of the focus on innovation is less certain. As the political and operational contexts which shape humanitarian aid change, the extent to which the current system is able to adapt and evolve in response will depend on whether it is possible to achieve a shift in the culture and underlying politics of the aid system.

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Separating the 'good' failure from the 'bad': three success criteria for innovation

Alice Obrecht

The value of innovation lies in its potential to improve humanitarian action. Innovation processes seek improvements by identifying and developing ideas for better tools, approaches and ways of thinking that will change the way humanitarian assistance is delivered. Innovators seek to do things better by exploring options for doing things differently.

The exploratory and uncertain nature of innovation means that some degree of 'failure' is inherent, as results will often differ from expectations. Innovation processes are dynamic. While they can eventually lead to improvements in humanitarian assistance, many false starts, unsuccessful pilots and revisions to original plans and prototypes occur along the way. It has been argued that, in order to increase innovation in the humanitarian sector, organisations and donors will need to become less risk averse and embrace 'failing fast' in order to support adaptation and improvement.

This poses a challenge to understanding what successful humanitarian innovation looks like. To address this lack of clarity, ALNAP has worked in partnership with ELRHA's Humanitarian Innovation Fund (HIF) to carry out 11 in-depth case studies on innovation projects funded by the HIF. The aim of this research is to understand the factors that contribute to successful innovation in humanitarian contexts. This is the first empirical research in the humanitarian system that examines successful innovation processes and the factors that contribute to them.

Why is this important?

There are three reasons why we should care about defining success criteria for humanitarian innovation. First, innovating teams and organisations need a way to communicate to donors and other external actors that they are making progress even when faced with an unsuccessful pilot or initial prototype. To do this, we need ways of distinguishing 'good' fails from 'bad' fails, which requires greater attention to the ways in which innovation processes generate evidence and learning from their pilots.

We also need to know what successful innovation looks like so that it can be better supported with guidance tools on good practice. Recommendations for how to innovate for humanitarian purposes must be grounded in solid evidence that links particular practices to successful innovation. We can only do this if we have a clear understanding of what successful innovation looks like.

Third, understanding what constitutes successful innovation can help us look more carefully at how we measure success in humanitarian action more generally. Innovation is concerned with generating improvements. In order to determine whether an improvement has been offered, we need quality baseline data and/or consistent standards that can be used to make comparisons across different approaches, tools and interventions. Such practices are significantly lagging behind where they should be in the humanitarian system to date. Demanding high levels of evidence from innovations while the evidence on the effectiveness of current interventions remains weak creates the possibility that we might hold innovations to a higher standard than existing practice. This might constitute an unreasonable level of risk aversion that sacrifices great potential gains in improved assistance. The demand to demonstrate the success of innovation processes requires us to also look harder at how we measure the performance of current practices and interventions.

Defining successful humanitarian innovation: three core criteria

We can identify the criteria for successful innovation by reflecting on the value that an innovation process offers across a range of scenarios:

- The 'ideal' scenario, in which innovation is fully successful and has causally contributed to improvements in humanitarian action.
- The 'missing middle' scenario, in which an innovation has developed an effective idea for improving humani-

A biometric fingerprint system in use in an IDP camp in North Kivu, Democratic Republic of Congo

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tarian action but may not have been adopted by many humanitarian organisations.

- The 'good fail' scenario, in which the original idea turned out to be ineffective or unfeasible, but lessons are generated that can support future successful innovations.

These scenarios are not mutually exclusive. In fact, the pathway to many successful innovations includes individual cycles that end in a 'good fail' or 'missing middle' scenario. For some innovations with long incubation periods behind them, each of the three scenarios has occurred at some point in the trajectory of the overarching innovation process.

The 'ideal' scenario: adoption

Beginning with the ideal case, the best possible outcome of an innovation process is the wide adoption of an innovation that then contributes to better performance in humanitarian action. Adoption is therefore a criterion of success for innovation processes: it is the most desirable success criterion and the most difficult to achieve.

The 'missing middle' scenario: improved solution

In the humanitarian literature, it is often implied that adoption is the only criterion of success, and that successful innovation equates to products or processes being taken to 'scale'. However, this fails to acknowledge the contributions of innovation processes that struggle with what has been called the 'missing middle' of innovation.[1] The missing middle refers to the gap between developing a product or process that offers an improvement over prior practice and achieving wider uptake of that product or process within the sector. Innovating teams can fall into this gap if there are adverse incentives in the humanitarian system that block uptake, even if the product or process offers tangible improvements for humanitarian action. Cash-based programming is often cited as an example of this kind of innovation. So-called 'product' innovations, such as pieces of software or water and sanitation kits, can also offer improvement, yet fail to reach full adoption. This is due to the 'wasn't built here' syndrome, where humanitarian agencies prefer to create their own version of an innovation rather than adopting one built by another organisation.

In these cases, HIF grantees used a variety of methods to overcome the missing middle, from generating strong evidence around their innovation and using this as a basis for advocacy to targeting specific actors who could help overcome the institutional barriers to adoption. For some innovating teams, attempting to address all political and institutional barriers may not be a reasonable expectation or a good use of resources. In these cases, senior leaders within an organisation often must buy into the innovation and use their influence to help its wider adoption. The point, however, is that innovating teams can do everything correctly, not achieve adoption and still claim some success for their innovation process if they have generated improvement.

1 Dan McClure and Ian Gray, 'Scaling: Innovation's Missing Middle', paper delivered at the Humanitarian Innovation Project conference, 19 July 2014.

Assessments of innovation processes must acknowledge the difference between cases where scale is not achieved but the innovation is a good one, and cases where scale does not occur because the prototype does not work or because the innovating team did not manage the process effectively. If an innovation process produces a good innovation it may still qualify as 'successful', in so far as it has yielded a viable improvement over current practices. Developing an improved solution for humanitarian action is therefore a second success criterion for humanitarian innovation.

The 'good fail' scenario: consolidated learning and evidence

In some cases, it may turn out that an innovation does not offer a viable improvement over current practices. The original idea for the innovation may have turned out to be unworkable in a way that could not have been expected at the outset of the innovation process. In these cases, innovating teams can still make an important contribution by sharing consolidated learning and evidence from their innovation process, in order to assist others who may try to build on their attempts or work on a similar problem in the future. These cases might still be considered 'successful', in so far as they contribute to the body of knowledge that is necessary for the humanitarian system to make progress. Therefore, consolidated learning and evidence is a third criterion for success that an innovation process might meet.

There are several good examples of consolidated learning and evidence being used as a crucial building block for further work towards an eventually effective and successful innovation. In 2005, Save the Children UK and the Emergency Nutrition Network set out to understand the effectiveness of supplementary feeding programmes (SFPs), a common intervention for acute malnutrition.[2] Their initial research, published in an HPN Network Paper, found that there were significant problems with the quality of monitoring data collected on supplementary feeding programmes, as well as highly inconsistent use of reporting categories and measures. As a result, SCUK and ENN led a consortium to develop a set of standard reporting requirements, initially for moderate acute malnutrition and later also severe acute malnutrition. SCUK also led the development of new software to enable the easy and consistent collection of data to monitor the performance of SFPs.

The process featured many stops and starts and restarts, as different types of software were trialled, and as the project changed to fit broader changes in malnutrition programming, including a shift towards Community-based Management of Acute Malnutrition (CMAM). In each iteration of the project, including unsuccessful pilots of an Access-based version of the software, lessons learned fed into the next cycle (though not without difficulty, as many of these lessons were generated according to funding deadlines rather than as a natural part of the innovation process). SCUK ended up carrying forward the project on its own, resulting in the recently launched CMAM Report, which is now being used by nine agencies in 20 different countries. The consolidation of learning and evidence in this project not only assisted SCUK in eventually developing and diffusing an effective innovation, but also contributed more widely to the nutrition sector's understanding of the effectiveness of CMAM programming.

Three success criteria

Over the past year, ALNAP has been using three criteria for successful innovation defined from the above scenarios in order to explore what factors and practices contribute to the successful management of humanitarian innovation. Working with 11 HIF grantees, ALNAP has explored the approaches and tools used by grantees and the extent to which they have helped to achieve the following three success criteria:

- Consolidated learning and evidence: new knowledge is generated or an enhanced evidence base around the area the innovation is intended to address, or around the performance of the innovation itself.
- Improved solution: the innovation offers a measurable, comparative improvement in effectiveness, quality or efficiency over current approaches to the problem addressed by the innovation.
- Adoption: the innovation is taken to scale and used by others to improve humanitarian performance.

Findings on the factors that contribute to the achievement of these success criteria are discussed in the final synthesis report that ALNAP and ELHRA are publishing in April 2016.

Other considerations

While the above criteria are the main way in which we understand innovation to be effective and successful, other factors can be important in our assessments of innovation:

Involvement and respect of affected people. Demonstrating how the rights and interests of affected people are respected in an innovation ought to be a minimum standard for all innovation processes. Too often, the message that humanitarian agencies should be less risk averse can overshadow the fact that increased risks are easily passed onto affected communities. Humanitarian organisations must take specific measures to ensure that any increased risk in terms of cost-effectiveness remains confined to the innovating organisation, rather than the affected community. As found in the ALNAP-HIF case studies, using a staged approach to piloting, whereby pilots are first undertaken in non-emergency contexts with clear protections and benefits in place for participating communities, is one way to deal with this.

2 Carlos Navarro-Colorado, Frances Mason and Jeremy Shoham, *Measuring the Effectiveness of Supplementary Feeding Programmes in Emergencies*, HPN Network Paper 63, October 2008.

Efficiency. Innovation processes can often appear weak on efficiency, particularly when they involve the development of new technologies or tools. There are, however, clear best practices that organisations can use to improve the timeliness and thus efficiency of their innovation process. For example, having a clear division of tasks and responsibilities across the innovating team and partners was supportive of an efficient innovation process. Also important are well-planned pilots that include defined times for collecting and responding to feedback, and that are implemented in a way that is complementary to the standard operating procedures, organisational structures or practices of pilot participants.

Unique impact. The individual unique impact of any innovation is often a function of its novelty, which in turn is shaped by how much the sector changes as the innovation process takes place. When a particular issue, such as cash-based assistance or menstrual hygiene, is largely ignored by the humanitarian system, innovations that seek to develop solutions in these areas can carry a high degree of risk, but also a unique impact on the system around them. As other humanitarian actors become more sensitised and active in these issues, innovations may not be able to offer a unique impact, but can still contribute to the sense of a 'groundswell' of activity that can serve as a tipping-point for the wider adoption of effective tools and approaches.

Looking ahead

Further attention to and research into the performance of innovation processes is needed if innovation is to deliver on its promise of improving humanitarian action. Given the enormous challenges in delivering timely, relevant and principled humanitarian assistance, fulfilling this promise is imperative for both the humanitarian crises of today and of tomorrow.

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Addressing the 'doctrine gap': professionalising the use of Information Communication Technologies in humanitarian action

Nathaniel A. Raymond and Casey S. Harrity

This generation of humanitarian actors will be defined by the actions they take in response to the challenges and opportunities of the digital revolution. At this critical moment in the history of humanitarian action, success depends on humanitarians recognising that the use of information communication technologies (ICTs) must become a core competency for humanitarian action. Treated in the past as a boutique sub-area of humanitarian practice, the central role that they now play has made the collection, analysis and dissemination of data derived from ICTs and other sources a basic skill required of humanitarians in the twentieth-first century. ICT use must now be seen as an essential competence with critical implications for the efficiency and effectiveness of humanitarian response.

Practice in search of a doctrine

ICT use for humanitarian response runs the gamut from satellite imagery to drone deployment; to tablet and smartphone use; to crowd mapping and aggregation of big data. Humanitarian actors applying these technologies include front-line responders in NGOs and the UN but also, increasingly, volunteers and the private sector. The rapid diversification of available technologies as well as the increase in actors utilising them for humanitarian purposes means that the use of these technologies has far outpaced the ethical and technical guidance available to practitioners.[1] Technology adoption by humanitarian actors prior to the creation of standards for how and how not to apply a specific tool has created a largely undiscussed and unaddressed 'doctrine gap'.[2]

Examples of this gap are, unfortunately, many. One such is the mass collection of personally identifiable cell phone data by humanitarian actors as part of phone surveys and cash transfer programmes.[3] Although initial best practice and lessons learned have been developed for this method of data collection, no common inter-agency standards exist, nor are there comprehensive ethical frameworks for what data should be retained and for how long, and what data should be anonymised or not collected in the first place.

One cause of this doctrine gap is what Evgeny Morozov calls 'solutionism', which he describes as recognising 'problems as problems based on just one criterion: whether they are "solvable" with a nice and clean technological solution at our disposal'. The urgent gap in humanitarian practice caused by

1 N. A. Raymond, C. Howarth and J. Hutson, 'Crisis Mapping Needs an Ethical Compass', *Global Brief*, 2012, http://globalbrief.ca.

2 N. A. Raymond and B. L. Card, 'Applying Humanitarian Principles to Current Uses of Information Communication Technologies: Gaps in Doctrine and Challenges to Practice', July 2015, http://hhi.harvard.edu/publications/applying-humanitarian-principles-current-uses-information-communication-technologies.

3 M. Enlund and J. Bauer, 'Using Mobile Phone Surveys To Fight Hunger', September http://www.silofighters.org/using-mobile-phone-surveys-to-fight-hunger.

A phone operator for a food security monitoring project in Gaikayo, Somalia

© WFP/Lucia Casarin

solutionism is limiting the effectiveness of current humanitarian uses of technologies and stymieing their ethical application.[4] Humanitarian actors are, in many cases, deploying ICT solutions in search of potential problems to solve, rather than first identifying the most urgent problems and then ensuring that the proper tool is being used correctly to address them. Additionally, these ICT solutions largely lack clear standards for how they should be responsibly applied if and when specific cases are identified.

This critique of current practice is not to suggest that ICTs do not have clear potential for demonstrably improving the efficiency and effectiveness of humanitarian response. They most certainly do. For example, satellite imagery analysis and other forms of geospatial data are already proving their value as tools for decision-making and situational awareness during response.[5]

Enthusiasm for the promise ICTs may hold for humanitarian action has eclipsed the significantly less thrilling but critically important task of building the technical and ethical doctrine necessary to deploy them in a truly 'humanitarian' way.[6] Developing standard humanitarian doctrine for the use of ICTs should begin with addressing the two areas below:

1. *Identifying actionable information for decision-making.* Humanitarian practitioners need to develop common approaches for identifying exactly what decisions need to be made and what corresponding information is needed to make them. This process should be undertaken before any ICT-based intervention is deployed. Without clearly articulated objectives, practitioners risk using disasters as experimental labs because no specific information need has been explicitly identified.

2. *Minimum technical and ethical standards.* Defining the information goals of an ICT deployment before it is launched is a prerequisite for creating minimum technical standards and comprehensive professional ethics in this area. The humanitarian community has protection principles, core standards and technical standards. However, there is currently no

4 *Ibid.*

5 F. Pisano, 'Using Satellite Imagery To Improve Emergency Relief', *Humanitarian Exchange*, no. 32, http://odihpn.org/magazine/using-satellite-imagery-to-improve-emergency-relief.

6 Z. Al Achkar, B. L. Card and N. A. Raymond, 'What Is "Humanitarian Communication"? Towards Standard Definitions and Protections for the Humanitarian Use of ICTs', October 2015, https://www.eisf.eu/library/what-is-humanitarian-communication.

comprehensive guidance on the use of ICTs and the information they generate. What's more, current doctrine for guiding the humanitarian use of ICTs is insufficient for addressing today's ethical challenges, necessitating the retrofitting of pre-digital revolution ethics to twenty-first century problems.

Identifying actionable information for decision-making

The 2014 Core Humanitarian Standard outlines nine 'core commitments' for humanitarian aid agencies. The first is that 'Communities and people affected by crisis receive assistance appropriate to their needs'.[7] Humanitarian actors currently do not appear to have proven theory or methodologies for applying ICTs in a manner that directly supports the identification of or response to the needs of affected populations.

Addressing this issue starts with examining when and why humanitarians deploy ICTs in the first place. Making clear the purported goals of any ICT deployment increases the likelihood of acting in accordance with humanitarian standards and principles.[8] While no conclusive data is available about which specific ICT applications are most prevalent, the vast majority appear to have, at least anecdotally, the goal of improving the situational awareness of responders in some way.

Crowdsourced crisis maps, satellite imagery analysis, social media tracking and mobile survey platforms are all examples of the role ICTs are now playing in situational awareness. These tools are being used, in many cases, without clearly established protocols, ethical standards and objectives for what actionable information is most critical in specific scenarios. Crowdsourcing, for example, is done by citizens and not trained professionals, which could lead to bias or the collection of unnecessary and unusable information. Social media tracking inherently excludes those without access to such technology.

Connecting the deployment of ICTs to improve situational awareness to efforts to meet the needs of affected populations should be treated as a humanitarian imperative. However, to meet this imperative a framework for ascertaining what actionable information for decision-making can be gained by a specific application in a specific operational context is required. Practitioners need to begin collectively identifying the overall data needs responders have in certain disaster scenarios, regardless of whether ICTs alone can meet those needs. With this basic framework, tools and tactics can be matched to the needs of responders and communities. Below is a hypothetical example of what a basic chart might look like for guiding decision-making about what tools and tactics should be deployed in the case of a response to a natural disaster such as a cyclone.

The process of developing a comprehensive framework for identifying actionable information for decision-making in an ICT deployment will require an iterative, inter-organisational effort across regional and disaster-specific contexts. Beginning this process as soon as possible is essential for identifying areas and applications where agencies are routinely employing ICTs. This process of understanding the potential value of applying ICTs in specific cases is necessary for eventually agreeing where minimum technical and ethical standards are most needed.

Table 1 Information requirements, purposes and tools

Information requirement	Purpose	Tools and tactics
The number and severity of damaged structures	Triage of most affected communities to prioritise needs assessments by ground teams	Analyse high-resolution satellite imagery
Locations of critical infrastructure, such as schools and hospitals, and main roadways leading to most affected areas	Updated, relevant maps for guiding ground teams conducting needs assessments in most-affected areas	Deploy crowd mapping platforms
Most urgent needs of communities in affected area	Determine programme priorities (e.g. food, water shelter)	Provide tablet-/smartphone-based survey platform to ground teams conducting needs assessments

7 Groupe URD, HAP International, People in Aid and Sphere Project, 'Core Humanitarian Standard on Quality and Accountability', 2014, http://www.corehumanitarianstandard.org.

8 'OCHA on Message: Humanitarian Principles', June 1012, https://docs.unocha.org/sites/dms/Documents/OOM-humanitarianprinciples_eng_June12.pdf.

Minimum technical and ethical standards

Multiple challenges have impeded the development of minimum technical and ethical standards for ICT use by humanitarian actors. These include agreeing on what particular technologies require specific minimum standards and developing guidelines that encompass the highly diverse ecosystem of non-traditional humanitarian actors involved in this space. These challenges should not prevent the humanitarian community from developing minimum technical and ethical standards in this area. The underlying issue which should compel the creation of minimum technical and ethical standards is not actually about a specific technology *per se*.

The profound impacts that the digital revolution is having on humanitarian assistance stem directly from the ways in which it has increased the volume of data that can be generated from disaster-affected areas and the speed with which that data can be transmitted. The digital revolution is fundamentally altering – both negatively and positively – previous notions about who can generate, access and transmit this ever-increasing diversity of data types. This phenomenon massively broadens the scope of when and where individuals and organisations can transmit and consume that data.

Some of the critical areas that minimum and technical standards need to address to begin building the necessary doctrine for guiding the use of data generated by multiple types of ICTs include the following:

- *Rights, privacy and consent.* Individual organisations are developing on a case by case basis technical and ethical standards governing their use of data. However, there is no overall guidance about what rights to data affected populations have; what privacy protections humanitarian actors should put in place; and what consent procedures should guide the collection and analysis of data for humanitarian purposes. Developing these common standards is a task for the entire humanitarian sector.
- *Data sharing and retention.* Organisations lack clear guidance about when and with whom they can share what forms of data. Additionally, there is no standard protocol for deciding what data from what sources should be retained, for how long, and for what purposes.
- *Protection of vulnerable populations.* Humanitarian actors are required to understand what factors in certain environments can increase the vulnerability of certain populations. When it comes to data, however, there is no shared understanding of how certain types of data can increase the risks faced by certain groups. Similarly, the humanitarian community lacks analysis of how certain data may contribute to the protection of vulnerable communities.

Many other key areas need to be included in any future minimum technical and ethical standards. These three areas above, however, are critical for ensuring that ICT use begins to address how current practice can become more consistent with core humanitarian obligations and values.[9]

Conclusion: professionalising the use of ICTs

Making the use of ICTs a core competency for current and future humanitarian actors will require the humanitarian community to create a framework for how the professionalisation of this subsector will occur. The steps outlined above represent the first phase of a much longer and more complex project that should be a top priority for the global humanitarian agenda. Addressing the urgent need for professionalisation of ICT use will depend on a cultural shift within the humanitarian community that ceases to view ICTs as simply available tools in the humanitarian toolkit. Instead, humanitarian actors must begin to see the professionalisation of ICT use as a broader transformative process that – either through its success or failure – will help define the future of humanitarian action and principles in the twenty-first century and beyond.

9 *Ibid.*

Innovating for access: the role of technology in monitoring aid in highly insecure environments

Rahel Dette and Julia Steets

Operating in insecure environments is one of the more critical tests for the humanitarian community. Access constraints, uncertainty, attacks and aid diversion make these unlikely settings for innovation. Yet several new approaches come from highly insecure environments. In these settings, technologies like mobile phones, radios, internet platforms and GPS trackers are sometimes the only way to send and receive vital information, or track the movement of goods. This article draws on the findings of a three-year research programme, Secure Access in Volatile Environments (SAVE), by Humanitarian Outcomes and the Global Public Policy Institute (GPPi), funded by the UK Department for International Development (DFID). In close collaboration with aid agencies in Afghanistan, Somalia, South Sudan and Syria, the research

A man listens to a radio in the Ifo Extension refugee camp in Dadaab, Kenya

examines access, quality and accountability in highly insecure settings, including assessing the technologies aid actors use for monitoring aid in hard-to-reach areas.

Technology for M&E in insecure settings

Access restrictions, high costs, poor infrastructure and high levels of uncertainty require tools that can function without constant electricity supply, across large distances and without advanced computing skills. The research identified four technology types that meet these criteria: handheld devices for digital data collection, mobile phone-based feedback mechanisms, remote sensing with satellites or delivery tracking, and broadcasting with radios and other forms of media.

Digital data entry and electronic databases

Digital data entry applications use smartphones or tablet computers to enter survey responses or other information. Data can be transmitted via an internet or direct connection to a central database, which often has automatic analysis functions. These applications make data entry and processing more efficient and offer greater opportunities to supervise and support enumerators remotely (since data can be time- and geo-stamped and photos and audio recordings can be added as data). Digital data entry technologies require physical access for enumerators to enable their use.

Experience with this technology is growing quickly. In South Central Somalia, for example, one INGO replaced all its paper-based monitoring over the last three years after a headquarter decision to support data collection software. Each field office now has five basic smartphones that cost around $100 each, which enumerators collect before going on assignment. As they enter survey responses in the field, data is immediately sent to a central database via a mobile data connection. The INGO found that digital data entry not only improved data quality, but also decreased the time needed to administer surveys by more than half. The fact that surveys record place and time information created strong incentives not to enter false responses.

Organisations also encountered problems. For enumerators, the restrictive format of software-based surveys and reporting platforms was sometimes frustrating or inconvenient, and the answer boxes on small smartphone screens were not easy to use. Where reception was bad, enumerators could wait for half an hour for the GPS-stamp before they could ask the respondent the next question. One interviewee in Somalia reported losing sleep at night staying up to charge two dozen touchpads from only one plug. In several areas, armed groups rejected the use of electronic devices.

Phone-based feedback and survey mechanisms

Aid organisations have developed several ways to gather beneficiary feedback or survey data remotely using cell phones. These include hotlines, verification calls, phone-based surveys and bottom-up reporting. In Somalia, one organisation set up an SMS-based feedback hotline, where

Table 1 Digital data entry and electronic databases: benefits and challenges

Benefits	Challenges
Rapid transmission of data	Requires physical access
Reduced work steps (no data entry from paper forms)	Can attract attention, risk theft and attack and can increase the risk of being expelled by armed groups
Surveys can be easily adjusted	Encourages closed-question formats
Easier detection of abuse in data collection	Can lead to unequal access to results
Lower visibility for enumerators using small handheld devices	Technology can be viewed with suspicion by armed groups
Can prevent unauthorised views	Requires capacity and skill
Enables the collection of multimedia data	Depends on connectivity and power

beneficiaries can submit complaints, praise or comments at any time. The messages are reviewed and (unless they contain sensitive information) recorded on a publicly viewable online map. Anyone can visit the site to see where feedback is positive or critical, and aid staff can follow up directly with individual and bulk requests.

Another group set up a call centre for individuals who agreed to provide information about food security indicators, such as crop prices. In short interviews, aid staff quickly collect data points and enter these directly into a centralised database. A large number of such interviews have been completed, including individuals from areas that the organisation was previously not able to reach. In Syria, where mobile network coverage has been severely damaged, aid organisations are increasingly using the online messaging platform WhatsApp to inform and communicate with their constituents.

Communities consulted for this research see phone-based feedback mechanisms as important complements to other channels, especially where physical access of staff is highly restricted. However, introduction and maintenance is costly and uptake can be limited. Another concern is the risk of multiple call systems from different organisations confusing or simply annoying people.

Remote sensing and aerial imagery with satellites, sensors and UAVs

When access is highly restricted, aid agencies have turned to aerial imagery and geospatial analysis to capture information. This data can provide valuable insights on infrastructure and shelter, population movements, vehicle positions and the effects of disasters. Taken repeatedly over time, imagery can also help assess project outcomes. Remote sensing also includes taking images with UAVs, radar technologies, sensors or barcode scanners that utilise GPS coordinates to track the location of goods, deliveries or people. Remote sensing or earth observation information is often visualised on maps or triangulated with other data sets.

A number of projects have been undertaken in volatile settings that suggest possible M&E applications. In Syria, for example, aid organisations analysed satellite images to help monitor the conflict and key events causing displacement

Table 2 Phone-based mechanisms: benefits and challenges

Benefits	Challenges
Enables direct contact between aid providers and beneficiaries in areas without physical access	Verification and follow-up are challenging
Phone-based data are technically easy to process	Bias: not everyone has access to a phone
Devices and software are inexpensive	Sensitive data shared via phone can be intercepted and cause risk
Aid organisations have increasing experience with these technologies	Requires literacy

Table 3 Satellite imagery and UAVs: benefits and challenges

Benefits	Challenges
Requires no access	Costs for satellite images can be prohibitive
Enables unique complementary data	Host state, local communities and armed actors can object to their use
Visible impact can be compared over time/scale	Limited experience and evidence of use
One image = many applications	Information requires verification
Industry interest in collaboration	Lack of ethical guidance and standards
UAV and sensor costs	Technical limitations (radius of operation)

Table 4 Radio and other media: benefits and challenges

Benefits	Challenges
Wide and reliable reach	Increases visibility and can create security risks for aid programmes
Local engagement, input and ownership	Difficult to target specific audiences and verify who has been reached
Increases accountability with better information	Translation needs, especially for dialects
Effective for awareness-raising	Costs can accumulate

or other impacts on the population. A team of analysts used commercial satellite imagery collected over time to document damage to and the destruction of critical infrastructure, including markets, hospitals and schools. The analysis also enabled them to observe new structures, including the growth and evolution of IDP settlements and likely burial sites.

In Somalia, aid organisations used satellite images to assess progress on infrastructure and agricultural projects. The analysis showed, for example, changes in charcoal production, provided rainfall estimates and enabled the identification of different livelihood zones. Another project in Somalia made use of 'crowdsourcing'. Hundreds of volunteers around the world worked with satellite images to tag shelter structures based on their shape, colour, tone and clustering. This created a detailed map of long-term and temporary shelters in the Afgooye corridor.

These are some of the most innovative technical tools for M&E in insecure settings, and not surprisingly their use poses some of the greatest risks. Although these technologies are ready to use, barriers include the high price of satellite imagery, the fact that many aid interventions do not create physically visible outcomes and the negative stigma of cheaper UAV alternatives (UAVs or other remote sensing technologies can be associated with spying and military attacks. Using them against the will of local authorities or communities can erode trust and put operations and staff at risk). In some instances, geo-spatial information can cause more harm than good. Records of the location of highly vulnerable or persecuted populations not only helps aid organisations, but can risk revealing these same locations to persecutors or other actors with harmful intentions.

Using radios and other media to broadcast information

Worldwide, radio remains the most popular technology for receiving news and updates, especially in resource-constrained contexts. In insecure environments, it is one of the most reliable ways to reach communities. Broadcasts can be used to share important announcements or explain aid efforts and feedback mechanisms. Radio programming can also be used for active engagement, involving or supporting communities in creating their own shows and stations.

Although as a one-way communication tool radio has not received much attention in the monitoring of humanitarian programmes, a number of projects have shown that radio is not only easy to use, but can complement feedback mechanisms and generate input from affected people. In particular, radio can be used to inform communities about humanitarian programming, such as assessments, targeting strategies or distribution dates and locations, linking to accountability efforts and increasing community engagement

and feedback. Radio can be used to announce and explain how feedback mechanisms work to increase usage, and interactive radio formats can be used to prompt information from communities. Technically, aid actors also have different options: using national broadcasts for urgent or regular announcements; contributing humanitarian shows to existing radio stations; or setting up small new radio stations for local humanitarian information, or where no station exists.

In South Sudan, one aid organisation used a localised USB radio to inform people at protection of civilian sites about planned programmes, enabling communities to provide more active feedback. Together with community members, the organisation recorded daily shows aired at select locations at the site. In Somalia, 'Radio Ergo', a locally run Somali-language station, streams every day from 3pm to 4pm on shortwave radio in order to reach people in remote areas who are not served by FM radio. Some local FM stations also rebroadcast the show and it is available on the station's website. The show is based on local reporting gathered by a network of correspondents. Themes include health, education, protection, agriculture and livestock and gender.

Mitigating the risks

Using innovative technological approaches to M&E in highly insecure settings inevitably involves risks, and while there is a natural tendency to revert back to 'low-tech or no-tech' in these environments, the research suggests a range of mitigation strategies should first be considered. Recommendations and measures depend on the technology, objective and context, but there are a few broad measures, which, while not necessarily comprehensive, are a first offering which can be further refined with practitioners. They include:

1. Study the context before choosing tools: understand who influences and spreads information and can impact it.
2. Involve all users actively: work with users' representatives when inventing, designing and testing tools. Focus groups or interviews and, as much as possible, collaboration all help ensure that technologies are usable and appropriate, including handling, pricing and language.
3. Establish informed consent practices: agree on mechanisms and standards by which to explain the risks involved with handling survey responses or phone requests digitally. Do this well before disaster hits.
4. Provide back-ups and alternatives: have analogue alternatives in place to turn to when the new tool does not work. Ensure that every online function has an offline option. And carry extra batteries.
5. Use security-conscious, free and open source software: use only those tools that independent security experts can review. Such free and open source software options exist for most relevant applications.
6. Minimise and limit data: collect only on a 'need to know' basis. Similarly, define access levels clearly. Who needs to see individual records and where do aggregate numbers suffice?
7. Invest in building acceptance: plan training and meetings with local staff, authorities and community members. Explain what you are using and let them see and perhaps test the tool themselves.
8. Pool funds and risk: collaborate with other aid actors in the area. Share the investment in tools and seek agreed mechanisms for sharing them and the data.
9. Apply humanitarian principles to technology: consider issues such as how to maintain independence when working with private sector companies. Are biases towards those willing and able to use phones conflicting with universality?

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Conducting simulated field visits for insecure locations in Somalia

Monica Zikusooka, Zinet Nezir Hassan, Alison Donnelly and Rachel Mose

With two decades since the central government in Somalia collapsed and despite efforts to support stabilisation, several parts of the country are consistently viewed as among the most dangerous environments for aid workers. Against the backdrop of a volatile security situation is a chronic humanitarian crisis where food prices, livestock survival and water and food availability are constantly under stress from drought and armed conflict. Between October 2010 and April 2012, Somalia was at the heart of a drought crisis in the Horn of Africa, affecting 13 million people and causing an estimated 258,000 excess deaths.[1]

While the humanitarian response to this crisis ended in 2012, people continue to face drought, violence and food insecurity. According to the Food Security and Nutrition Analysis Unit (FSNAU) for Somalia,[2] 38% of the population of Somalia are acutely food insecure and 304,700 (12%) of children 6–59 months old are acutely malnourished. Biannual surveys by FSNAU show that, in many parts of South and Central Somalia, the situation remains in the 'critical' category for malnutrition in the FSNAU's ranking system, just below the 'crisis' classification used during the famine. In much of this part of the country government presence is limited and basic services are delivered by NGOs.

In response to the humanitarian situation in Somalia, Save the Children has long-standing programmes to prevent and treat acute malnutrition, provide health care services, improve water and sanitation and enhance household food security and livelihood options for communities. Due to the very high rates of acute malnutrition, Save the Children's programming includes Community-based Management of Acute Malnutrition (CMAM) programmes in Awdal region, Somaliland, Karkar and Nugaar regions in Puntland and Hiran, Baidoa and Banadir regions in Central and South Somalia, supporting 96,415 children in 2015. In accordance with the national protocols for Somalia, all children 6–59 months old are screened by community volunteers who take their mid upper arm circumference (MUAC) to determine if they require treatment. Severely acutely malnourished children are referred to the nearest health centre, where they receive a medical check, and unless they have serious medical complications they are treated as outpatients with follow-up once a week, where they receive routine medical treatment and Ready-to-Use Therapeutic Food (RUTF). The Outpatient Treatment Programmes (OTPs) are run by Somali national staff at the health centres, with routine supervision from Somali national programme managers. International nutrition technical advisors conduct regular support visits where security allows.

While all Save staff have direct access to programme areas in Puntland and Somaliland, access to sites in Central and South Somalia is limited, especially for non-Somali staff, and in some cases staff who are not from that specific implementation area and ethnic group. This can result in a lack of understanding by non-local staff of the situation on the ground and the quality of the programme. At the same time, lack of contact with technical staff can affect motivation and opportunities for learning from field support visits. Save the Children has explored different methods for remotely monitoring and supporting field teams: Simulated Field Visits (SFV) are one of these methods. The SFV has been developed to enable monitoring of nutrition programmes, including assessing programme performance against established standards, identifying bottlenecks and challenges and providing a connection with field teams to foster motivation and capacity development.

The first SFV was conducted in 2013 as part of a review of a nutrition programme in Puntland and Hiran by headquarters and regional staff ahead of a donor audit. The review of the Puntland programme was conducted without much access difficulty, but insecurity prevented direct access to Hiran. In place of a face-to-face review as in Puntland, the team in Hiran was asked to take photos of key treatment points in the OTP sites, such as screening and measurement-taking, appetite testing and the dispensing of RUTF and medicines, and of children having their MUAC taken; scan or take photographs of a sample of patient cards; and share supply monitoring figures/sheets and reports and supervision checklists. Skype calls were also conducted with the programme manager and OTP staff to get feedback on challenges and progress.

The review of patient cards and stock reports provided significant insight into the level of understanding of the treatment protocol by implementing staff and resulted in a number of recommendations for improvements. Reviewing photographs helped to visualise the programme, but the quality of the pictures was often poor. However, even with low-quality photographs it was possible to identify possible areas for improvement in site organisation and measurement-taking. The review team felt that the process had significantly increased understanding of how well the Hiran programme was operating, where there were difficulties and what to prioritise in terms of programme

1 F. Checchi and C. Robinson, 'Mortality among Populations of Southern and Central Somalia Affected by Severe Food Insecurity and Famine during 2010–2012', FSNAU, 2013.

2 FSNAU, 'Somalia Post-Deyr 2015/16 Food Security and Nutrition Outlook (February to June 2016)', 17 February 2016, http://fsnau.org.

A mother holds her daughter at a health centre in the Karkaar region of Puntland, Somalia

improvement. A comparison with the Puntland programme, which had received a lot of on-site technical support, showed large differences in programme quality, indicating a need for much more regular support of the Hiran programme. The method was then standardised to include documentation, a technical and joint review of documents, feedback and action planning.

Documentation

The same set of documents and photos as for the 2013 review have to be requested for all SFVs. However, to ensure that the correct photos are provided specific guidance in the form of a checklist has to be followed by field teams, detailing which parts of the site to photograph and the distance from which photos are to be taken. Photographs should include:

- Outside of the OTP from ten metres away.
- Latrines (if available).
- Seating/waiting area for caregivers.
- Photo showing roof/shading of the waiting area (if there is any).
- Stock/storage room (if this exists).
- Photos of how the RUTF and medicines are stored in the room.
- Photo of drinking water storage.
- Children and pregnant and lactating women having their MUAC taken.
- Nutrition/IYCF education sessions.

Technical review of documents

For the purpose of SFV, minimum standards were set in terms of site set up, equipment, waiting space, times and supplies and storage of therapeutic foods and medicines as well as water sanitation facilities. Submitted documents have to be reviewed against these standards. To ensure that standardised checks are made on patient treatment cards an audit tool in Excel was developed, where metrics from the review of the cards are entered. These look at whether correct processes were followed at admission and discharge, the amounts of therapeutic food and medicines given and data management. Photographs and checklists are reviewed against the minimum standards set for the programme.

Joint review of documents: discussion with the field team over Skype

During the joint review of documents, calls to the field team are conducted to go through the documents and photos and discuss findings. Where screen sharing is possible it is used.

Feedback and action planning

After the SVF, the review team has to write a report including findings and actions agreed upon. The programme manager then leads the field team in implementation of the agreed actions. The next SVF then compares its findings with the previous visit to track improvements and address recurring issues.

Implementation

The SFV process was refined over the course of implementation between February 2014 and October 2015. The October review was the first to test the final process. During this review, it was also possible for the first time, due to a stable internet connection, to jointly review photos and documents with the team in Hiran via Skype's video and screen sharing function. Following each review a report is produced and shared with the field team, and follow-up actions are drawn up jointly by the review team and field staff who participated in the SVF.

Initial findings: what improved?

Early indications are that this process has helped improve programme quality. The second SFV in February 2014 revealed improved adherence to admission protocols and documentation of beneficiary information, with more than 90% of children admitted correctly, given medical checks and provided with appropriate medication. However, in some cases, certain dosages of RUTF were still incorrect. No information on actions taken for children with static and/or faltering weight were provided for a third of beneficiaries (31%), and information on whether the child was vaccinated against measles was missing for all of the patients. Nearly half of the cards (49%) were found to have no information on discharge outcomes. Some photographs indicated that MUAC was not taken correctly, and the waiting space and facilities were inadequate.

Follow-up SFVs showed improvements, with 61%, 74% and 96% of the eligible children provided with measles vaccination and/or vaccination status noted in the second, third and fourth reviews respectively, compared to none in the first review. Children who received the correct amount of RUTF as per their weight improved from about 70% in the initial review to 100% in the fourth. Correctly recording discharge had also improved from 51% in the initial review to 80% in the last review. Ensuring that poor weight gain is identified and investigated showed less progress, so this will be an area of focus for training and future SFVs.

The process has received positive feedback from both technical staff based in Nairobi and the team in Hiran, and it will be continued and expanded for insecure locations elsewhere in Somalia. It is time-consuming, with a lot of preparation needed by field staff, but as it is intended to replace time spent on actual field visits this is felt to be acceptable. Where internet connections are strong this can be a participatory approach, which aids acceptance of the final recommendations. Where there isn't a strong internet connection the process is still possible, but documents and photos need to be physically transferred to the review team, so additional time must be factored into the process.

Much of the analysis depends on information provided by field teams, so it would be possible to 'stage manage' visits, provide falsified beneficiary cards and create a false impression of the programme. However, the effort involved in doing so would be similar to that required to actually improve the programme, and it is felt that, if this takes place, even 'faking it' may lead to an improved understanding of how the programme should be managed.

Next steps

Save the Children's Somalia programme will continue to use this method and conduct quarterly SFVs for inaccessible locations where there are nutrition programmes. Save the Children is also using mobile phones to support early warning and supervision in Somalia, and will look at incorporating the platform into the SFV. Remote monitoring systems elsewhere[3] have demonstrated the potential of text messages (SMS) and interactive voice response (IVR – pre-recorded audio messages) for collecting information from difficult-to-reach populations. Save the Children is piloting the use of SMS to collect feedback from CMAM beneficiaries on the quality of services. Data collected from this system will be included in SFV to supplement information gathered and presented by programme staff.

While SFV appears to have had a positive effect on programme quality, it is difficult to determine from the current data exactly how effective this method has been. Save the Children will further investigate the effectiveness of SFV for improving OTP quality and staff motivation in Somalia. Subsequently, the possibility of using this for other sectors or in other locations where access can be difficult, such as Syria and South Sudan, will be explored.

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3 J. Bauer, A. Mouillez and A. Husain, 'Not a Rolls-Royce but It Gets You There: Remote Mobile Food Security Monitoring during the Ebola Crisis', *Humanitarian Exchange*, no. 64, June 2015, http://odihpn.org.

Innovating in an ongoing armed conflict: the Mine Action applications (MApps) project in Ukraine

Karen Kisakeni Sørensen

For the past two years, the Danish Demining Group (DDG), the humanitarian mine action unit within the Danish Refugee Council, has been working on an ambitious, global innovation allowing for two-way communication between people affected by mines and explosive remnants of war[1] and mine action operators through web- and mobile phone platforms. The project is funded by the Humanitarian Innovation Fund (HIF). Although the project is global and is currently being piloted in central Vietnam and eastern Ukraine, this article focuses on Ukraine. Given the ongoing conflict there, this setting has been by far the most challenging of the two contexts.

The recognition stage

When the idea of strengthening two-way communication in mine action first emerged, the setting and concept was quite different: the setting was Somalia and the intent was to investigate if more contamination information currently held by mine action actors could be shared with those affected by these explosive dangers. However, when testing the concept against field realities,[2] the pilot team found that it was necessary to revise the concept. Data is often incomplete, potentially putting affected people at risk. In addition, it was found that the security situation in Somalia would pose too great a challenge. In the revision of the concept the pilot team started to look at other options for using digital means for two-way communication.

About 10% of ordnance fails to detonate as expected. This means that, after armed conflict, numerous items of unexploded ordnance pose a threat to the local population. To give an idea of the scope of the mine action intervention required to address contamination, it is commonly estimated that, for every year of armed conflict, roughly ten years will be required to clear affected areas. The armed conflict in eastern Ukraine has now been ongoing for about two years

A member of a shelter team speaks with a woman in the village of Hranitne, eastern Ukraine

© Pete Muller

1 Explosive remnants of war (ERW) comprise unexploded grenades, bombs and shells remaining after an armed conflict.

2 In particular, miscommunication or misunderstanding of the information shared, as mine action operators never have a full contamination overview, could lead to false impressions of safe areas and thus put the public at risk.

and, despite the ceasefire agreement between the conflicting parties, continued fighting is regularly reported, and it is still hard to see an end to the conflict. As in most conflict contexts, it is also very difficult to systematically liaise with the public to identify and map suspected dangerous areas. This difficulty is related to multiple factors, including insecurity, lack of resources to undertake systematic surveys and the expectation that surveyed areas, if located in an active conflict zone, may experience renewed fighting after which a new survey would be necessary. For these reasons, large-scale survey activities rarely take place in areas where fighting is ongoing or likely to recur. Instead, mine action operators rely on reports from the public on suspected dangerous items, which they can use to do initial mapping and clearance. At the time of writing, in Ukraine no information management tool has been adopted nationwide to support the planning and prioritisation of clearance activities by any of the national mine action authorities.[3] As a result, they are forced to rely on manual processes and continue to record incoming reports from the public with pen and paper.

In addition to information collection, risk education is a critical component of mine action work during active conflict. The provision of information about safe behaviour is often the only option to protect civilians until capacity is available and areas can be thoroughly accessed for clearance. Communities affected by mines and other explosive remnants of war rely heavily on mine action operators for information about possible dangers and how to keep safe in potentially dangerous areas. However, getting access to people in need of safety information can be a challenge in conflict areas, and Ukraine is no exception. The security situation in conflict areas can change rapidly, and having the means to communicate updated safety information more dynamically to people at risk would be a great advantage.

DDG decided to investigate how this mutual dependency between mine action operators and conflict-affected people could be linked to developments currently taking place in the sector. One of the pilot project partners, the Geneva International Centre for Humanitarian Demining (GICHD), has developed one of the most widely used databases in humanitarian mine action, the Information Management System for Mine Action (IMSMA). The GICHD is currently developing an updated version called the IMSMA core, a more flexible and open database that can take in information via crowdsourcing. DDG and GICHD quickly identified relevant synergies between the DDG project and the IMSMA development process: crowdsourcing reports of suspected dangerous items from the public and giving them back safety information about safe behaviour (risk education) and mine action activities in their area through digital platforms. As people in eastern Ukraine rely to a great extent on the internet and their mobile phones to get and share information about the situation in their area, the DDG project would enable mine action operators to provide safety messaging through channels already used by the public, as well as allowing people to send in reports via communication tools they are comfortable with. For the project locations, Vietnam was chosen as representing a residual contamination context, and Ukraine was facing both residual contamination from the Second World War as well as and new contamination from the current conflict.

Development and implementation

Two concepts were central to DDG's project methodology: beneficiary inclusion and agile development.[4] End users must be included in the design and development process if the end product is to be relevant. Agile design and development was considered crucial to ensure user feedback along the way. There are two beneficiary groups: the mine action authorities and the general public in conflict-affected areas. In Ukraine, DDG is partnering with a regional unit of the State Emergency Services (SES), the national mine action authority currently responding to reports from the public and conducting clearance activities. To ensure that the project would be relevant and add value, it was critical for DDG to understand how it could support the work of SES. Many of the first conversations with SES were in the capital, Kiev, to gain an overall idea of workflows. Based on this, DDG could start to design the overall project and decide what systems to base it on.

In order to refine the prototype and make it applicable at local level, DDG needed more detail on SES' day-to-day work, necessitating more iterations of the design and development process at the operational level. This proved less straightforward than hoped. In the current fragile situation in eastern Ukraine, the top priority of SES is to carry on with its core business of addressing people's most critical needs and carefully prioritising its limited resources. In addition, because of the conflict, SES had to hastily relocate some of its offices away from non-government-controlled areas, which meant that survey and clearance equipment, laptops and other critical equipment were lost. As a result, it proved very difficult to convince the local-level SES to become fully involved in the design and development process. After renegotiating, re-analysing, redesigning and redeveloping the project with SES, including changing the pilot location, DDG did in the end succeed in getting the local SES on board, albeit with a massive delay. The digital reporting and crowdsourcing part of the project has now gone through a series of iterative tests and adjustments with SES, and the project is now aligned fully to its workflows.

3 At the time of writing there was no unified mine action authority in Ukraine. Three main national authorities engage in mine action activities: the State Emergency Services (SES), the Ministry of Defence and the Ministry of Interior. A national mine action centre is planned and negotiations are ongoing. No international mine action organisations are mandated to do clearance in Ukraine.

4 The essence of agile design and development is that design, development and testing take place in parallel, allowing for maximum user influence on the end product and maximising relevance.

The involvement of the second beneficiary group, conflict-affected people, was less important in the first phases of design and development. However, it was considered critical that this group be involved in how content was developed, as well as getting their input into how such tools should be introduced. As part of this group are vulnerable and are struggling to meet their basic needs, DDG needed to carefully balance keeping consultations with this group to the necessary minimum for ethical reasons, while at the same time getting enough feedback to tailor the tools as much as possible to their needs. The fact that it proved difficult to engage people in affected areas for feedback sessions confirmed DDG's decision that these kinds of activities must be kept to a minimum.

Suitability

Key features of conflict or crisis contexts are instability and unpredictability, conditions not usually considered conducive to innovation. It can be very challenging to 'sell' an innovation in its early stages, where there is no prior experience of it. It would be reasonable to assume that this would be the case in other similar emergency contexts. In addition, implementing an untested innovation in an ongoing humanitarian crisis, where affected communities are in dire need of basic services and have many concerns, and engaging both the national partner and the affected population in design, development and testing, has been tricky, presenting DDG with ethical dilemmas and raising concerns around expectation management among both beneficiary groups. Can the innovation offer them improved services? If so, for how long can these services be sustained? The answer to both questions remains to be seen: large-scale field testing is needed to provide more evidence[5] of relevance and applicability.

Although the project has not been finalised, there are some key reflections around innovation in an ongoing conflict. The most pertinent question is whether an inherently unstable and unpredictable conflict context is suited to innovation. Is a conflict setting appropriate for testing an innovation in its early stages, both from an ethical point of view and in terms of actually extracting learning? The DDG experience in Ukraine has shown that managing the context can overshadow managing actual design, development and implementation. There is no doubt that it has been a valuable and necessary process. However, at the final stages of innovation (e.g. the late implementation stage or the diffusion stage) more experience would have been acquired in terms of the potential value of the innovation as well as the conditions necessary for successful implementation. Testing of the same innovation in Vietnam will allow for a comparison to inform this reflection.

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5 Large-scale field testing was due to start in mid-March, and run for six weeks.

Automation for the people: opportunities and challenges of humanitarian robotics

Andrew Schroeder and Patrick Meier

On a crisp late-September morning in Panga, Nepal, just outside Kathmandu, a small aerial robot, the DJI Phantom 3, floats through a jagged landscape of damaged buildings and uncleared rubble. A high-resolution camera affixed to its underbelly silently siphons up image after image. Onboard sensors stabilise and geolocate both the robot and the pictures, allowing its data collection mission to follow a precise predefined pathway set only minutes before in a smartphone application. Later that afternoon a group of software engineers and students from Kathmandu University assemble the data into orthorectified mosaic maps[1] which can be draped over digital models of the earth for the sake of analysis and interpretation. The very same data contains point cloud measurements[2] of the distance between the camera and ground features, allowing for the creation of three-dimensional models to assess damaged infrastructure. The next morning a team of Nepali citizens and scientists, along with international technology professionals and aid workers, all convened by UAViators (the Humanitarian UAV Network), examines the maps and models in search of new, timely and more detailed perspectives than were previously thought possible on rebuilding in the wake of the April 2015 earthquake.

1 Orthorectification means the creation of a photographic map which shows locations in their accurate spatial positions by means of the removal of various aspects of image distortion. For more information see https://trac.osgeo.org/ossim/wiki/orthorectification.

2 A 'point cloud' is a collection of data points generated in three-dimensional space, which can be processed into a model of objects located within that space. On the use of UAVs to generate 3D point clouds, see A. Ansari, 'Use of Point Cloud with a Low-cost System for 3D Mapping', http://ieeexplore.ieee.org.

A flying drone used to help identify areas worst-hit by the 2015 Nepal earthquake

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Aerial robots are the first wave of robotics to impact the humanitarian space.[3] They will certainly not be the last. Popularly known as Unmanned Aerial Vehicles (UAVs) or 'drones', aerial robots have already been used many times in many different situations to collect data in support of disaster response and recovery efforts. The International Organisation for Migration (IOM) has been using aerial robots in Haiti since 2012 to capture aerial imagery to assess disaster damage and displacement. In 2013, Medair and Catholic Relief Services (CRS) used aerial robots to collect imagery to inform their reconstruction and rebuilding efforts following Typhoon Haiyan in the Philippines. The following year, Médecins Sans Frontières (MSF) and the World Health Organisation (WHO) piloted the use of aerial robots for the delivery of small medical payloads (vaccines, medicines) in Papua New Guinea and Bhutan respectively. In 2015, the World Bank used aerial robots in Vanuatu and Tanzania to support disaster response and risk reduction efforts. Several agencies used aerial robots for search and rescue, situational awareness and mapping following the earthquakes in Nepal in 2015. In 2016, the UN Children's Fund (UNICEF) will pilot the use of aerial robots for medical payload transportation in Malawi. This year Redline will also launch Rwanda's first Droneport network to facilitate routine long distance cargo delivery using aerial robots.

Sensing and acting at a distance

The common denominator in all of these efforts is the capability of robotics technologies, aerial and otherwise, to sense and act at a distance at reasonable cost with varying degrees of autonomy and intelligence. Rather than send a human up in an aircraft to take photographs of a flood zone, refugee camp or agricultural field, we can now send an aerial robot to do the job at far lower cost and higher data quality. In the time it takes to send a human on a motorbike to retrieve and deliver laboratory samples over muddy and sometimes impassable roads, we can now potentially send a small drone with secure cargo capacity back and forth multiple times, speeding up entire public health diagnostic systems. Rather than sending people in boats into urban flood zones to measure water contaminants we can now send small fleets of semi-autonomous marine robots to gather and analyse data more safely and quickly over a much wider area. Rather than risk sending people into minefields to determine optimal patterns of explosives removal we can now send rugged ground robots.

In each of these cases we can begin to detect not only new opportunities to do what disaster relief professionals and

3 Prior to the broad-based introduction of aerial robotics in humanitarian assistance, ground robots, or 'unmanned ground vehicles' (UGVs), were used in mine clearance and search and rescue. In neither case, though, did these applications spark a broad wave of technical innovation in the humanitarian sector. See Center for Robot-Assisted Search and Rescue: http://crasar.org.

humanitarian agencies have always done, only faster, safer, cheaper, more efficiently or more accurately; we can also detect the outlines of possible new types of dynamic, flexible and adaptive public service and humanitarian systems. Medical payload delivery is perhaps the clearest case, even if many of the core technologies have not been entirely proven. Failure of the drug supply chain, particularly at the last mile in remote areas with low settlement density, patchy health infrastructure and poor transport systems, is one of the leading causes of serious health problems including maternal mortality, childhood pneumonia and diarrheal disease.[4] Failures due to poor transport systems are compounded by weak centralised procurement and distribution systems, which lack timely information on changes in local demand and the capacity to respond to quickly changing information. In the most obvious sense drone delivery systems could avoid the problem of road transport conditions altogether, alleviating a key logistical blockage. But that important detail looks almost minor compared to the ways that drone delivery could alter core attributes of health systems.

Imagine, for instance, that trained community health workers spread throughout small villages could determine specific local demand for basic needs like vaccines, nutritional supplements and antibiotics, and communicate that demand to regional distribution centres via SMS or cellular data channels. Rather than directing medical supplies through health facilities which may not be sufficiently responsive, they could request supplies directly to remote points of care, such as household vaccination campaigns or mobile clinics. During the Ebola crisis in West Africa, we know that cases of preventable childhood illness spiked in part because health facilities in Liberia, Sierra Leone and Guinea had become sites of disease transmission and were therefore avoided by much of the population. Effective drone delivery systems tied to strong community health worker programmes might have circumvented this problem

Social automation and social collaboration

Perhaps it goes without saying, but it's nevertheless worth remembering that, no matter how promising or how well designed they are, robots will not accomplish significant humanitarian gains on their own. The opportunities of social automation for social good are inevitably tied to the challenges of improving human–machine collaboration within the context of integrating robotics into humanitarian systems through a combination of standards, evidence and institutions.

The concept of improved social collaboration with robotics technologies goes back to the foundations of the information age and J. C. R. Licklider's depiction of 'man-computer symbiosis'.[5] As Licklider framed it in 1960, effective social automation systems depend on a viable division of labour between human-centric goal orientation and machine-centric task performance: 'In the anticipated symbiotic partnership, men [sic] will set the goals, formulate the hypotheses, determine the criteria, and perform the evaluations. Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking'. A shifting but nevertheless persistent boundary exists between what people and computers, of which robots are a variant, can each do well. If that boundary is managed intelligently and creatively, the resulting socio-technical ensembles can produce social gains which neither humans nor computers could achieve on their own. Framed in this way, the real question for humanitarians is not whether they ought to use robotics at all, or whether robotics ought somehow to determine the shape of our public goods, but rather what kinds of possibilities are achievable through their combination with social good efforts, and what kinds of new institutional arrangements will be required to achieve those possibilities.

As a first step, the humanitarian community should develop an international code of conduct on the use of robotics in humanitarian aid. This could usefully draw on the International Code of Conduct on Humanitarian UAVs developed by the Humanitarian UAV Network (UAViators) in close collaboration with dozens of humanitarian organisations.[6] The UAViators Code of Conduct does not proscribe specific behaviours or structures, but sets in place basic standards, such as the requirement that humanitarian benefits outweigh risks to people's safety, in order to shape the applications of aerial robotics within clear ethical purposes and driven by clear social goals. Adherence to these basic standards is vital to ensure things like regulatory approval by the range of national authorities with sovereign control over airspace, customs and many other legal and policy dimensions of humanitarian operations. The UAViators Code of Conduct is being extended to include data collection and payload transportation. Members of the UAViators network and their partners are in turn working to shape national policies to provide for defined humanitarian exemptions and clear approval processes. Extending the Code of Conduct and this type of policy advocacy further to include terrestrial and maritime robotics would be easier than starting from a blank slate.

Alongside the establishment and implementation of a Code of Conduct for humanitarian robotics, the humanitarian community needs a much better evidence base to provide insight into what constitutes effective robotics applications. Humanitarian benefits need to be proved, not assumed. For instance, although the conceptual and technical basis is clear for developing automated drone-based delivery systems,

4 David Jamieson, 'The Health Supply Chain: Still the Cinderella of Development?', 18 July 2015, http://www.theguardian.com.

5 J. C. R. Licklider, *Man-Computer Symbiosis*, IRE Transactions on Human Factors in Electronics, March 1960.

6 UAViators Humanitarian UAV Code of Conduct and Guidelines: https://docs.google.com/document/d/1Uez75_qmIVMxY35OzqMd_HPzSf-Ey43lJ_mye-kEEpQ/edit.

there is as yet no established cost-effectiveness or health impact analysis to demonstrate the benefits of this approach. While there have been a substantial number of humanitarian drone mapping projects there is still little well-documented evidence, and even less with real methodological rigour, for the effect those projects have had on specific project outcomes. Without the creation of a strong empirical evidence base the robotics field risks missing out on high-quality and high-impact field applications just as the humanitarian community risks falling further behind the exponential growth of new technologies.

Improved standards and evidence for humanitarian robotics also requires new types of localised institutions in order to generate genuinely responsive and effective projects. Humanitarian UAV operators faced myriad challenges in the immediate aftermath of the Nepal earthquake, from regulatory confusion to community suspicion. Several communities were overflown and imaged by different organisations repeatedly without being informed that the flights were taking place or being asked for their consent; data and analysis were also not shared with affected communities and government representatives. UAViators returned to Panga in Nepal in the following months to produce high-quality maps and 3D models, and to create, in conjunction with Kathmandu University, Kathmandu Living Labs, DJI and Pix4D, a new type of localised innovation hub called Kathmandu Flying Labs (KFL). While the immediate goal of KFL is to train local experts and establish the basis for Nepalese-driven demand for aerial robotics, in the future KFL may be able to step into the institutional void which led to so many coordination and communications problems during the post-earthquake response.

From UAViators to WeRobotics

In order to keep up with the rapid pace of global social and technological change, the UAViators network is in the process of transforming into a new institutional framework called WeRobotics (http://werobotics.org).[7] Aerial robots may be the first wave of robotics innovation to hit the humanitarian community, but the second and third waves are already on the horizon: industry and academia are making tremendous strides in both terrestrial and maritime robotics like the self-driving vehicles developed by Google and others and the Autonomous Underwater Vehicles (AUVs) being used for environmental research. Like aerial robots, terrestrial and maritime robots will significantly extend people's ability to collect data and transport payloads in many of the world's most vulnerable societies. Fortunately we aren't starting from scratch this time.

WeRobotics represents an effort to apply the lessons learned so far from the use of UAVs for humanitarian aid, global development and environment protection to the fields of robotics and social automation. The heart of this effort is the creation of a global network of innovation hubs modelled on the kind of activity that has proven successful for Kathmandu Flying Labs. Over the next three years, WeRobotics is co-creating globally networked city-level innovation labs with technology and social good partners in cities experiencing cascading risks, rapid development and serious environmental threats, such as Jakarta, Monrovia, Port-au-Prince and Santiago. These 'Flying Labs' provide aid, development and environmental organisations with direct access to promising robotics technologies, connecting NGOs, academics and governments with global technology partners and cultivating new locally-owned organisations and trained technology workers. In the process, a new kind of localised but globally networked humanitarianism may emerge, grounded in ethics, dynamically responsive to the needs of the most vulnerable and founded upon strong collaborations with the remarkable new robotics technologies soon to be suffusing our air, land and seas.

Andrew Schroeder and **Patrick Meier** are co-founders of WeRobotics.

7 Patrick Meier, 'Introducing WeRobotics', 16 November 2015, http://irevolution.net/2015/11/16/introducing-werobotics.

Military actors and humanitarian innovation: questions, risks and opportunities

Josiah Kaplan and Evan Easton-Calabria

The role of military actors in the international humanitarian landscape has expanded over the last two decades. However, despite growing acknowledgment by humanitarians of the need to search 'outside' the traditional humanitarian community for new products, processes and innovations, very little systematic research has examined militaries as a reference point for informing humanitarian innovation. The nature of civil–military relations across the humanitarian community is complex and often fractious; that this lack of engagement extends to the discourse around humanitarian innovation is unsurprising. Nonetheless, a major research gap exists in understanding both the risks and lesson-learning opportunities that military actors present to humanitarian innovation.

This article looks at military actors as a serious subject of study and debate within the humanitarian innovation

discourse, and calls for further research on this topic. We outline three areas of exploration, drawing on research conducted at the Oxford Humanitarian Innovation Project (HIP) in 2015, supported by consultations with expert practitioners, policymakers and researchers from across the aid sector, militaries and academia.[1] Taken together, this work suggests the need for better understanding of both the opportunities and hazards that military actors pose to the humanitarian innovation agenda.

Learning lessons from military innovation

The NGO Military Contact Group (NMCG), hosted by the British Red Cross, recently noted that '[t]here is clearly a lot of research and development that originates in the military community that could provide real benefit to the humanitarian community and populations on the ground'.[2] Militaries have significant lesson-learning potential for humanitarian innovation, both as a general reference point and through the identification of novel and scalable dual-use products and processes.

Military innovations developed by defence-sector research and development (R&D) regularly transfer into daily civilian life – and, by extension, humanitarian usage – via commercial channels. While remaining intrinsically linked to controversial security agendas and their associated political economies, the diffusion of dual-use innovations in areas such as information communication technologies (ICT) and medicine has also resulted in formative breakthroughs which have fundamentally contributed to civilian society.

A pivotal factor in achieving such breakthroughs is the sheer scale of military R&D – strikingly high when compared to humanitarian investments in innovation to date. In 2015, for example, the US Department of Defense (DoD) alone allocated $63.5 billion for research, defence, testing and evaluation.[3] Moreover, as militaries are increasingly drawn into humanitarian and development missions, their own large and well-funded innovation systems are confronting design challenges with significant overlap with those the aid community faces. While there may be potential for humanitarian innovators to 'look to military innovation … as a source of useful ideas',[4] successfully scaling innovations between both communities requires addressing their fundamental differences. These include both actors' distinct innovation cultures and goals, as well as training, skills and resources.

Examining military innovation for scalable dual-use technologies and processes is one way to begin considering how these differences can be negotiated in practice to enable transferable lesson-learning. As one OCHA official put it: 'it's less *who* we're learning about innovation from, whether that's the private sector or the military – it's how the differences between their sector and ours map onto innovation lessons-learning exercises'.[5] Indeed, many innovations in humanitarian practice already reflect military roots often unrecognised by the aid community. This suggests that, far from a hypothetical source of lesson-learning, humanitarian innovation has historically been intrinsically linked to military research, development and learning.

Information and Communication Technology

Such impact is clearly illustrated in military R&D contributions to modern commercial ICT, a dominant subject of wider humanitarian innovation discussions. The last half-century has seen seminal ICT breakthroughs, enabled through research conducted or directly funded by militaries. These include internet, email, GPS and interactive maps (later commercially adapted, such as Google Streetview). Moreover, military R&D breakthroughs will continue to influence, and perhaps fundamentally alter, civilian ICT: areas of significant investment by the US DoD and UK Ministry of Defence include research on Terahertz-range communications, improved geolocation technology drawing on the Earth's magnetic field and remote-controlled robotics for use in natural disasters.

Remote sensing and geospatial technology is another area of humanitarian innovation whose military lineage is clearly evident, particularly in the emergence of civilian unmanned aerial vehicles (UAVs). UAVs – commonly referred to as drones – have strong roots in technologies originally developed for military use, yet are rapidly becoming a highly visible, and often controversial, tool of humanitarian surveillance and observation, including crisis mapping and search and rescue operations.[6]

It is clear that militaries hold tremendous experience in the research, development and use of UAVs, and will remain an important source of innovation and good practice around this emerging technology for the foreseeable future. Moreover, while the nascent humanitarian and human rights remote-sensing community lacks standard methodologies for analysing the large amounts of geospatial data produced by these new remote sensing technologies, these processes have already been refined through decades of tested military intelligence, surveillance and reconnaissance (ISR) doctrine.[7]

1 J. Kaplan and E. Easton-Calabria, *Militaries and Humanitarian Innovation: Opportunities and Risks*, Refugee Studies Centre Working Paper, 2016.

2 NGO–Military Contact Group (NMCG), 'Challenge and Innovation: Civil–Military Relations in a Changing World', Conference, London, 26 February 2015, http://www.redcross.org.uk.

3 US Department of Defense, 'United Stated Department of Defence FY 2015 Budget Request Overview', 2014.

4 B. Ramalingam et al., *Strengthening the Humanitarian Ecosystem* (Brighton: University of Brighton, 2015).

5 Interview, OCHA official, 5 October 2015.

6 OCHA, *Unmanned Aerial Vehicles in Humanitarian Response*, OCHA Policy and Study Series (Geneva: OCHA, 2014).

7 Z. Achkar, I. Baker and B. Card, *Sharing Space: Adapting Military Approaches to Geospatial Analysis for Humanitarian Response and the Documentation of Human Rights Abuses*, Program on Humanitarian Policy and Conflict Research, Harvard School of Public Health, 2013.

Strategic planning

Military approaches to strategic planning and knowledge management draw on large-scale information networks, strong institutional support for strategic planning and proven processes and models for setting clear planning goals. Weiss argues that, while humanitarians 'will undoubtedly take offense with this generalization', military organisations nonetheless 'tend to better value learning, and supervisors invest substantial resources in institutional infrastructure to assemble and act on lessons than their humanitarian counterparts'.[8] Military strategic planning mechanisms, such as the US Army's Training and Doctrine Analysis Center (TRAC) and the UK MoD's Development Concepts and Doctrine Centre (DCDC), demonstrate planning capabilities which extend far beyond the typical one-year horizons relied upon by humanitarian organisations.[9]

Although rarely acknowledged, several ubiquitous humanitarian planning approaches reflect military origins, most notably the logical framework and matrix, which originated as a 1960s US military planning framework. After-Action Reviews (AARs) and mission-to-task have likewise developed from their US Army origins into a widely adopted knowledge management and accountability tool in humanitarian practice.

Additional areas

Further work is required to fully map and prioritise areas for deeper consideration. Synergies to explore include military approaches to simulation and gaming. Militaries are also extremely creative in rebuilding disrupted supply chains and solving logistical problems in conflict and natural disasters. The diffusion of products and processes from military to humanitarian medicine also has a long history, particularly in trauma care. In public health, military research has contributed to key innovations in understanding of immunology, parasitology and vaccine development, most recently during the West Africa Ebola response.[10]

Opportunities – but also risks

Along with opportunities for lesson-learning from military innovation, there is an equally important need to critically engage with the risks this may pose to humanitarian principles and practice. Many of these principle-based issues are concretised in the evolving application of specific military-derived ICT innovations in humanitarian assistance. Increasing reliance on 'data philanthropy' from government military intelligence sources, for instance, poses a growing challenge to humanitarian impartiality.[11]

Due in part to such concerns, important work has begun on professional principle-based frameworks for guiding humanitarian innovation.[12] It remains important, however, that this emerging work (which tends to focus predominantly on private sector ICT partners) also considers militaries as central brokers of ICT assets, capabilities and data for humanitarian use. The use of drones, especially in conflict settings, has raised particular concerns regarding privacy and neutrality during data collection, and the related need for transparency and informed consent for the communities drones are observing.[13]

The rise of humanitarian technology is also propelled by the defence and intelligence surveillance industries' search for new markets and the legitimacy provided by partnerships with humanitarian actors. As Sandvik and Lohne write, the production and diffusion of dual-use military and commercial technologies 'raise questions about costs, lobbying, and the framing of political agendas'.[14] More work from a political economy lens is needed in investigating the motivations, perceptions, incentives and challenges involved in firms providing commercial off-the-shelf technologies to both military and humanitarian markets. Many commercial suppliers of humanitarian products at this year's AidEx Conference, for example, also supplied military customers.

It is important to separate tangible risks to humanitarian principles from general unease about certain technologies with military origins, of which there are countless examples in everyday use. Advocates of so-called 'humanitarian drones' argue, for instance, that the military character of drone technology is often misunderstood, with humanitarian critics failing to differentiate between the explicit military origins of larger fixed-wing UAVs and the commercial civilian lineages of smaller, primarily rotary UAVs. This point remains open to further debate between humanitarian drone proponents and their critics, and could certainly benefit from greater historical clarity. At the same time, both technologies are similar enough that many of the risks experienced by military adoption of UAV technologies – such as the introduction of a 'distancing effect' which abstracts and distorts the messy realities of ground operations – can also hold instructive and relevant warnings for humanitarians.[15]

8 T. Weiss, *Humanitarian Business* (Cambridge: Polity, 2013), p. 195.

9 R. Kent and J. Ratcliffe, *Responding to Catastrophes: US Innovation in a Vulnerable World* (Washington DC: Center for Strategic and International Studies, 2008); Deloitte, 'Promoting Humanitarian Innovation Exchanges: Developing Models for Humanitarian Innovation Knowledge Bases', 2015.

10 J. Kaplan and E. Easton-Calabria, 'Military Medical Innovation and the Ebola Response: A Unique Space for Humanitarian Civil–Military Engagement', *Humanitarian Exchange*, 64, June 2015. 5.

11 N. Raymond and B. Card, *Applying Humanitarian Principles to Current Uses of Information Communication Technologies* (Cambridge, MA: Harvard Humanitarian Initiative, 2015).

12 Humanitarian Innovation Project (HIP), 'Principles for Ethical Humanitarian Innovation', Refugee Studies Centre, University of Oxford, 2015.

13 K. Sandvik and K. Lohne, 'The Rise of the Humanitarian Drone: Giving Content to an Emerging Concept', *Millennium: Journal of International Studies*, 43(1), 2014.

14 *Ibid.*, p. 150.

15 *Ibid.*

An Unmanned/Unarmed Aerial Vehicle is prepared for flight in North Kivu, Democratic Republic of Congo

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Too little is understood about the risks that the diffusion of military innovation may pose to humanitarian practice and principles. Yet critical perspectives do not need to compete with work to identify possible areas of synergy and exchange. An informed, considered debate should pursue these research streams, balancing an investigation of the potential benefits of military innovations with critical dialogue on the associated risks.

Ways forward: a research agenda for military actors in humanitarian innovation

Bringing together research on the opportunities, challenges and implications of innovation diffusion and exchange between the military and humanitarian communities paves the way for engaging both sets of actors in collaborative dialogue and debate. As an initial step, case study analysis of military dual-use innovations and approaches to innovation management would be of immediate value. There is also potential for military and humanitarian innovation experts to directly engage with each other through active co-learning. Military practitioners might be invited to contribute insights and expertise around innovation management, or be consulted for their technical experience with military product and process innovations adapted to the humanitarian context.

Existing platforms of civil–military engagement should be used to facilitate the input of military actors into learning around humanitarian innovation. Leading convenors of civil–military dialogue, such as InterAction, the United States Institute of Peace, the NMCG, the Center for Civil–Military Excellence and OCHA's CMCoord, already bring together civilian, military, government and academia for collaborative knowledge exchange. They are therefore natural vehicles for hosting conversations around innovation diffusion and exchange between militaries and humanitarians. Such conversations could initially take the form of workshops, seminars and conferences. Academia also has an important role to play in convening dialogue around innovation in a neutral environment, moderated within a format permitting anonymity and frankness (i.e. under the Chatham House Rule).

Facilitating more active co-learning between two mutually distrustful communities is not easy. Any military contributions to learning around humanitarian innovation should, first, occur at a time and place well away from active emergency response. Utmost care must also be taken in addressing the significant concerns around information-sharing and data privacy between both communities. And it will be essential to consult with a wide diversity of military stakeholders, particularly Southern and middle-income country militaries. As the most common first

responders to natural disasters, these forces possess unique perspectives and may provide some of the most innovative new ideas for humanitarian practice.

A research agenda exploring the relationship between military actors and humanitarian innovation challenges the boundaries of current rhetoric, which espouses the need for greater engagement with 'non-traditional' partners such as the military, but without seriously confronting the risks and opportunities involved in doing so. Innovation is a valuable area for learning and constructive engagement and dialogue between two communities long known for their strong mutual distrust. As such, innovation through the lens of civil–military relations is worthy of further research and deliberation.

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Innovations in the Nepal earthquake response: ten lessons from the DEC response review

Ben Ramalingam

As part of the Nepal earthquake response review commissioned by the Disasters Emergency Committee (DEC) in the UK and Canada's Humanitarian Coalition (HC), an assessment was undertaken on how well humanitarian innovation worked in the operational effort. While the scope of the exercise meant that a comprehensive and detailed evaluation was not feasible, it has been possible to develop an overall sense of the effectiveness of the innovation effort in the response. Key lessons are summarised in Box 1, and explained in detail below.

Lesson 1: *The earthquake presented major operational challenges to international and national actors alike, and demanded a number of operational and strategic adaptations to ensure that effective responses could be mobilised*

For many actors on the ground, the need for creative approaches was apparent in the immediate aftermath of the earthquake. There were challenges around assessment, access and delivery, which have continued to affect the response. This created a potentially ripe environment for humanitarian organisations to apply and adapt new technologies, form partnerships with new actors and test new approaches. However, there was little collective or organisational effort to make use of this opportunity by the international humanitarian community.

Lesson 2: *The contextual and political barriers to innovation were considerable*

The context, and in particular the need for organisations to carefully navigate national and local institutional politics and structures, led many organisations to act conservatively,

Box 1 Key lessons

Lesson 1:	The earthquake presented major operational challenges, and demanded a number of operational and strategic adaptations.
Lesson 2:	There were considerable contextual and political barriers to innovation.
Lesson 3:	Most of the creativity and novelty present in the response involved tactical adaptations to the context.
Lesson 4:	Many 'visible' and high-profile innovations had no or little connection to the operational setting.
Lesson 5:	Transformative innovations need foresight and preparedness if they are to be brought into responses in an effective and timely manner.
Lesson 6:	Resourcing for innovation, although potentially available, was not focused and targeted enough on priority challenges.
Lesson 7:	Almost all of the innovation that took place in the response was within specific organisations, rather than across organisations.
Lesson 8:	International organisations paid insufficient attention to the role of local organisations and end-users in innovation.
Lesson 9:	Innovation needs to be thought about and undertaken in a much more open and democratic fashion than is currently the case.
Lesson 10:	Operational humanitarian innovation is still very much a nascent effort.

rather than push for novel and creative approaches. Bringing innovation to bear on the humanitarian challenges created by the earthquake was not just a technical challenge, but also a political one.

Lesson 3: *Much of the creativity and novelty present in the response concerned tactical adaptations to context*

Much of what was referred to as innovation related to tactical operational adjustments in response to specific conditions and challenges. For example, there were many examples of procedural changes by DEC/HC members to enable them to work in new settings, with new partners, or to expand their previous sector focus. There were examples of effective engagement with local communities, especially youth networks and savings groups, as volunteers in the relief phase, and as platforms for distribution. In particular sectors and areas there were interesting new partnerships, for example with remittances companies, to channel cash transfers to affected people. There were also many new variations of existing processes, such as rapid assessments, reallocating staff across offices to meet surge needs and expedited procurement processes.

While some of these are noteworthy, they amount to what has been described as 'single loop learning', namely finding ways to make existing processes work better. Much of the 'innovation' has been about adapting existing standard operating procedures to achieve marginal improvements in performance and effectiveness. They were also largely in pockets here and there, rather than systematically integrated into the response as a whole. While such incremental improvements are necessary and important, questions remain about whether they were sufficient to meet the challenges of the response and the needs of Nepalis.

Lesson 4: *Many 'visible' and high-profile innovations had no or little connection to the operational setting*

Some of the more externally visible ideas had little or no connection to the frontline of response operations, with humanitarian innovation summarised by one observer as being mostly about 'disaster-focused technology marketing'. Although this may seem cynical, numerous examples were given of innovative ideas that were showcased in the media and in fairs in universities, but which had not been adopted by any operational organisation and had not seen any real-world testing. This was especially apparent in the areas of shelter and digital tools.

Lesson 5: *Transformative innovation needs foresight and preparedness if it is to be brought effectively into responses*

In contrast to the prevalence of 'single loop learning', there was an acknowledged lack of 'double loop learning', or approaches to rethinking and finding new ways to achieve the objective. Without some degree of preparedness and groundwork, transformative innovative procedures and protocols are unlikely to be utilised in emergency responses. DEC members made good progress in cash responses thanks to pre-crisis training, which helped establish individual and organisational capacities and made the context more receptive and amenable to the introduction of cash when the response was underway. The lesson here is not just for operational organisations, but also for funders of innovation, who should consider allocating dedicated resources for crisis-specific applications of previously tested approaches.

Lesson 6: *Resourcing for innovation, although potentially available, was not focused and targeted enough on priority challenges*

Although there have been emergencies, notably the Ebola response in West Africa, that have triggered specific funds and challenges for innovation, there is no consistency within the sector as to whether such efforts are made for emergencies as a whole. In Nepal, few formal innovation mechanisms were established with a specific focus on the response, meaning that specific issues that were calling out for more and better innovation – shelter, say, or communications – did not get a critical mass of attention and investment. As a result, the innovation effort was highly fragmented across and within sectors.

Because of the lack of predictable emergency-specific funding of innovation, much of the work that goes on in real-time responses is not funded. By contrast, many funded innovations do not always have good connections to ongoing operational responses. This leaves the humanitarian innovation effort in a curious Catch-22: needing to do more to demonstrate its operational relevance, but not getting the resources to do so until it demonstrates its operational relevance.

Lesson 7: *Almost all of the innovation that took place in the response was within specific organisations, with very little happening in a cross-organisational fashion*

Innovation efforts are highly fragmented, meaning that there is both waste and duplication, and numerous missed opportunities. For example, many organisations talked about the use of some form of mobile monitoring or digital mapping of the crisis, but much of this was replicated within different organisations. More collaboration would allow for much better use of resources and solutions that can be supported collectively. Even within organisations, different sectoral responses have very different ways of engaging with the innovation question. While mechanisms such as the clusters did in some cases raise innovation-related issues, they were not typically high-priority issues.

Lesson 8: *International organisations paid insufficient attention to the role of local organisations and end-users in innovation*

One key area of discussion was the extent to which end-users' own priorities, needs and capacities played a role in innovation efforts in the response. The overall message was that this was not yet a major priority for international aid organisations. There was a tendency to focus on internal stakeholders and innovations that addressed their needs. As one respondent put it, 'we are still really doing innovations in and for aid processes, not innovations with and for communities'. There were some examples of efforts that opened up the innovation process and made use of the considerable skills and talents within communities, but these tended to emerge from Nepali

Participatory geographic information system (GIS) training in Bhaktapur, Nepal

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organisations that engaged directly with communities and involved them directly in the innovation process. Examples include bringing in diaspora expertise in community-based reconstruction efforts and the engagement of the Nepali cooperative banking sector to finance early response. While it must be noted that such innovations can be localised solutions to problems of response and recovery, and therefore may not always be replicable, the fact is that they are often completely off the radar of international organisations. As a result, novel ideas that could potentially have had positive effects across the response were not fully grasped by international humanitarian organisations.

Lesson 9: *Innovation needs to be thought about and undertaken in a much more open and democratic fashion than is currently the case*

The lack of sensitivity described above did not just relate to end-users in communities but also to potential operational partners. There were numerous promising innovations from Nepali organisations themselves, such as the Kathmandu Living Labs (see the article by Elizabeth Gilmour in this edition of *Humanitarian Exchange*). The military trialled interesting information management approaches, and some private sector organisations and diaspora organisations developed novel forms of fundraising. But these initiatives were poorly linked to by the international humanitarian community as a whole, whose mindsets, processes, organisational structures and networks proved insensitive to the kinds of ideas and approaches that were emerging on the ground. Instead, what was seen as innovative was largely what had some form of legitimacy and credibility within the formal sector. This served to limit the potential of radical and challenging ideas.

Lesson 10: *In operational contexts, humanitarian innovation is still a nascent effort*

Although there has been an encouraging increase in interest in humanitarian innovation, as well as positive signals from major donors and implementing actors, the Nepal experience suggests that there is still some way to go before innovation becomes a mainstream operational focus for humanitarian organisations. Instead, what was observed was at best a nascent system, with very small-scale efforts to try out new approaches, but insufficient investment and infrastructure to make the effort really meaningful. Based on the evidence of the Nepal response, there isn't enough attention and resources being paid to bring innovation into the frontline of emergency response work.

Conclusion

These lessons should serve as a wake-up call for the sector as a whole. Much more effort is needed to fully operationalise

innovation so that it makes the most transformative contribution to response efforts.

This means, at a minimum:

- more operational preparedness for innovation efforts in different settings, to include training, pre-emergency piloting and establishing necessary partnerships for developing and testing innovations;
- crisis-specific funding and support mechanisms to strengthen and amplify innovation efforts;
- mechanisms for drawing in ideas and insights from end-users and local organisations; and
- mechanisms for facilitating cross-organisational innovation efforts in specific areas, to pool resources.

Overall, the findings about humanitarian innovation need to be linked to, and contextualised within, wider findings about weaknesses in humanitarian action. It is perhaps unsurprising that the innovation field should replicate some of the self-same challenges as the wider sector. However, as innovation is being positioned as one possible set of solutions to the ailments affecting the sector, there is also a need for a good hard look at whether innovation efforts are being thought about, developed and strategised in ways that could ultimately change the way that aid is delivered. On the basis of this current review there is some way to go, and innovation is more of a nice to have, rather than a must have, and is not yet a core operational priority for response organisations. As such, humanitarian innovation appears to have much in common with previous efforts to change and improve the sector, such as accountability, learning and performance initiatives.

With the forthcoming World Humanitarian Summit placing a high priority on innovation issues, there is potential traction at the policy levels of the system. But without more conscious and sustained effort to support creativity and novelty at the frontline of operations, innovation is likely to remain a marginal part of humanitarian responses.

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Mapping for resilience: crowd-sourced mapping in crises

Elizabeth Gilmour

Massive earthquakes have rocked the Nepalese capital Kathmandu throughout its history. In 1934, an earthquake destroyed a quarter of the buildings in the city and killed over 10,000 people across the region. The most recent major event, on 25 April 2015, had its epicentre 80 kilometres from Kathmandu, in Gorkha. Fourteen of Nepal's 75 districts sustained serious damage, including the three districts in the Kathmandu Valley. Nearly 9,000 people were killed and another 17,000 injured. Half a million houses were destroyed.

Concerns about earthquake preparedness had been growing for years before the earthquake. Preparedness is more than building earthquake-resistant buildings and resilient infrastructure: information is also a key element, of which maps are an important part. Maps show road networks and settlements, as well as hospitals and other facilities. They are crucial for directing relief, understanding the risk of secondary disasters and locating resources.

Kathmandu Living Labs (KLL), a Kathmandu-based not-for-profit civic tech company founded in 2013, uses crowd-sourced mapping to improve the information infrastructure in Nepal. KLL helped pre-pare Nepal before the earthquake using open mapping. After the earthquake, the organisation provided crisis maps to relief actors. KLL's preparation and previous work with crisis mapping meant that it was uniquely placed to provide maps and coordinate crisis mapping after the earthquake.

Capacity-building and preparation

The Open Cities project, an initiative from the Global Facility for Disaster Reduction and Recovery (GFDRR), began in 2012 to collect open-source data about the seismic vulnerability of schools and medical facilities in the Kathmandu Valley. Student groups and citizen volunteers assisted in digitising data about building locations and the road network, as well as structural information about schools and medical facilities.

Open Cities stored the information it gathered on OpenStreetMap, a global online map that anyone can edit and contribute to. OpenStreetMap is a crowd-sourced mapping platform. Local mappers can add places with which they are familiar to the map, while volunteers around the world add features from satellite imagery. Users map manmade and natural features ranging from highways to temples and sources of water. In addition to drawing objects on the map, users can add information. For a school, for example, users can add the name, the number of students and details about the building.

As part of the Open Cities Project, schools, roads, medical facilities and houses were mapped in OpenStreetMap. In total, the volunteers mapped over 100,000 buildings in the Kathmandu Valley, added structural information about 350 medical facilities and about 2,300 schools and improved and

updated the map of the road network on OpenStreetMap. The project meant that crucial information was in place, and many residents of Kathmandu knew how to use OpenStreetMap and could continue to add to it. KLL also began working with other organisations in Nepal to teach open mapping. For example, in 2013 staff of the Nepal Red Cross Society (NRCS) were trained in mapping vulnerabilities and resources in communities. These training sessions taught NRCS staff from several districts how to use open data and open mapping in their day-to-day work, and in case of a disaster.

During crises such as natural disasters the Humanitarian OpenStreetMap Team, or HOT, organises the mapping of affected areas. The area is broken into many smaller mapping tasks. Each task is divided into squares, each of which is mapped by one or more volunteers who work with aerial imagery to trace objects on the map. Just as in the case of the Open Cities project, volunteers use aerial imagery to produce a digital map. In this way, volunteers can efficiently map large areas, and organisers can focus volunteers' efforts on priority areas. KLL also studied how OpenStreetMap contributed to the response to Typhoon Haiyan in the Philippines in 2013. Just as after other natural disasters, maps were important for locating victims, routing aid and assessing damage. The typhoon KLL joined other volunteers from around the world in mapping road networks and damaged buildings. KLL also organised mapping marathons to recruit more volunteers.

Post-earthquake mapping

The day after the earthquake, on 26 April, several members of KLL met to plan a course of action. Although Open Cities Project and KLL had organised a major mapping effort in Kathmandu, the other affected districts had not yet been thoroughly mapped. As the building where KLL worked was one of many damaged in the earthquake, staff set up a table and chairs in the parking lot. For the next few weeks, they would work outdoors.

The lessons KLL learned in the mapping effort after Typhoon Haiyan helped to plan next steps. Mappers had to be alerted to the need, and mapping tasks had to be assigned to direct volunteer efforts. As the available imagery was from before the disaster, it did not show earthquake damage or the camps where internally displaced people were staying. Despite cloudy skies over Nepal, by 1 May, less than a week after the first earthquake, enough satellite imagery was available to create new mapping tasks focused on several districts outside the Kathmandu Valley. The first imagery to arrive was of Gorkha, Nuwakot and Dhading districts; imagery from Sindhupalchok, a heavily damaged district to the north of Kathmandu, arrived later. In addition to HOT, KLL worked with other organisations to understand what maps were needed for earthquake relief.

Maps on the ground

The earthquake drew an unprecedented response from mappers. By 28 April, 2,200 people had contributed to the crisis mapping effort. KLL was still helping to guide the mapping from the parking lot of its former office. At this point, individuals, volunteer groups and humanitarian organisations began to request map data as well as printable maps, for navigation on the ground in places where mobile maps were unreliable.

Residents of Pokhara, Nepal learn how to use OpenStreetMap

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Four days after the earthquake, on 29 April, KLL began to co-ordinate with the Nepal army, after establishing contact through its GIS division. The army specifically requested information about camps housing earthquake victims, and also used the maps to coordinate relief operations. Working with a non-governmental organisation to plan relief operations was a major change for the military. The information provided by KLL helped the army expand its relief efforts. 'Earlier, we were simply focusing on Bhaktapur but we found out that areas like Ramkot and Balaju were heavily damaged', explained Lieutenant Colonel Sudeep Panta, the head of the army's GIS Department.

The day after coordination with the Nepal army began, KLL held a training session for doctors on how to use its maps to assist in earthquake relief efforts. By this time, five days after the earthquake, 3,300 people had participated in crisis mapping. KLL also began posting printable maps to an online repository. Relief organisations, such as the Canadian Disaster Response Team, had already begun using the printable maps for their relief operations. On 1 May, KLL created the QuakeRelief.info website and consolidated and posted its collection of printable maps.

Mapping only affected districts is not enough for future natural disasters. In a country like Nepal, with such diverse and challenging topography, it is necessary to know where people live and how to reach them in times of crisis, by car, jeep, mule or helicopter. Continuing work on mapping in Nepal and in other developing countries should be considered

an essential part of disaster preparedness and mitigation. The role that KLL played before, during and after the crisis caused by the 25 April earthquake shows the value of having an organisation on the ground to direct and organise crisis mapping.

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Innovating and testing small business disaster microinsurance for urban resilience

Ronak Patel and Mihir Bhatt

Between 1990 and 2016 India suffered hundreds of natural disasters, causing over $48 billion in losses. Over the same period, the insurance sector contributed just 11–12% of total loss recovery.[1] Currently, the informal sector is the largest contributor to urban gross domestic product (GDP) in India, accounting for 48% of GDP[2] and 69% of employment in 2004–2005.[3] However, informal businesses' access to risk transfer tools such as insurance is limited. The reasons are many, ranging from the unavailability of suitable products, the need for tailored products that meet small businesses' specific risks, the inability of small business owners to pay high premiums, high risk pools for insurers and limited awareness and lack of contact by insurers with this client base. In the absence of any type of insurance coverage, following a disaster many informal businesses must resort to selling personal and business assets and taking out high-interest loans. Some are forced to shut for long periods, and many never reopen. This has significant implications for post-disaster recovery: local markets are an important source of goods and services for crisis-affected people in urban areas, and make an important contribution to the ability of communities to get back on their feet. Just as cash transfer interventions aim to revive local economies through increasing demand from local markets, microinsurance aims to ensure that the very small businesses that comprise these local markets can also recover rapidly.

Household microinsurance: the experience of *Afat Vimo*

The concept of *Afat Vimo* (Gujarati for 'disaster insurance') arose during community consultations on livelihood security following the 2001 Gujarat earthquake. At that time, only 2% of those surveyed had insurance of any kind. The All India Disaster Mitigation Institute (AIDMI) began discussions with Indian insurance providers around the possibility of offering a simple, single microinsurance[4] policy that would provide cover to poor policyholders for a wide range of disasters. AIDMI designed a microinsurance scheme with two regulated public sector insurance companies on a partner agent model.[5] The scheme covered five risks: (limited) loss of life, trading stock, livelihood assets, home and home contents, with an annual premium of around $4.50 (including administrative charges) and a total potential benefit up to $1,560 across the various components of the coverage.

The product was first sold in April 2004 to 3,700 policyholders in Gujarat, and was later extended to 800 families affected by the 2004 Indian Ocean tsunami in Tamil Nadu, and 171 families affected by the 2005 earthquake in Jammu and Kashmir. In 2011, the pilot scheme was extended to 950 families affected by floods and a cyclone in Odisha. In addition to the insurance policy itself, policyholders were supported with mitigation measures such as fire safety, seismic-safe construction practices and business development, as well as awareness raising and education on disaster risk reduction through training, focus group discussions, dissemination of case studies and the creation of a platform to share ideas within the community. Between 2004 and 2010, *Afat Vimo* payouts helped affected policyholders manage their economic recovery faster and better, demonstrating in the process that providing microinsurance is financially feasible and effective.

Action-based research

Given the potential benefits of microinsurance in supporting urban markets and livelihoods, AIDMI and Stanford University requested support from the Humanitarian Innovation Fund

1 India General Insurance, 'Vision 2025: Towards an Inclusive, Progressive and High Performing Sector', FICCI, October 2013, http://www.ficci.com.

2 Ramesh Kolli, 'Measuring the Informal Economy: Case Study of India', n. d., http://www.cwsc2011.gov.in/papers/sna/Paper_4.pdf.

3 Preetam Kaushik, 'Is the Humongous Contribution of the Informal Sector to GDP Assessed Properly?', *Business Insider*, 11 December 2014, http://www.businessinsider.in.

4 Microinsurance serves low-income groups with low-cost premiums covering low-value assets.

5 A partner agent model is one in which the insurance company underwrites the insurance policy but another party takes responsibility for functions such as advertising, enrolling, collecting premiums, assessing damage and distributing payouts. Partner agents are usually micro-finance institutions but can be community-based groups, religious organisations or a private company. They allow the insurance company to reach people who may be difficult or expensive to access.

Discussions about the effectiveness of *Afat Vimo* disaster insurance following Cyclone Phailin in 2013

© AIDMI/Innovating Disaster Micro-Insurance for Local Market Recovery

(HIF) to design and implement a microinsurance scheme for urban informal small businesses, and to study its impact on small businesses and its effectiveness in promoting local market recovery. Using a randomised control trial (RCT) design, the study team allowed half of the business owners that intended to buy insurance to actually purchase it. The other half – those not given the opportunity to purchase microinsurance – will serve as the control group. Because of randomisation, we can assume that both groups, those with insurance and those without, are similar in all other respects, and that any differences, such as time to recovery, method of recovery and risk reduction behaviour, can be attributed to the insurance. The study will compare how each group of owners is impacted by a disaster, if and how quickly they recover, what coping mechanisms they employ, how business and household finances are affected and what disaster risk reduction efforts they engage in before the event.

The study is being implemented in three cities: Puri in Odisha, Cuddalore in Tamil Nadu and Guwahati in Assam. The three cities were selected based on the high frequency of climate-related disasters they suffer and AIDMI's pre-existing relationships with local community-based organisations (CBOs), which serve as partner agents for the insurance programme. An initial survey to assess demand among a sample of informal businesses was conducted at the beginning of 2015. In all three cities the majority of respondents reported that disasters, mostly of natural origin, not only affected their businesses and livelihoods, but also had downstream impacts on household finances and comsumption patterns. The survey also confirmed that businesses commonly relied on negative recovery strategies after disasters, which are either exploitative, such as high-interest loans, or harmful for long-term growth and recovery, such as selling important assets or drawing down savings. There was very low awareness of insurance, particularly microinsurance: less than 1% of respondents in Guwahati and Puri knew about microinsurance, but, once explained to them, there was universal demand forthe product if it was designed to meet their needs at a reasonable price.

CBOs help advertise the product and provide outreach to a group currently neglected by the big insurance companies. They will also facilitate the claim and payment process to improve cost-effectiveness for insurers. The CBOs also survey study participants to collect relevant data, including name, gender, income, risk reduction behaviour, post-disaster impact on recovery and coping strategies. Although the project will run for only 18 months, the individuals and institutions involved are committed to collecting evidence on its impact over the next five years.

Implementation

The study team is currently engaged in advocacy, negotiation and facilitation with stakeholders to address issues identified during the preliminary survey. Initially, insurance companies did not see the value in covering customers living in high-risk areas on the periphery of the city, in low-lying coastal zones or on undeveloped land with poor infrastructure and drainage. The premiums demanded by these companies were either prohibitively high or the amount and type of coverage was capped at an unfeasibly low level. The project partners have been negotiating with insurance companies to design

Key terms

Insurance: Contract where an insurer promises to provide the insured a sum of money in the event that certain accidental occurrences result in losses. The coverage depends on the type of losses and the policy terms.

Risk transfer: System aimed at accepting risks through contractual obligations, transferring a portion of the risk to an insurer.

Risk pool: Aggregation of losses and claims by insurers to reduce the risk and increase margins for insurers.

Reinsurance: Insurance purchased by insurers to hedge their own insurance portfolios.

a demand-based product catering to the needs of small-business owners, while still being financially viable. Through design workshops, an insurance product has been finalised for one of the study sites, covering a reasonable number of disasters for an adequate amount at an affordable premium. The project partners have also started raising awareness among small-business owners on the concept, process, available options and benefits of insurance.

The project has initiated engagement with the national disaster management authority and at least four disaster management authorities at state level. Two private insurance companies at the national level are directly engaged in the implementation of the project. The process of engagement is challenging and time-consuming as the concept of small businesses using insurance to manage or transfer risk related to humanitarian emergencies is new. Nevertheless, progress has been made. Three leading sub-national authorities have been involved in co-organising consultations, shaping demand and planning policy outreach. As interest and commitment among key stakeholders has grown, participating insurance companies are now interested in tracking the project for an additional 24 months, and the government authorities are developing a 3–5-year mainstreaming plan.

Moving forward

If disaster microinsurance for small businesses proves successful and beneficial, expanding the project will become a priority. Operationalising it where CBOs are not present or capable of serving as partner agents will have to be addressed. Microfinance institutions flourished rapidly in the fields of microloans and savings groups as evidence attested to their viability and, in the area of microloans, their profitability. The same may happen with microinsurance if the evidence proves its financial viability and profitability, with MFIs as partner agents instead of CBOs, and insurance companies acting to simply underwrite the policy. Similarly, private insurers will also be incentivised to tap into this customer base and spread the product. External advocacy support, however, will still be required. AIDMI will continue in that capacity to help scale up the innovation. Progressive policies will need to be adopted, including encouraging and requiring insurance companies to include the poor in their portfolio of clients. Reinsurance (essentially insuring the insurance) – through a private reinsurer, government or international facility such as the World Bank – will also be needed to manage the risk of a catastrophic event that could wipe out the entire risk pool and cripple insurance companies.

While uptake may be incremental, change could be radical. If taken to scale, growing urban populations would have an internal mechanism to allow rapid recovery, limiting the need for expensive and inefficient outside aid. Institutionalising risk transfer is important and time-consuming, requiring commitment beyond the project timeframe. However, the results from AIDMI's pilots demonstrate that this process is crucial to building the evidence base and influencing policy-makers. Flexibility in the project process, from both agencies and donors, will be important.

Shifting from a pilot to a replication model is neither easy nor automatic. It needs planning, resources and continuous engagement and advocacy with key stakeholders. Consultations with UN, government and civil society organisations during the ISDR Asia Partnership meeting in Delhi in November 2015 indicate a wide range of interest in investing in a follow-up to the pilot. The diverse, decentralised and collaborative approach to the pilot was highlighted as a particular strength. The innovation was also cited as a 'positive disruptor that could potentially help reorient the humanitarian system to focus on the fundamental causes of vulnerability'. What is needed is a facility that funds, builds capacity and engages continuously with key stakeholders. A survey conducted by AIDMI among private sector, donors, the UN system, sub-national authorities, researchers and international financial institutions suggests there is overwhelming demand for – and willingness to fund – such an initiative. The Indian government's 100 Smart Cities programme offers the ideal platform for such a facility, which AIDMI aims to develop and launch at the Asia Ministerial Conference on Disaster Risk Reduction in Delhi in November 2016.

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(Loan) cycles of innovation: researching refugee-run micro-finance

Robert Hakiza and Evan Easton-Calabria

Refugees across the global South are increasingly choosing to venture into cities rather than staying in camps. Currently, approximately half of the global refugee population now lives and pursues their livelihoods in non-camp settings. Increasingly, these urban refugees are undertaking their own entrepreneurial initiatives, often in sectors in which they have no prior experience. Most also lack access to the micro-loans that could help them start businesses. Few refugee-serving organisations have comprehensive loan programmes, and micro-finance institutions (MFIs) rarely target refugees as beneficiaries. Lack of legal status often prohibits refugees from becoming MFI clients or opening bank accounts in host countries, and lenders' fears of refugees leaving the host country increase uncertainty about loan repayments and sources of collateral. Refugees in receipt of free assistance have sometimes perceived loans as hand-outs, and may not have adequate community or other support to successfully repay loans.[1]

Despite these obstacles, and the fact that the majority of urban refugees survive without institutional assistance, little research exists on whether and how they access micro-finance. In particular, refugees' own micro-savings and micro-lending groups (termed here refugee-run micro-finance) have not been comprehensively researched. This means that, despite an awareness of these groups, there is no real understanding of how they operate within communities, how they interact (if at all) with outside capital providers and the main challenges they face. Our research project, funded by the Humanitarian Innovation Fund (HIF), aims to illuminate not only the current state of micro-finance for urban refugees but also how refugees' own communities and networks can act as sites of innovation for bottom-up micro-finance programmes. We are currently mapping existing initiatives and programmes in Kampala, and have already identified 25 refugee-run micro-finance programmes. Our work aims to expand upon the existing micro-finance structures refugees have created within their own communities, and to learn how these could be linked to MFIs (both Ugandan banks and MFIs and international non-profit lenders such as Kiva).

We aim to provide evidence-driven recommendations for micro-finance providers and develop a model that builds on refugee-run micro-finance initiatives. In this way, we hope to provide avenues for urban refugees to directly access capital. To do this, various questions must be more comprehensively answered. What degree of access to financial tools is available to refugees? From a lender's point of view, what conditions would enable refugees' access to micro-finance? Are refugee-run micro-loans and micro-savings groups successful and, if so, how could these be expanded?

Experience: our innovation catalyst

The catalyst for this research came from our experiences as founders and directors of small grassroots non-profit organisations in Kampala, as well as from academic engagement with the Humanitarian Innovation Project (HIP) at the University of Oxford. Our organisations, the refugee-run Young African Refugees for Integral Development (YARID) and the Paper Airplanes Project, co-led by refugees, focus on livelihoods training, which led us into direct contact with urban refugees seeking capital for small businesses. Through discussions with potential beneficiaries, we identified urban refugees' need for micro-finance, and the potential of refugee-run community micro-finance operations. A 2012 pilot initiative led by the Paper Airplanes Project confirmed the viability of such programmes.

The need for micro-finance opportunities for refugees has been clear to Robert, a principal investigator for this project and YARID's founder, since 2013, when YARID's Women's Empowerment Centre opened. The centre has provided formal opportunities for women to develop vocational skills, with daily training in fashion design, tailoring and craft-making. YARID has regularly interviewed refugee women about their experiences in the programme. Twelve women completed the tailoring programme after a recent training cycle, but only four managed to start their own business. Representative of the situations of many refugees we know, lack of access to capital was repeatedly cited as a major barrier.

The decision to research refugees' micro-finance innovations also grew out of our frustration at the lack of partnerships between refugees and researchers (not to mention between refugees and refugee-serving organisations). Although current rhetoric espouses refugees' capabilities as active agents, they are still too often seen solely as subjects of study and beneficiaries of programmes. As a Congolese refugee and an American researcher, we represent the research partnerships we hope will become more common. As such, our project is a case study of process innovation in research, and a model of Northern academic research partnerships with Southern practitioners and researchers. Collaboration, particularly across nationalities, socioeconomic backgrounds – and sometimes across continents – is not always easy. It has required trust and transparency, and, to that end, a lot of very clear communication. We recognise that we each bring

1 The Alchemy Project at the Feinstein International Center has recommended that 'Separate agencies, de-linked from relief, should manage and dispense loans to refugees': K. Jacobsen, *Microfinance in Protracted Refugee Situations: Lessons from the Alchemy Project* (Boston, MA: Tufts University), p. 15, http://www.alnap.org/resource/20045.

A street view in Kampala, Uganda

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particular strengths to our project. Our different positions, for example, give us different sorts of access to informants, a reality that has been aggravating at times but has ultimately served our project well.

Refugees are doing it themselves

Our research in Kampala demonstrates that many urban refugee communities have developed their own finance mechanisms, such as micro-savings and lending groups in their own communities. These are divided amongst the main refugee populations – Congolese, Rwandan, Somali and Burundian – we are researching. Our research is centred on these populations based on our prior knowledge of micro-savings groups among Congolese and Rwandan refugees, our interest in examining the potential role of diaspora remittances in micro-savings groups among Somalis and the opportunity to examine micro-finance mechanisms among recent refugees from Burundi.[2]

The savings groups we have identified thus far are composed mainly of women, with between 20 and 40 members in each group. These groups generally meet once a week. Each member brings a contribution of money, which varies from one group to another. This starts at 2,000 Ugandan Shillings (approximately 40 pence) and goes up to 25,000 (about £5) depending on what members have agreed. The weekly meeting is also an opportunity for members to discuss their business challenges, or to borrow from or pay back money to the group. The loan cycle generally lasts a year, after which members divide the accrued interest among themselves and then decide whether to start a new cycle.

Preserving the grassroots nature of these groups while injecting them with more capital from institutions may offer a way to address some of the long-standing issues in refugee micro-finance provision. Many refugee-run micro-finance programmes do not have enough capital to make substantial loans to members (average loan sizes are generally under 300,000 Uganda shillings, roughly £62/$89, and not enough to start a small business), while a failure to repay loans is often a problem for NGO micro-finance programmes. Creating partnerships between refugee-run organisations and formal MFIs could address these problems: these micro-finance groups could provide larger loans, while the community collateral that grassroots refugee-run initiatives provide could also serve as an important bulwark for MFIs against loan delinquency.

To further investigate this option we are interviewing banks, MFIs and refugee-serving organisations offering micro-finance loans. There are over 100 MFIs in Uganda, yet only a few currently have refugees as clients. Since 2000, UNHCR has implemented different forms of microfinance in 45% of its country operations, but this has happened only recently in urban areas and the

2 Some 22,000 Burundian refugees have arrived in Uganda since Burundian President Pierre Nkurunziza announced in April 2015 that he would run for a third term of office. UNHCR Inter-agency Information Sharing Portal: Burundi, http://data.unhcr.org/burundi/regional.php.

success rate is low overall.[3] To strengthen its micro-finance programme, InterAid, UNHCR's only implementing partner in Kampala, has partnered with the international micro-finance organisation BRAC. However, BRAC only offers technical guidance, and does not administer or monitor loans.

We are also examining other micro-finance programmes that could provide models for urban refugees. These include successful initiatives for refugees in rural Uganda, like Hope Ofiriha and Kyangwali Women's Microcredit Project.[4] Citing a need for micro-finance schemes for urban refugees in Kampala, the Women's Refugee Commission argues for a combination of grants and loans 'from informal village savings and loan associations (VSLAs) up to formal micro-finance institutions'.[5] These options, which we believe rely on a strong community foundation, are all promising possibilities for further research.

It is important to research not just refugee-run micro-finance but also the types of community that provide the strongest basis for such programmes. Urban refugee communities exist in various spheres of life in Kampala, comprising church congregations, refugee-run organisations and refugee resource centres. However, these cohesive communities have not been examined as potential sites of micro-finance, where existing social structures might be enhanced and act as bases for livelihoods programmes. We are currently developing case studies on different communities with micro-loan programmes, as well as undertaking a best-practice literature review on community micro-finance models in different countries, and as provided through different lenders, including international and local NGOs and banks.

The Bondeko Women of Hope Savings Group

The Bondeko Women of Hope Savings Group is based at a refugee-run organisation known as the Bondeko Refugee Livelihoods Centre. The group began in 2013 and has now started its third year-long loan cycle. It comprises 30 women, who meet every Saturday to repay loans and discuss business challenges and ideas. Each member contributes between 2,000 and 10,000 Ugandan Shillings (approximately 40 pence–£2) each week. Loans must be repaid within one month. Each member runs her own enterprise, ranging from selling vegetables to jewellery, and the savings group offers a chance for these businesses to expand. The group also has a welfare component, where weekly donations are made to support other women in unexpected situations of need, such as family illness or death. The group was founded and is run by a former statistician, who was part of a micro-loan group in the DRC. As it was being established the group was supported by the Finnish Refugee Council (FRC), which supplied booklets to record savings, a safe box and business training. The Bondeko Women of Hope Savings Group is only one refugee-run micro-finance programme among many in Kampala. However, its professional nature and high loan repayment rate (98%) is similar to other initiatives we have identified. There is significant potential to expand refugee's access to the micro-finance these groups provide.

Conclusion

As a research project directed by a refugee-run organisation and involving refugee communities themselves, we view this innovation as an important bottom-up contribution to both research and practice involving refugees. In order to increase the access and effectiveness of micro-finance programmes for refugees, it is vital to gain a sound evidence base on refugee-run micro-savings and lending groups, and how they could be built upon and linked to MFIs. This research is valuable for urban refugee micro-finance in Kampala, but is also relevant to other urban contexts where refugees have the right to work, such as South Africa or Turkey, where Syrian refugees are granted temporary work permits. We aim to contribute an evidence base, recommendations and a model for refugee micro-finance for the international humanitarian community. Research describing the conditions for refugee micro-finance and the development of implementable refugee-run models also contributes to the promotion of policy environments that offer refugees the right to freedom of movement and the right to work. Such research provides the foundation for micro-finance programmes that promote active refugee participation and the recognition of refugee communities as important social hubs for innovation.

Robert Hakiza, YARID, and **Evan Easton-Calabria**, University of Oxford.

3 M. Azorbo, *Microfinance and Refugees: Lessons Learned from UNHCR's Experience*, UNHCR Policy Development and Evaluation Service, Research Paper 199, January 2011, p. 11. p.

4 Hope Ofiriha (Northern Uganda): http://www.ofiriha.org; Kyangwali Women's Microcredit Project: http://www.peopleweaver.org/projects.

5 Women's Refugee Commission, The Living Ain't Easy: Urban Refugees in Kampala (New York: WRC, 2011), p. 17.

Innovating humanitarian emergency water supply: the Clarifier Kit for Emergencies

Caetano Dorea

Emergency water treatment kits are often designed to favour water quality over the quantity produced. While quality is important, water treatment in a humanitarian setting is largely based on the premise that the transmission of water- and excreta-related diseases in emergencies is as likely to be due to the lack of sufficient quantities of water for personal and domestic hygiene as to contaminated water sources. Hence, in most cases the quantity of water supplied should be prioritised over its quality, as recommended in the Sphere standards, while simultaneously ensuring a safe water supply that is both free of pathogens and aesthetically pleasing (i.e. visually clear, no taste, no odour, etc.). In other words, a larger quantity of relatively good (safe)-quality water is better than a small quantity of very high-quality water.

Many of the water purification kits currently available use treatment processes (i.e. filtration by sand, activated carbon or membranes) that are not always compatible with field conditions in emergencies and can be expensive. In non-emergency situations, such techniques are typically used as a 'polishing' treatment once the bulk of the particulates in the water has been removed. When confronted with very turbid (i.e. 'cloudy') water, as is typical in emergency contexts, such filtration-based systems suffer from frequent clogging, and fail to provide adequate amounts of safe water. As such, many 'innovative' processes developed by the private sector turn out to be efficient in the removal of particular contaminants in controlled conditions, but are not effective in practice. This is partly due to the focus on high-tech solutions that do not take into consideration the operational realities of humanitarian assistance. This problem has been attributed in part to the lack of communication between manufacturers and relief agencies. While humanitarian workers can feel that private sector innovations do not adequately address their requirements, private sector companies hold the view that humanitarian organisations are not good at communicating what they want, and are often driven more by donor requirements than by real needs.

The CLARKE project

One of the objectives of drinking water treatment is the reduction of turbidity. Naturally occurring particles in suspension give water its turbidity or cloudiness. Reducing turbidity not only makes the water clearer, but more importantly it improves the efficiency of the final disinfection step which ensures that the water is safe to drink. If turbidity is high, the efficiency of disinfection can be compromised because some of the microorganisms are sheltered from the disinfectant by the particles. The simplest way to remove particles is to let them settle under the influence of gravity. The problem here is that the smaller the particle is, the longer it takes for it to settle. Moreover, in drinking water treatment the particles of concern are usually very small. For this reason, chemicals known as coagulants are used to bring such minute particles together, increasing their size and settling velocities into what are known as 'flocs'. The removal of such flocs from water is done in sedimentation basins, also known as settlers or clarifiers. While both coagulation and inclined plate settlers are commonly used in conventional water treatment, these two techniques have never been applied to emergency water treatment together. Inclined plate settling is a clarifier variant that allows for increased particle removal efficiencies at higher flow rates within a smaller footprint. Combining these two techniques (i.e. coagulation and inclined plate settling) in one system allowed us to develop a fit-for-purpose humanitarian water treatment system: the Clarifier Kit for Emergencies (CLARKE).

Development

The CLARKE project was a collaboration between NGOs (Oxfam and RedR India), academia (Université Laval) and the private sector (Aquaplus Ltd.). Oxfam's humanitarian experience helped the partners identify the key constraints and criteria the plate settler needed to address; Université Laval had the research and technical capacity to determine how to adapt the design to meet these performance criteria; and Aquaplus possessed the manufacturing and marketing expertise to undertake the necessary adaptations and minimise production costs. The previous humanitarian experience of the key leads at Aquaplus and Université Laval ensured a basic understanding of the emergency response context. Each organisation had complementary interests: Oxfam was seeking a better water treatment system; Université Laval aimed to publish research findings generated from the process; and Aquaplus, as a private sector organisation, was interested in developing and marketing humanitarian products.

The project aimed to develop a solution for producing large quantities of safe water in emergency settings. This required the design and testing of different prototypes. Researchers working with Aquaplus (India) in Pune tested prototypes to verify the performance of different design configurations. Problems which could not be fully verified in India were referred back to testing facilities at Université Laval in Quebec City, where further lab testing took place using a much smaller model of the inclined plate filter.

The development of the CLARKE was partially based on experience acquired during the testing and deployment of Oxfam's Field Upflow Clarifier Kit. This kit, developed collaboratively

Water points in Juba, South Sudan

© Petterik Wiggers/Hollandse Hoogte

by Oxfam GB and the University of Surrey, overcomes the limitations of other technologies challenged by high turbidities whilst maintaining a high production yield. However, one shortcoming was the limited involvement of the kit's potential operators (i.e. field staff) during its development; practitioners saw its set-up and operation as too complicated, and it was not widely adopted despite being considered one of the most cost-efficient emergency systems available. Further involvement of potential end-users in its development could have helped simplify the system and increase uptake in the field.

Support for the proof-of-concept of the treatment process underpinning the CLARKE (i.e. inclined plate settling) was first obtained through seed funding from Oxfam in 2011. The promising results from early work in Pune in partnership with Aquaplus Ltd. led to a larger grant from the Humanitarian Innovation Fund in 2012. This work was aimed at optimising the original design and determining how it could be transformed into a collapsible system. The development of the water treatment system aimed to meet the following design criteria:

- Maximal 'throughput': attaining a relatively high flow rate, as the system is intended to produce large volumes of treated water.
- Sufficient quality: attaining the minimum quality levels set by Sphere.
- Transportability: reducing transport costs by creating a highly mobile product.
- Usability: ensuring the system could be operated by newly trained field staff.
- Cost-efficiency: maintaining a competitive cost relative to production yield.

During its development, there was significant rethinking around how to best meet the criterion of transportability. This exemplified the dynamic nature of innovation and the unexpected outcomes that can arise in an innovation process. The original aim had been to emphasise the transportability criterion by designing a system with a collapsible structure. However, parallel independent work on a similar system being developed by ACH Spain indicated that a collapsible design could reduce water treatment efficiency, and the rigid structure was retained so as not to compromise water quality. This also ensured physical robustness, which was not initially considered as a design criterion. The first versions were made of mild steel that allowed for ease of manufacture and flexibility, but resulted in a very heavy system. Once the final design configuration was decided following testing in India and Canada, a lighter final product was manufactured using fibreglass.

Implementation

In 2013 there was an opportunity to deploy the second prototype version in the Typhoon Haiyan response in the Philippines. However, as the prototype was made of mild steel it was decided it was too heavy to be quickly and easily deployed. By the time the final and lighter version of the CLARKE was manufactured in 2015 no humanitarian crises warranted its use by Oxfam. In view of this, it was decided to deploy the CLARKE to South Sudan instead. At the time of writing, the CLARKE is being shipped to Juba, where it will help bolster safe water supplies as part of a larger Oxfam cholera mitigation and response programme. This operation will be done in collaboration with the local government body in charge of water infrastructure and will support local capacity for treatment and delivery. This deployment will also serve as part of the 'bottom-up' diffusion strategy adopted for the CLARKE, including demonstrating the technology to other agencies in the field to generate interest and uptake. During this deployment the performance of the CLARKE will be carefully documented. In addition to disseminating this experience through peer-reviewed publications and conference presentations, this innovation will be further diffused at a grassroots level through RedR-India training, as has been done in the past with other water treatment equipment.

Final thoughts

The more technical aspects of this project have been presented in several international conferences and can be made available by contacting the author (caetano.dorea@gci.ulaval.ca). In addition, ALNAP has recently published a series of detailed case studies on successful innovations including the CLARKE.[1] It is believed that the success of the development of the CLARKE was due to the good fit between the partners. One key contributing factor to this healthy relationship was good communication between partners with regard to roles, responsibilities, limitations and expectations. However, it is still early days for the CLARKE. The experience in South Sudan and uptake by other agencies will be critical for the wider adoption of this innovation.

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1 A. Obrecht, *Improving Water Quality and Quantity in Emergencies: The Inclined Plate Settler Water Treatment System*, HIF/ALNAP Case Study (London: ODI/ALNAP, 2015).

3D printing humanitarian supplies in the field

Eric James and Laura James

Anyone working in the field long enough will have experienced the frustration of failed supply chains, the backbone of all aid operations. Simply getting necessary items where they need to be at the right time is exceptionally challenging where uncertainty and disrupted physical and communications infrastructure mean that procurement orders, even for simple items, can take weeks or months to fulfil. Yet relief efforts need more than just lots of basic items. They also need individual 'one-offs', such as replacement parts for medical equipment or machines. Logistics are also expensive, accounting for an estimated 60–80% of costs related to humanitarian aid. These demands require novel approaches to making aid more efficient that go beyond incremental supply chain innovation.

Field Ready

Field Ready uses partnerships and capacity-building to provide sustainable hyper-local manufacturing of essential supplies in the field.[1] With support from the Humanitarian Innovation Fund, we use agile and iterative techniques and practices drawn from technology start-ups. This approach allows us to try new ideas, evaluate them quickly and adapt them for the contexts we find in the field. One way we are doing this is by extending the potential of 3D printing (3DP) in the field. Our approach involves making and testing designs closely with the people who will use them (including affected people and relief workers – anyone who might come into contact with the final product or item), reducing the risk that too much is invested in an inappropriate design or in solving an unimportant problem.

As Field Ready is pioneering 3DP in disaster relief, we have also put heavy emphasis on working in partnership and passing on skills to others. We are working with other initiatives, such as the ICRC's 'RedLabs', Refugee Open Ware and World Vision, to create innovation labs and other activities to respond to humanitarian need. We have trained dozens of aid workers and local partners in Haiti and Nepal in 3D printing skills and printer maintenance. Field Ready has developed learning steps which support different levels of starting skill and knowledge, and a basic training curriculum.

Digital design and manufacturing

3D printing is a way of making three-dimensional solid objects from a digital file. A 3D printer is a machine which automatically

1 Whereas 'local' relates to specific areas such as a neighbourhood, the term 'hyper-local' denotes an even more narrowly defined geographic space, such as a hospital, school or refugee camp.

converts a coded digital file into a physical item by 'printing' layers of material on top of each other. 3DP has been used in the manufacturing industry for at least two decades, printing materials including metal and ceramic, for prototypes and to test new designs and for final product manufacture. Recently, smaller, more affordable printers have become available. These typically work by melting and depositing plastic filaments and producing small objects, often no more than 25cm in any dimension, with reasonable accuracy. Good examples of objects which can be produced on such printers include plastic spare parts such as clips, models of objects which are hard to visualise or explain (such as the internal parts of a machine), objects which have specific dimensions in order to fit other existing items, or prototypes of items where the shape needs to be felt and seen to be evaluated (such as a handle).

Alongside 3DP, computer aided design (CAD) tools allow digital representations of objects to be understood, modified and tested. Desktop and handheld 3D scanners are used to convert an existing object into a digital representation, which can be reproduced or modified. Scanners vary widely depending on the scale and detail of the object being scanned, from desktop versions to scan small objects to mobile Lidar and camera technology to scan whole buildings or large cultural artefacts such as sculptures. As computer technologies advance all of these systems are improving, becoming faster, cheaper and more capable.

Benefits of 3D printing supplies in the field

Digital manufacturing techniques such as 3DP enable the local production of complex spare parts and the low-volume production of items that are not currently available in the field. This provides the specific items needed, rather than 'pushing' items along the supply network based on supply and not demand. Items may also be modified or adapted to fit local requirements. Printed supplies may be available on site more quickly than if they need to be procured from a remote warehouse or manufacturer. Item packaging for transport can be eliminated and fewer deliveries are needed. Importantly, 3DP filament – the plastic material used by printers – can be recycled and reused.

Local 3DP can also foster community engagement, enabling local people to feel ownership and play a role in designing and improving a range of products and services. This can even have the potential to develop new livelihoods and businesses. The equipment and skills to make relief supplies which we leave in the field will translate to other supplies and items over time.

Making medical supplies in Haiti

Field Ready undertook a trial of 3DP in Haiti starting in 2014, working with a number of partners: Real Hope for Haiti, which operates a health clinic north of Port-au-Prince, Project Medishare, with health activities in Port-au-Prince, and the NGO Haiti Communitere.

Using different 3D printers and software, Field Ready made and tested 165 prints, including prototypes, 21 print failures (where the printing did not finish or went wrong, so that the resulting output was not usable for the intended purpose) and 110 items distributed for use. We printed a unique prototype prosthetic hand (using just five parts), three items to repair and improve the printers, a winged (butterfly) needle holder (used in collecting blood samples), a prototype screwdriver, three prototype pipe clamps, two prototype bottles and a mock-up of a gas cylinder regulator, so that we could accurately test S-hooks used to suspend medical supplies in crowded emergency rooms. This assisted approximately 60 medical patients and a dozen aid workers.

From our research with midwives, we uncovered a supply chain problem involving umbilical cord clamps for new-born babies – simple clips which prevent dangerous infections. The main supply chain for these items comprises volunteers from the United States, who bring them in their backpacks. Most clinics could not secure a supply. When they are available on the market they typically cost $1, and can cost as much as $3. A 3D printed clamp costs just $0.60. Our prints resulted in a reduction in the risk of neo-natal umbilical sepsis, and more efficient (and safer) health worker and patient areas. With the additional items made, we also reduced the likelihood of mosquito-borne disease and enabled a clinic to consider alternative means of providing prosthetic hands for amputee patients.

3D printing spare parts and key items in Kathmandu

Nepal has strong local markets and supply chains. Aid agencies are able to procure most of the supplies they need locally, while good international links enable remaining supplies to be brought in. However, the rapidly changing political context, long delays at border crossings and high customs duties can disrupt these supply chains. These issues were heightened following the earthquake in April 2015. We found significant problems in procuring unusual components (particularly complex components from branded products made in Europe or the United States) as well as some curious omissions from local supply chains, such as plastic fittings used to connect water pipes together. The complex shapes involved in such items means that they are difficult and prohibitively expensive to manufacture using conventional techniques, even by skilled Nepali machinists and craftsmen. Some products available on the market in Nepal do not meet the specifications and standards desired by aid agencies (e.g. buckets with corners where bacteria can grow).

On our first visit to Grande International Hospital in Kathmandu we found much donated equipment, often now broken and disused. This included five baby warmers, three of which had the same fault – the corner clips which hold together the sides of the warming cot had broken. Attempts had been made to repair these using duct tape, and by painstakingly making metal brackets, which turned out to be unsafe. The corner pieces were a custom part, and the baby warmers were old

A 3D printer is used to create a fitting for a leaky water pipe in a camp for displaced people in Nepal

© Field Ready

equipment for which spares could no longer be purchased. A Field Ready engineer designed a new corner (aiming for greater strength in the area that had been breaking in the originals), printed and tested it, and then redesigned it. On a subsequent visit, Ajeev Bar Singh Thapa, head engineer at the hospital, said that the new corner fitted better than the original, and looked better too. We were able to print sufficient supplies to repair all the baby warmers.

A lack of proper pipe fittings was identified as a key issue by logisticians and water and sanitation (WASH) teams at Oxfam and Save the Children in Kathmandu. Field Ready visited Barhabise IDP camp in Sindhupalchowk district and identified a clear need for plastic water pipe fittings. We found 'improvised' connections using pushed-together pipes, inappropriate metal fittings and bicycle tyre inner tubes, which were often loose and leaky. A few hours later, a design for a fitting to connect two pipes was drawn and then printed in the camp on a portable 3D printer running off a car battery. The pipe fitting, which cost about $0.40 to print, was used to connect pipes that supply water to 18 households (about 75 people). On a return visit, the fitting was still in place and working well, with no leaking and no degradation of the plastic material. Gunjan Gautam, a local WASH coordinator, often sends engineers into remote areas for month-long visits to install and repair water infrastructure, where it is difficult to check on status later on. He is now keen for Field Ready to go along on a trip to evaluate the potential of 3D printing on site.

Opportunities and challenges for local manufacturing of humanitarian supplies

There are still both human and technical challenges to overcome if 3DP and related technologies are to be more widely used in our sector. Issues such as interoperability between brands and types of 3DP equipment and consumables, and the ease of field work with them (including resistance to dust, intermittent internet connections and ease of repair) must be considered.

Aid workers have little awareness of local manufacturing for humanitarian purposes, and there are few resources for them to tap into. There is no handbook or manual, and no catalogue of 3D printable parts to provide inspiring ideas. There are similar learning needs in affected communities, who may also benefit from an entrepreneurial design mindset (for instance, the ability to recognise whether and how a problem could be solved). We are creating a system of training, and are seeking to partner with organisations that can help with the creation and delivery of training materials. By working with international NGOs and other relief organisations, undertaking projects to validate the technology and remove obstacles to adoption and sharing our work through their networks, we can help aid workers see how 3DP could fit with and assist their work.

Some tasks, such as modifying 3D designs, require a high level of expertise and a significant amount of training. For these, Field Ready is supporting a global online community of volunteer experts called 'Humanitarian Makers',[2] who can assist remotely with challenging design and testing activities. We have carried out a first test of this from Kathmandu, and received interesting and useful responses online.

Our multi-disciplinary approach involves methods, both humanitarian and technical expertise, human-centered design and capacity-building. This allows new types of problem-solving and reworks the logistical supply chain, enabling the provision of surge capacity, specialised products and on-site production in extremely remote places immediately after a disaster, when normal supply chains have not been established.

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2 See http://humanitarianmakers.net.

The life and death of an innovation lab: a personal reflection

Paul Currion

At the end of 2015 I stepped down from the Grants Advisory Panel of the Humanitarian Innovation Fund. The Panel needed fresh eyes: after four years and nine rounds of grant applications, a sense of déjà vu had started to settle upon me. One of the last things the HIF asked me to do was to participate in a one-day Humanitarian Innovation conference in June 2015. I was asked to talk about my own experiences in innovation – and it was at that point that I realised that I'd never really talked about those experiences.

I'm not sure that I'm an innovator myself, but I was good at recognising and managing innovation. I was originally invited to join the HIF partly because of my association with projects that were seen as innovative. I began with the Humanitarian Information Centres (HICs) run by the UN Office for the Coordination of Humanitarian Affairs (OCHA), which I was involved with from about 1999–2004. Prior to 1999, a couple of key managers – particularly Randolph Kent and his team in Rwanda – had paved the way for the idea, but it was in Kosovo that the HIC really flourished.

I was Liaison Officer for the International NGO Council of Kosovo, and the NGO community immediately saw the potential of the HIC concept. Basing my position in the HIC, rather than in one of the NGO member offices, meant I would have better access to UN information and, in return for hosting me, the HIC would have better access to the NGO community. I started working at the HIC shortly after it opened, and six months later I was the manager, working with a tremendous team to deliver real value.

The first innovation of the HIC was to act as an independent service provider for the entire humanitarian community, funded and staffed on an inter-agency basis, providing access to technology (particularly Geographic Information Systems, or GIS) that individual agencies could not afford. Today there are a growing number of what Lars Peter Nissen of ACAPS has labelled H2H (or Humanitarian-to-Humanitarian) service providers – but the HIC was a pioneer in this category.

The second innovation was to provide a citizens' advice function: anybody could walk in, ask for help and be directed to the best provider, civilian or military, UN or NGO, national or international. Unfortunately this was also the first feature that was done away with when the HIC was replicated in less secure locations. This demonstrated how critical it was to tailor HICs to the operational environment.[1]

I went on to work in HICs in Afghanistan, Iraq and Liberia,[2] but with each project it felt as if they were getting less traction in the humanitarian community, despite the best efforts of the staff working in them. This was partly due to OCHA's lack of understanding of how to capitalise on the concept: at that stage OCHA had not yet recognised the value of information management, although it has since made great progress with projects such as the Humanitarian Data Exchange. The HICs were promoted by two secondees from the Food and Agriculture Organisation (FAO) and the World Food Programme (WFP), Paolo Recalde and Giorgio Sartori, and once those two returned to their home agencies, the insurgent mentality that had kept up the momentum disappeared. The concept thus began a slow death, which only ended around 2006, and for which I previously held OCHA responsible.

I now think I was wrong about OCHA's role because the decline wasn't just a management issue. The HICs existed in a space that is hard to recall now: built on the technology that emerged during the first wave of the information revolution, but before the second wave of that revolution saw social media begin its domination of the web.

In this context there were diminishing returns on the concept of the HIC as a focal point for new technologies, given how many of those technologies were becoming widely accessible. The technology landscape changed around us: mobile phones, social media (such as Facebook), online mapping (such as Google Maps) and other technologies (such as Skype) quickly became mainstream. This trend was likely the underlying reason for the eventual demise of the HICs, but that wasn't visible to us at the time, and it certainly wasn't within OCHA's control.

We now know that this is a basic rule of innovation: your business model will eventually be disrupted by smaller, more agile innovators. Back then, of course, I had no idea about any of this: the idea of innovation didn't really land in the humanitarian sector until 2009, when ALNAP published a chapter on 'Innovations in international humanitarian action' in its 8th Review of Humanitarian Action. It's only with hindsight that we can recognise the HICs for what they really were: innovation labs, before innovation labs were cool.

Now everybody wants an innovation lab. Labs clearly have a role to play in the emerging innovation ecosystem, but they have started to become the default solution for promoting innovation – and that might be a problem for the entire sector. Labs create a 'safe space' for experimentation, but that safe space is often seen

1 I wrote about the HIC previously in *Humanitarian Exchange* 18: 'Learning from Kosovo: the Humanitarian Community Information Centre, Year One'.

2 *Humanitarian Exchange*, 33: 'A Little Learning Is a Dangerous Thing: Five Years of Information Management'.

as separate from the rest of the organisation, which in turn can provide those organisations with an excuse for avoiding the much more difficult task of changing their wider organisational culture.

At the time, however, this was the third HIC innovation: creating a field-based 'skunkworks' – a small, loosely structured and project-focused team with a mandate to experiment in developing ICT services, particularly spatial technologies such as GIS, remote sensing and handheld GPS. On top of that, we offered these technologies as services and products that could recover at least some of their costs (even if payment was only through the exchange of data) – the origins of the H2H category mentioned earlier in this article.

This style of service delivery was difficult because our customers – UN agencies, NGOs, government departments – found it hard to articulate their needs clearly. Part of our role was therefore helping them to identify exactly what information they were missing, and it was at this point that I realised that decision-making in the humanitarian sector was barely connected to evidence. This remains a worrying problem, but it also made it possible for a Lab to provide a launching pad for new ideas, or at least a vehicle for extending existing ideas.

Kosovo's first road atlas, multivariate vulnerability analysis in Afghanistan, infrastructure mapping with private companies in Liberia, a series of joint needs assessments in various countries – all of these were possible because of the Lab approach. Not every idea worked: we tried crowdsourcing in Liberia, liaising with US universities to clean datasets, but it didn't work out. In 2003 the necessary technology wasn't in place and the wider culture wasn't ready for the idea, providing yet another lesson: timing is critical.

One of the most interesting aspects of the HIC was that most of the time, most of our users didn't even notice how innovative these approaches were. This was partly because it wasn't branded as innovation, so we were able to enter organisational structures without attracting much attention, and create an enabling environment for smart and dynamic people to try new approaches. Obviously this wasn't as easy as it sounds, but the experience suggested the following tactics:

1. Create a flatter hierarchy – although there are limits in countries where this working style is unfamiliar.
2. Establish flexible working conditions – let people work in their own time, as long as they deliver.
3. Develop a culture that combines saying 'yes' to new ideas (encourage) with a culture of saying 'but' (critique).
4. Give staff (especially national staff) as much responsibility as possible – put them front of house in presentations and meetings.
5. Protect the project from senior management so that staff feel they have permission to try new ideas.

If those are the tactics, then what's the strategy? I walked away from the HICs having learned three main lessons. First, baby steps are important in a conservative environment like the humanitarian sector. Any large institution, even in the private sector, gives you one shot to make a big change – and if you get it wrong then you have to wait a couple of years before you get another chance. Large institutions have well-developed immune systems, and once they've tagged you as an infection, all the defences go up.

Second, the success of the HICs was due to the teams, not the individuals. Creative individuals are important, but they are rarely able to achieve much if they don't have the support of a team. The early success of the HICs was definitely not due to me as some kind of heroic manager: if anything I may have been a liability to their long-term success, having burnt a lot of political kindling in order to make sure the HICs that I worked in were successful. Next time around, I hope I would be smarter about the diplomacy of innovation.

I had too much faith that OCHA would grasp the concept at an institutional level, and take it forward in the same spirit as staff on the ground. This misalignment of priorities arose partly because of the multi-stakeholder nature of the HICs, but also because the goals were never clearly articulated (or at least never clearly understood) at senior management level. This worked to our advantage at the start, since it gave us room to manoeuvre, but as time went on it became a disadvantage, since it made us prone to takeover if one of the stakeholders decided to force a change of direction.

This was first and foremost a systems question: service providers such as the HIC are more common now than they were 15 years ago, but they are still new enough that stakeholders do not recognise their potential. They act as critical hubs within the humanitarian system, but in order to understand the strengths and weaknesses of such hubs we need to use systems thinking – a discipline that barely exists in the humanitarian sector. After a lot of reading, my third lesson was a rule of thumb: creating meaningful change in a system takes a minimum of ten years.

Sadly, the humanitarian sector encourages short-termism, both in terms of planning and people, which makes system change a dispiriting activity requiring a level of stamina that not many people possess. I only lasted seven years, and then watched as others carried the torch on, feeling that I had somehow failed. Yet while the HICs are not much remembered now, they were an essential foundation for much of the progress in information management that the humanitarian community has made in the last ten years. Perhaps there's a fourth and final lesson: while we may sometimes feel that we have failed to make an impact, we need to take the long view in order to assess whether our contributions – our innovations – have helped to make the humanitarian sector better.

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