Using Technology in Fragile, Conflict, and Violence (FCV) Situations

Five key questions to be answered

Many technologies are now widely used by humanitarian and development partners to collect data, improve planning and project implementation, and strengthen monitoring and evaluation in fragile and conflict-affected contexts—and many other technologies are in the pipeline. Within the World Bank, there is growing interest to incorporate technology more strongly into FCV projects; at the same time, there is also a recognition that technology is not a "one size fits all" solution, and some technologies may be more appropriate for certain contexts than others. This note offers some basic guidance to Task Team Leaders (TTLs) on how to approach this "new frontier" when considering the use of technology in FCV health projects.

Q1 WHAT challenges can technology help address in FCV settings?

Challenge	How technology can help
Planning and data collection	▪ Many remote technologies such as satellite imagery, social media, and radiofrequency identification (RFID) do not require strong ground presence for data collection ▪ Geospatial information systems (GIS) can help manage and collate field data to identify needs, detect emerging trends, and help with efficient resource allocation ▪ Social media, SMS text messaging, and mobile apps can identify user needs when traditional surveys are not feasible
Need for flexibility and adaptation	▪ SMS or tablet-based surveys can be quicker to deploy and analyze, with field data rapidly uploaded to the cloud ▪ Satellite imagery and social media can provide near real-time updates on changing conditions; social media posts are often geocoded, providing valuable localizing detail as well
Implementation and service delivery	▪ SMS, mobile, and web-based platforms can connect patients with emergency services, improve supply chain management, deliver education messages, and monitor adherence to medications ▪ Telemedicine, virtual counseling, and e-learning can provide services to otherwise inaccessible or difficult to reach populations ▪ E-learning tools can provide valuable guidance and advice to clinicians and facility mangers ▪ Drones, mobile medical equipment, and cheap 3D printers can improve the delivery and availability of aid and basic supplies in remote or hard-to-reach areas
Oversight, monitoring, and transparency	▪ Many technologies, such as GPS tracking, RFID, and geospatial mapping, can track the delivery of inputs and ensure that services (and providers) are reaching their intended populations ▪ Social media can serve as a powerful grievance redress mechanism, giving recipients (and populations at large) a platform for voicing needs and dissatisfaction ▪ Mobile or digital payments to health workers can help ensure that salaries or bonuses reach the intended recipient and are not being diverted by intermediaries

Source: UN News

Q2 WHAT basic enabling factors should be assessed for technologies in FCV settings?

Capacity of existing infrastructure: Many technologies require stable electricity, mobile, or wireless networks. TTLs should carefully assess the scope, capacity, and reliability of in-country networks before proposing technologies that depend upon such infrastructure.

Technology saturation and use: Contrary to some beliefs, cellphone ownership and social media use are often quite high among populations in FCV settings, particularly refugees and forcibly displaced persons. This is not universally true, though, and cellphone/social media use may lag among certain age groups, income quintiles, etc.

Regulatory and legal frameworks: Some countries have policies and regulations restricting the use of certain technologies. During the Ebola crisis, for example, electronic payments to health workers were allowed in Sierra Leone, but for legal reasons not as easily replicated in neighboring Ebola-affected countries.

Local capacity: Some technologies require greater maintenance, field testing, trouble-shooting, etc. upon deployment, and necessary local capacity should be ensured to safeguard against delays.

Appropriateness for task: The choice of technology must be tailored to the problem at hand. Although satellite imagery, for example, is good at identifying airstrike damage and new refugee camps, it may fail to detect street-level damage or displaced populations living in buildings in urban areas, etc.

Q3 WHAT risks and limitations should be considered with these technologies?

BOX 1.1 Risk Considerations when Selecting Technologies in FCV projects

- ✓ **Bias.** Technologies can make data collection faster and easier, but they can also introduce bias. If cellphone ownership is concentrated in certain areas or among certain demographics, SMS-based surveys will disproportionately capture those groups and may not be appropriately representative of populations in need.
- ✓ **Verification**. Data collected using remote technologies often needs to be verified through other modalities to ensure accuracy and reliability. This process often involves some degree of "triangulation" with other sources.
- ✓ **Safety.** While remote technologies can make data collection safer, some technologies may expose in-country teams to elevated risks. Because tablets can be resold for a profit, for example, using them may make survey teams targets for theft or attack. Armed groups have also been documented as harassing enumerators using tablet-based technology.
- ✓ **Privacy.** For technologies relying upon GPS data (cellphones, sensors, etc.) to track locations or population movement, care should be taken to ensure that all data is de-identified and no personal information is collected without consent. Authorities in many Arab spring countries have used social media posts to identify and target outspoken critics.
- ✓ **Perception.** Depending upon the context, the use of certain technologies, such as satellite imagery or GPS tracking, can be perceived as "spying" by populations or authorities, and care should be taken to explain these modalities in advance to local partners and ensure local acceptance.
- ✓ **Sustainability.** Studies of mobile health pilot interventions have shown that many are often either discontinued or lack feasible plans for scale-up. Particularly for service delivery projects that may incorporate technological solutions, TTLs should consider barriers to scale-up and sustainability.
- ✓ **Cost.** Cost of technology deployment can vary widely. The cost of satellite imagery, for example, depends upon the size of land area or resolution to be analyzed. Many mobile platforms are free, but programmers and surveyors are not.

Q4 HOW have technologies been used in World Bank FCV health projects?

Technology	Potential Uses in FCV Settings	Example WB Project/Country	Details
SMS text messaging	• Early warning alerts • Health promotion and education messages • Population surveys • Beneficiary feedback • Third-party monitoring data collection	**Yemen Emergency Health and Nutrition Project (P163741)**	• WB partner UNICEF is using mobile platform RapidPro to send SMS text messages to health workers and facility managers to collect monitoring data on project implementation
Mobile apps	• Data collection/surveys • Medication compliance • Diagnostic assistance • Supply chain management	**Pulse of South Sudan**	• WB-sponsored livelihood surveys are capturing data via hand-held devices, allowing uploads to real-time dashboards, including questions on access to hospitals
Web-based platforms	• Decentralized e-health records/HMIS • Supply chain management • E-learning tools and digital counseling	**Democratic Republic of Congo: Health Systems Strengthening Project (P145965)**	• Partnership among donors and Ministry of Health to roll out a decentralized HMIS based on the DHIS-2 platform, with key data on inventory and consumption
Electronic payment systems	• E-vouchers for health worker payments • E-vouchers for health services (refugees) • Cash-based aid for displaced populations	**Sierra Leone: Ebola Emergency Response Project (P152359)**	• Provided hazard pay to health workers in Sierra Leone through national e-payment system
Satellite imagery and remote sensing	• Tracking/quantifying population movement (IDPs, refugees) • Assessing health infrastructure damages, functionality, and accessibility	**Syria Economic and Social Impact Analysis (ESIA) (2017)** **Somalia Drought Impact Needs Assessment (DINA) (2018)**	• In Syria, the Bank used high-resolution satellite imagery to document infrastructure damage in hospitals in 10 cities (including Aleppo) • In Somalia, the Bank and partners used satellite imagery to estimate IDP populations and settlements in major urban areas, as well as access to health facilities
Social media	• Crowdsourcing data collection on local health needs, infrastructure damage • Outbreak prediction • Grievance redress • Information “hubs”	**Iraq Damage and Needs Assessment (2018)**	• Social media analytics performed on more than 2 million posts from Mosul, including 40,000 commenting on hospitals
GPS tracking and Geospatial Information Systems (GIS)	• Tracking mobile teams and health workers • Data collation, analysis, and visualization • Transparency of funding flows	**Nigeria: Polio Eradication Support Project (P130865)**	• Used GPS tracking to monitor locations of vaccinator teams and ensure compliance

Q5 WHAT "disruptive technologies" are on the horizon?

Several technologies are being touted as potential "game-changers" for healthcare delivery. These include advances in data sharing, utilization, and verification—such as blockchain, big data, ground sensors, and artificial intelligence—as well as platforms and tools for healthcare delivery, such as drones, biosensors, and new mobile apps. Many remain experimental or aspirational in FCV contexts, but some are already being used in the field.

- **Blockchain:** Blockchain is a decentralized record-keeping technology that can improve transparency in financial agreements and help reduce corruption. UNICEF's innovation fund is supporting grants to start-up companies exploring blockchain technology for improving contracts and resource delivery in FCV settings. In 2017, the Bank launched a Blockchain Lab, and some have suggested that blockchain could help improve supply chain management for vaccines. The technology remains largely investigational in FCV health applications.
- **Artificial Intelligence (AI):** Efforts to combine artificial intelligence and mobile technology in healthcare are growing. In 2017, the UN held its first-ever "AI for Global GOOD Summit," spotlighting AI-based mobile programs to assist with medical diagnoses and ensure medication compliance. Such efforts must be considered within their context, as the former WHO Director-General noted: "What good does it do to get an early diagnosis…if a country offers no opportunity for treatment, has no specialists or specialized facilities and equipment, or if the price of medicines is unaffordable?"
- **Big Data:** The World Bank defines big data as "datasets that are so large and complex that they cannot be processed by everyday database management tools." Real-world examples includes GDELT, which catalogues news stories daily from around the globe and allows users to track insecurity, social unrest, and other trends in FCV countries, and the UN 's Global Pulse project, which mines social media to track crisis-related stress.
- **Ground Sensors:** Sensors that detect foot traffic and population movements may allow for more prospective data collection. One possibility: monitoring real-time utilization in hospital settings. These include thermal, infrared, pressure-based, and other technologies.

Source: Johns Hopkins University School of Medicine

- **Drones and ANTs:** Automated drones (unmanned aircraft systems) can map displaced populations, provide real-time visuals on infrastructure damage, and deliver medicines and supplies. The World Bank has used drones to model flooding risks in Tanzania and post-cyclone damages in Vanatua in 2015. Zipline launched the world's first national-scale drone-based blood delivery system in Rwanda in 2016. UN agencies have tested drones for mapping, planning, and delivery in DRC, CAR, and Malawi. The UN has also deployed unmanned vehicles called Aid Necessities Transporters (ANTs) to deliver supplies over rough or insecure terrain.
- **3D printers and portable medical equipment**: Some 3D printers now cost less than $1,000 and have been used in refugee settings to rapidly produce basic supplies. Examples of FCV-relevant medical technologies are also becoming more common, including mini-X-ray machines and solar-powered drug refrigerators used by WHO.
- **Geo-enabling:** Geo-enabling can provide near real-time monitoring and supervision of projects and interventions through the of collection and analysis of geo-tagged field data. Using handheld ICT tools (i.e. smartphones or tablets), geo-enabled data can automatically be uploaded and integrated into to a central server where the information can be connected to the monitoring and evaluation framework or used to effectively plan and develop projects.
- **Uber-style apps:** Uber-style apps are being used to connect ambulances to patients in need. The Flare app is one example currently being used in Kenya and Rwanda. The app allows first responders to see patient locations in order choose the appropriate vehicles and staff before responding. The GoodSAM app takes this concept a step further, not only dispatching first responders, but by allowing remote triage through cell phone cameras, as well as dispatching automated external defibrillators (AEDs) via drone when emergencies arise.

BOX 1.2 Selected Resources for Further Reading:

- World Health Organization. 2011. Mhealth: New Horizons for Health Through Mobile Technologies: Second Global Survey on E-health. Available: www.who.int/goe/publications/goe_mhealth_web.pdf
- World Bank. 2011. Mobile Applications for the Health Sector. Available at: http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/mHealth_report.pdf
- World Bank. 2015. Measuring and Monitoring in FCV Environments: Using New Methods and Technologies (Module VI). Available at: http://fcvindicators.worldbank.org/sites/fcv/files/FCV_Toolkit_mod6_UsingNewMethodsTechnology.pdf
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- Drones in Humanitarian Action: A Guide to the Use of Airbone Systems in Humanitarian Crises. Available: http://drones.fsd.ch/wp-content/uploads/2016/11/Drones-in-Humanitarian-Action.pdf
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- Lyseen, A. et al. A review and Framework for Categorizing Current Research and Development in Health-related Geographical Information Systems (GIS) Studies. Yearbook Med Inform 2014: 110-24. doi: 10.15265/IY-2014-0008.
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- Barcock, A. 2015. Solutions That Are Saving Lives in Humanitarian Response. Aid and International Development Forum, Available at: http://www.aidforum.org/disaster-relief/top-solutions-that-are-saving-lives-in-humanitarian-response.

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