FROM THE FIELD: MOBILE TECHNOLOGIES FOR MINE ACTION

by Torsten Vikström [Spinator AB]

T-IMS with Bluetooth connected GPS and binocular rangefinder.
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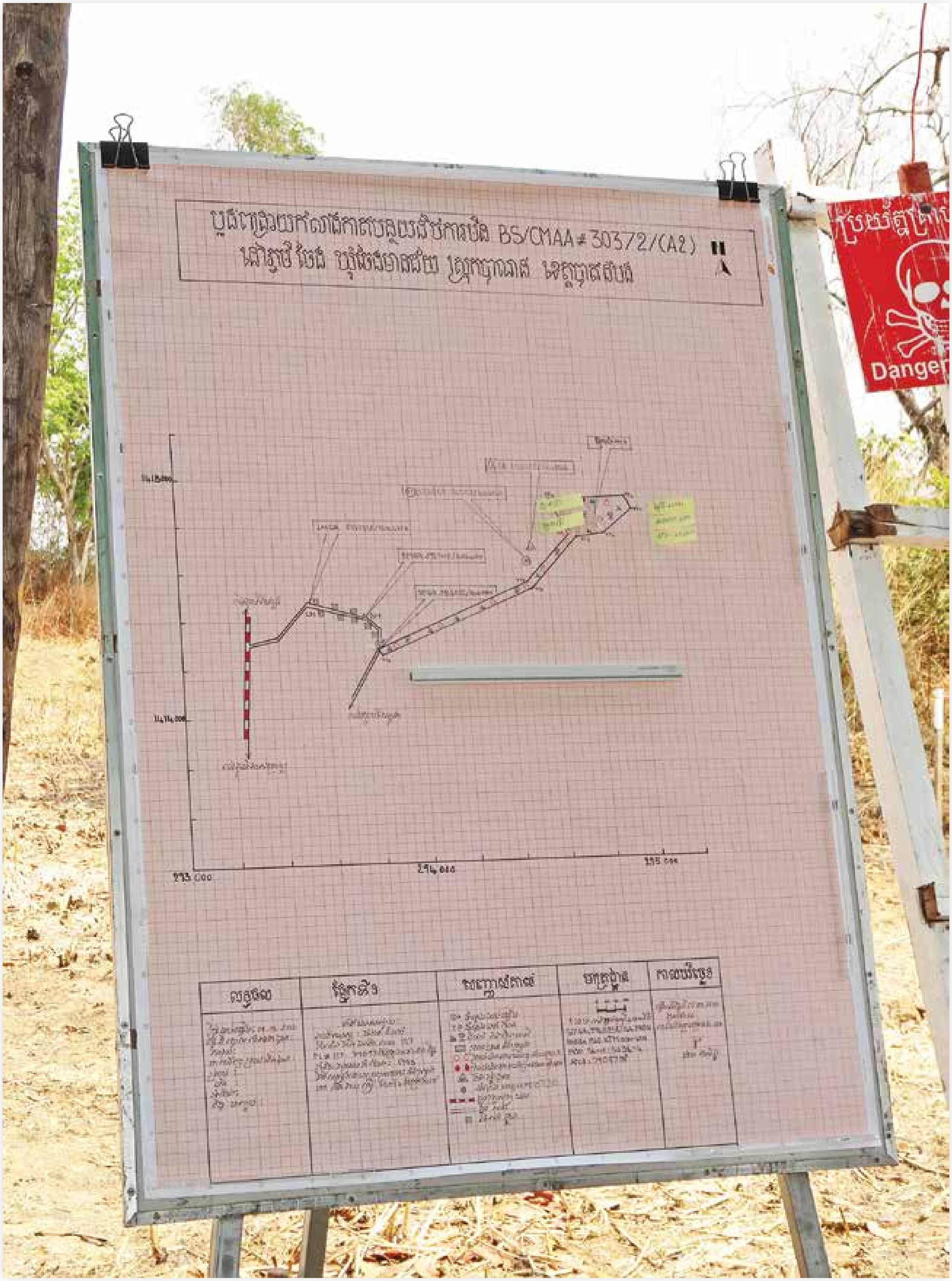
Breakthroughs in technology development transformed desktop computers into small, powerful mobile units equipped with intelligent software and extensive possibilities to connect and interact. Alternatively, the world of mine action still depends on manual work done with pen and paper, and the process of field data collection is especially exposed. However, field tests show that the use of mobile technology vastly improves safety and increases the effectiveness of field work. Adapting to new mobile technologies for field data collection will also positively affect the ways in which we gather, share, analyze, monitor and evaluate information.

TIRAMISU

Through the TIRAMISU project, the European Union assumed the task of boosting clearance efforts in countries plagued by war and conflict.[1] This project, which received funding from the European Union's Seventh Framework Programme (FP7) for research, technology development and demonstration under grant agreement n° 284747, has engaged 26 partners from 12 countries.

The objective of the TIRAMISU project is to provide the mine action community with a toolbox to assist in addressing the many issues related to humanitarian demining, thus promoting peace, national and regional security, conflict prevention, social and economic rehabilitation and post-conflict reconstruction.

One outcome of this project is the TIRAMISU Information Management System (T-IMS), a mobile field data collection tool for humanitarian demining. T-IMS is a software application for deminers and surveyors in the field. GIS centric, the app is built for touch technology and functions without the need for a keyboard or mouse.[2,3] Emphasis was placed on the "ease-of-use" aspect, which means system data and



A hand-drawn map containing critical information. Is this the best we can do?

Briefing in the tent at the benchmark of minefield #06926 by a CMAC team leader before entering the minefield.

information from the field can easily be captured. This includes the ability to mark suspected and confirmed hazardous areas (SHA/CHA); map sketches; identify and locate landmines, unexploded ordnance (UXO) and other findings; take geo-referenced photos, videos and interviews with voice recordings; use GPS tracking and more. The system supports non-technical survey (NTS), technical survey (TS), mine/UXO clearance, quality assurance (QA), quality control (QC), and structured reporting and analyses. It does not require an internet connection and is fully functional offline. Furthermore, T-IMS optionally contains the Collaborative ORDnance Data Repository (CORD), designed and developed by Ripple Design and Mindlark, and hosted and managed by the Center for International Stabilization and Recovery (CISR) at James Madison University (JMU).[4] CORD provides access to approximately 5,000 ordnance objects offline.

As incorporating standards are of great importance, the system is compliant with the Mine Action Extensible Markup Language (maXML), a data specification integration standard, which can exchange information with the Information Management System for Mine Action (IMSMA), developed by the Geneva International Centre for Humanitarian Demining (GICHD).[5] The system also uses standardized map symbology for mine action to avoid the misinterpretation of sensitive information.[6]

Operational Validation in Croatia

In 2015, T-IMS was validated by the Croatian Mine Action Centre (CROMAC), whose team was authorized to validate TIRAMISU tools.[7] During validation, T-IMS was tested for several months in field survey operations by CROMAC deminers and surveyors. CROMAC survey experts provided the basis for the validation procedure. CROMAC's validation team concluded that T-IMS

- Enables precise collection of geospatial data in the field and can store the collected data in the information management system (IMS).
- Improves the general survey processes and SHA analyses by allowing information collected in the field to be directly transferred into the IMS. This reduces the time needed to update the IMS and expedites decision making and prioritization processes.
- Improves the safety of field activities by recording surveyor and geospatial positioning.

Cambodia Field Experience: Battambang Province

With a long history of war and conflict, Cambodia is still one of the most contaminated countries in the world. In northwestern Cambodia, the Battambang province has had more landmine casualties than any other province in the country. Between 2005 and 2007, a total of 2,588 accidents

Ordnance objects identified with CORD in the T-IMS ordnance module.

were reported in the Battambang province.[8] Ten years later, landmines still cause injury and death.

In March 2016, the author visited Cambodia with GICHD to field test T-IMS. Conducted together with the Cambodian Mine Action and Victim Assistance Authority (CMAA), the evaluation took place in three different minefields in the Banan district of Battambang province, where the Cambodian Mine Action Centre (CMAC) was conducting clearance operations. The system was used for NTS, TS, QA and QC activities on these operational sites.

For the field tests, the team loaded overview maps of the area from OpenStreetMap into the map module and equipped the system with the ordnance database CORD for offline use.[9] Small, Bluetooth-compatible handheld GPS devices were also included to show the current position of the user in the map module.

During NTS and TS, the team documented all three minefields directly into the system. SHAs and CHAs were plotted directly into the map module. The turning points (i.e., fixed points on the ground that indicate a change in direction of the perimeter) of these areas had longitudinal and latitudinal values previously recorded by CMAC and were thus entered into T-IMS to create SHAs and CHAs.[6] The team drew boundaries and safe points, documented and positioned benchmarks in the T-IMS map module (i.e., reference points that indicate hazards or hazardous areas outside the SHA or CHA), and identified landmines via CORD (e.g., PMN-2, POMZ-2 and Type 72).[6] Geo-referenced photos and videos were recorded, and GPS tracking was enabled to capture the team's (safe) route through the minefields. The system documented clearance priorities and the progress of the survey and clearance activities to create a snapshot of the current situation as of area cancelled, area cleared, and area reduced following the process of land release.

The system also documented QA/QC activities on the largest minefield (457,000 square meters or 546,567 square yards). During QA/QC activities, the team used the NTS and TS tools as well as the quality management tools with standardized QA/QC input forms to make additional voice recordings, take videos and photos, interact with the map, perform GPS tracking and use the ordnance module CORD to strengthen the QA/QC reports. Documentation of the three minefields occured directly in the field without any modifications or additional office work. Each report took an estimated 15 to 30 minutes to complete.

The surveyors, clearance personnel, QA/QC and management staff of both CMAA and CMAC appreciated the simplicity of T-IMS in both usage and information collection; the GPS connectivity, which displayed actual positions in the field and simultaneously used GPS to add and draw points, lines, and polygons; and the access to an offline ordnance database, which gives instant access to approximately 5,000 ordnance objects such as landmines and types of UXO.

Offline Ordnance Database

During field activities, having direct and instantaneous access to an offline ordnance database (such as CORD) as a part of a mobile field data collection tool is of great value for surveyors and clearance personnel. Facilitating risk assessment and situation awareness, offline ordnance databases provide improved security for those involved in operational activities. Statistics and geographical information on mines and UXO

Inspection of an area cleared by a machine as part of the QA activity.

from past clearance operations can improve decision making for clearance personnel planning in nearby regions.

Conclusion

In addition to being easy to use, GIS-based mobile tools must also support the global processes of humanitarian mine action by allowing data to be collected, stored and reported in a standardized manner. Once information is automatically processed from surveyors' or deminers' work in the field—including recorded interviews, geo-referenced photos, drawings of CHAs, plotted GPS tracks—and inserted into the information management system (e.g., IMSMA), where it is collected for further processing, aggregation, analyses and sharing, only then will we see the true benefits of mobile technology in the field.

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