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Information Systems for Mine Action from the Data Entry Point of View

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This article aims to provide readers with a closer insight into the endeavors of creating an information system and problems related with keeping data consistent and up to date, especially from the point of data entry. The author strives to provide honest and direct insight into the problems and solutions found while supporting mine action activities in Bosnia and Herzegovina.

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Chronology

Mine action in Bosnia and Herzegovina started in March 1996. The basis was the obligation of former warring factions to submit all minefield reports and clear all of the minefields within their area of responsibility. Wanting to sort out the mine problem and being aware of a lack of expertise and technical resources, the government of Bosnia and Herzegovina issued an appeal to the international community in January 1996 to provide help and kick-start the program.

As a result, the first set of equipment and the first team of foreign experts came to Bosnia in March 1996, and their first task was to set up a database capable of dealing with the mine problem in Bosnia and Herzegovina. The initial database system was developed by the FGM Company, and it was up and running as of July 1996. The first set of data was given to the United Nations Mine Action Center (UNMAC) by the Implementation Forces for the Dayton peace agreement (IFOR). At that time, humanitarian standards were not created and a favored approach was mine lifting.

After July 1998, all the assets were submitted to the Bosnia and Herzegovina authorities. From the database point of view, that meant that data entry was to be decentralized to the Entity mine action centers (MACs), and more than that, Entity MACs were responsible for reporting to their governments and the donor countries. The UNMAC had a centralized structure that lasted until July 1998. From that time until February 2001, we had a tripartite structure composed of the MAC for the Federation of Bosnia and Herzegovina, the MAC of Republika Srpska, and the Bosnia and Herzegovina MAC (BHMAC) at the state level, which has the task of coordinating activities between Entity MACs and maintaining central activities like standards, accreditation and databases.

Time proved that there was a need to centralize some functions. As a first step, it was necessary to create some sort of "umbrella" for MACs to work under. As a reaction to that need, the Ministry of Civil Affairs and Communications was chosen in September 2000 to channel activities on behalf of the Bosnia and Herzegovina government. The Board of Donors provided the necessary influence of the international community. A new Demining Commission was appointed as a part of the Ministry of Civil Affairs and Communications.

Knowledge gained by that time also proved that an entirely new structure was needed. Part of these thoughts are included in the Bosnia and Herzegovina demining law. As a result, the following has happened:

- February 2002: Demining law for Bosnia and Herzegovina put in power
- March 2002: 10-year strategic plan presented
- April 2002: Decision made to establish the BHMAC as a state body institution
- July 2002: Council of Ministers appointed new director

Back to the Subject

Having an information "system" in place was actually just the tip of the iceberg. The real challenge was to populate the database with meaningful information.

Mine action systems are not data-entry intensive at the late stage of the project. On the contrary, data entry is the only meaningful activity that can be done at the early stages of the project, and this is the data-entry intensive phase.

The Bosnia and Herzegovina information system started with 16,600 minefield reports including some 300 tasks and 300 mine incidents entered by IFOR. Today's system has 18,300 minefield reports, 2,000 incidents and more than 3,000 tasks. In fact, after the creation of database systems, the author tends to declare it as "perfect" (or slightly better), but the first data entry usually provides the first disappointments.

The fact that is mostly forgotten while a database is being created is that the data entry personnel are the first customers to please. The entire quality of the information system depends on the initial entry of data. An additional problem is either a shortage of information sources or too many of them. The best example for this is the point where one has to choose which coordinate system, ellipsoid or map background to use. My opinion is that there is no common solution for this; it is impossible to compare mapping needs for a country as big as Afghanistan versus Bosnia and Herzegovina or one even smaller.

Once the database system is in place and running, the next task is to link the MAC with the local government. Although it may sound easy, it is not. Most of the data that are necessary for daily activities are also matters of daily politics, so it is not very often that one finds somebody to talk and exchange information with. Based on our experience, it was very easy to organize meetings, less easy to sign some sort of Memorandum of Understanding and even less easy to exchange information. In recent days, the situation has changed, but not significantly.

Because of the fact that wrong entries made at the initial phase very rarely get rectified, it is never enough to emphasize the importance of the initial data entry, since it sets up ground for further mistakes. Reasons may vary—understaffing, increased amount of work or sometimes pure laziness.

If Possible, the Mistake Will be Made

The most common mistakes in my experience are figures mismatched while entering coordinates, like entering BP 345345 instead of BP 345354. The error is harder to find as we go right (toward smaller units). The only possibility to avoid this is some sort of automated data entry for coordinates, which has become possible only recently by the provision of the differential Global Positioning System (GPS) for field work. Additional problems could be described as:

- Using any comment field for all of those things that should have been entered elsewhere
- Tampering with tables without sufficient knowledge on data structure by applying the "I-will-create-a-report-by-myself" approach
- Deleting records

One possible way of rectifying the mistakes after entry is to conduct significant field activity, with very little impact to final data quality. For instance, in the territory of the Federation of Bosnia and Herzegovina, a "Systematic Survey" took place. The idea was to talk with all municipal authorities and to make them express their concerns on mine contamination, and to gather information on confrontation lines and possible risk areas together with some sort of prioritization for these areas. After one year of activities, the final result had less then 10 percent of new data, and yet we were not in a position to put all dots representing minefield reports in the proper places.

Basics of the System

While creating an information system for mine action, some decisions need to be made about the database engine and the Geographic Information System (GIS) software. For the Bosnia and Herzegovina system, these decisions were made at the very beginning by the FGM Company, giving us MapInfo 4.0 as GIS and Paradox 7.0 as a database engine. Later on, although several other software products were on the market, we decided that this winning team should remain intact, and today we are running our system on Paradox 9.0 and MapInfo 6.5. In order to avoid problems with different geodesy parameters (projection and ellipsoid), we decided to use an interim solution, Lat/Long and WGS 84. We also decided to split data by keeping descriptive data with the database engine and keeping spatial data linked to their descriptions within the GIS part of the information system.

Vector data are being processed by use of an exported .dbf file having vector data input finalized by the use of the drawing tools. This rather odd solution was chosen to give the data entry personnel the ability to check all coordinates once again prior to entering the shape into the database.

Regarding raster data, after several tries with Defense Mapping Agency (DMA)/ National Imagery and Mapping Agency (NIMA) maps, satellite images and a variety of other sources, we came to the conclusion that maps used by warring factions during the conflict are the best possible backdrop for initial minefield data entry and planning, if available. The reason for this is the easy identification of the reference points taken from them at the time of the report creation. Because of their accuracy, cadastral maps are the best for reporting on humanitarian deming activities in our experience.

Raster data in use by the Bosnia and Herzegovina information system for mine action are as follows:

1: 1,000,000	Scanned and registered, satellite images for the scale are available
1: 300,000	Scanned and registered
1: 200,000	Scanned and registered
1: 100,000	Satellite image for region
1: 50,000	Scanned and registered M 709 and S 1002, satellite images available for five regions
1: 25,000	Scanned and 60 percent registered
> 1: 25,000	Available scanned and registered

In order to improve the accuracy of the reporting, GPS is in use (less 20 cm accuracy).

Once You Have It

One way or another, the information system will most likely be the first visible part of any MAC; thus, all the training will be done according to the information system in use. Since we are dealing with mine affected countries, or countries that have just finished a war, it is unlikely that one can be in a situation to hire pre-trained staff. More likely, initial education will be provided to further inform department staff members and later on hopefully propagated through a kind of help desk provided to the rest of the staff. Being the first department up and running, and being attractive because of its results, this becomes the most exposed department and takes significant role in PR activities.

Looking at things from the other perspective, all possible errors that will occur while prioritizing or making periodical reports, any kind of propaganda, or any fundraising materials will be automatically attached to "wrong data provided by the database," making them perfect victims for all other errors.

My experience says that besides laziness of the staff—there is no other term for not entering data that is available—another significant reason is a line of thinking something like this: "When data start talking, people will ask questions. If we don't enter (provide) them, we are on the safe side." Surprisingly enough, it is not only the local side that gets blamed.

The only way to sort out the problem was to create the law that will *force* information flow and get the system running.

Need to Have

So what could be a solution to have an information system and have data entered into it? First, an absolute necessity is to have clear, well-defined procedures providing as much data as possible and, if possible, have it organized in such a way that they can be entered into an information system with a lot of predefined values. In order to emphasize the importance of certain fields, it is advisable to have some fields that must be entered as a condition to proceed.

Another problem is how to keep the entered information. Our experience shows that there are two solutions: either not delete records (just declare them canceled) or have well-formed and carefully programmed routines for record deletion. Over time and with the expansion of activities, it becomes obvious that some sort of traceability has to be implemented, and ideally, there should be a printed journal file (log book for major changes).

A need to have a chance to educate and re-educate staff is more related to program managers, as they often forget the simple fact that one may gain knowledge not only through trial and error, but also by attending seminars. This is not only more cost-effective, but it also creates a sense of importance for the staff and in the long run creates a better environment and more effective employees.

Besides the problems mentioned so far, there are also some points that simply cannot be over looked. When the staff moves, things are forgotten. Being (at least in Bosnia) the first organization in place maintaining a live database, the staff educated during the process become an asset desired by other companies. By rule, salaries reflect funding, and it is difficult to keep quality staff together.

Another problem is purely physical: paper copies are inclined to disappear or get damaged by manipulation. With luck (from the program's point of view), the amount of activities is growing and the paper archive is growing, which means more data to enter. A solution would be to scan all the reports and to use the scanned images as information carriers.

Statements that say that minefield report data lose their importance with time are simply wrong. In the end, they become the only written proof of contamination. A survey report, while an expert's opinion, is still just an opinion on the possible mine risk for certain areas.

Prioritization and the Information System

It is not always easy to find a mathematic algorithm to define priorities. Sometimes even scoring does not help; for instance, the complicated state structure reflects procedures for priority definition. Also, the term "impact" can be understood in many different ways. Speaking of complexity, here is a Bosnia and Herzegovina state structure equation:

1 State + [1Entity+1Entity (10 Cantons) + District] = 14 Governments

Taking into consideration the fact that real executive authority lies in municipalities (more than 120), it becomes obvious why priorities cannot be defined based just on some "points."

Through six years of data collection, we learned that where the mines are and the real impact of them on the population and society is the question. The problem is that priorities have to reflect needs and be part of plans for development as desired by authorities. Otherwise it's simply not working.

Southeastern Europe Approach

In order to have a broader scope and to share experience with neighboring countries, we used an opportunity kindly provided by the European Commission (EC) to start a project on regional data sharing. So far, the beneficiaries of the project are the following countries in southeastern Europe (SEE) region: Slovenia, Croatia, Bosnia and Herzegovina, Serbia and Montenegro, Albania, Macedonia, and Azerbaijan—and this list is likely to expand.

So far, we have sent four exports to the Joint Research Center and information interchange has proven possible. Based on data inconsistency, it becomes obvious that some sort of standardization has to take place. Thus, we agreed on standard hardware and software packages. In order to be able to show data for the region on a single map, we agreed on basics for use of the satellite images, and we have images provided for the region.

Prior to the information interchange, we had a four-day meeting in Sarajevo yielding some information interchange core standards for SEE.[1] Based on experience gained through these activities, exported data sent could be harmonized. Once a standard for information interchange is provided, information can be interchanged. An exporting exercise helped a lot because some of the mistakes became visible. A "house cleaning" was necessary. More than that, countries within the region are helping each other sort out problems. A good illustration of this is the BHMAC's GPS campaign in Albania.

Since all participants provided data without any problems, SEE could be used as an example of equality in diversity. In fact, once the "one-size-does-not-fit-all" philosophy was accepted, it was considerably easy to achieve awareness on information-sharing benefits.

Having seen all aspects of information sharing and cooperation, I think it is time for the Global Information Exchange Standard for mine action. We fully support the Mine Action Extensible Markup Language (maXML) initiative, which becomes more and more accepted as a standard protocol for information interchange. ■

Endnotes

1. Results of the conference can be seen at http://www.bhmac.org/bhmac/info/conferences/conferences_e.htm

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