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A support information system for data management during project implementation: Application in Tanzania

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Water and sanitation (WatSan) programmes are usually implemented over several years and require large amounts of information to be processed, so effective monitoring systems are essential. In this paper we present a support information system (SIS) for monitoring WatSan programmes. A SIS is a database system in which simple interfaces are used to store and process relevant data. Graphical representations are incorporated to facilitate data analysis and provide better real-time responsiveness during the programme implementation phase. The Logical Framework may be used as the starting point to define the tool. Experience has shown that this type of system must be created jointly with professionals working directly on the programme in question. The system was applied to two programmes in Tanzania and found to be suitable for both day-to-day monitoring and long-term analysis. The information collected improved the knowledge of researchers, development planners, and staff working on project implementation.

Introduction

In general terms, monitoring involves collecting, analysing, communicating and using information about the progress of a project (EC, 2004). The main aims of monitoring are to provide project staff with the data to make quick and informed decisions when targets are not met, to provide comprehensive information on all aspects of project implementation, and to generate outputs with which to carry out project evaluations and draw conclusions on the processes used.

Monitoring is carried out continuously by project staff during the implementation of planned activities and is designed to support the decision-making process. In contrast, evaluations are usually carried out once projects have been completed or at specific points (half-way through the programme, or some years later to asses the long-term impact). They focus on the objectives and the strategies chosen, are commonly conducted by external consultants, and are designed to analyse general aspects of the programme.

Evaluations of development programmes are often based on the assumption that the planned activities have been implemented correctly. Consequently, if the desired results are not achieved, it is concluded that the initial assumptions in the project formulation were incorrect. However, experience has shown that poor long-term results are often affected when project methodologies are implemented incorrectly.

In addition, WatSan programmes are usually designed with long-term goals in mind (minimum of three years), so the implementation phase is likely to be affected by staff rotations (i.e. more than one team will be used during the project lifespan). WatSan programmes also generate large amounts of information related to different areas, such as socio-cultural, technical and physical information. If data are not recorded and analysed effectively, staff changes can cause considerable long-term problems.

A SIS was created to monitor different phases of WatSan development projects. The system was designed principally to collect data and display information to improve the project knowledge during the implementation phase. It was developed jointly by researchers of the Universitat Politècnica de Catalunya (UPC) and the Spanish NGO Ingeniería sin Fronteras - Asociación para el Desarrollo, which carries out WatSan programmes in rural districts of Tanzania to provide sustained access to water, proper sanitation and hygiene promotion campaigns. Since 2006, this NGO has been working with the European Commission

(which is the main source of funding) under the ACP-EU Water Facility programme. This programme is supported by substantial funding and has a long implementation phase, so the NGO needs to implement an efficient monitoring system to ensure that the project management is improved continuously.

The SIS was developed for two programmes, one in Same District (Kilimanjaro Region, Tanzania) and the other in Kigoma Rural District (Kigoma Region, Tanzania). In the first case the system was defined during the pilot phase of the programme and designed to be used throughout the implementation of the following phases in conjunction with the European Commission. In the second case, the system was only implemented in phases IV and V. Each of the programmes has a budget of between €0.5 and 1 million per year and is designed to supply water to between 7000 and 10,000 people per year.

The system was created by a part-time technician over a period of eight months, half of which were spent in the field. The monitoring system was defined as follows:

1. Definition of the indicators for results and objectives and the means of verfication.
2. Definition of the time frame for obtaining partial indicators, if deemed necessary due to the programme length.
3. Definition of the implementation methodologies.
4. Definition of the implementation indicators, which provide information on the degree to which the desired results are achieved (not the final indicators).
5. Definition of the process quality indicators (e.g. stakeholder participation, etc.).
6. Definition of the monitoring sheets and questionnaires for collecting the required information.
7. Definition of the procedures for processing and analysing information.

In the following sections we review the definition process, analyse how the system is used, taking into account day-to-day monitoring and long-term assessment (mainly in programme evaluations), and present the conclusions.

SIS definition

Participatory design

As explained above, the first step in designing the SIS is to define the types of data to be monitored. The indicators for results and objectives are already defined as part of the Logical Framework Approach (LFA). Participation of the end-users of the tool, who have extensive knowledge of the project, may help to identify all other aspects that must be covered. The use of the LFA matrix has several benefits. Firstly, the knowledge generated by this approach provides a detailed picture of the programme to be monitored, and secondly, it defines indicators whose evolution could be charted by collecting data continuously.

On the other hand, the best way to define the partial indicators, the time frames in which they should be obtained, the implementation methodologies, the implementation indicators and the quality indicators for the overall process is to work with the professionals who are going to use the tool. The NGO in this case had already worked on similar programmes in Tanzania, so the knowledge possessed by its staff was extremely valuable when these definitions were made.

Once the indicators have been defined, the next step is to determine the way in which the information will be collected by creating the corresponding forms. These will have the same structure as the interface used to enter data into the SIS. This step is carried out jointly with the staff responsible for data collection to guarantee that the information required will be accessible, to define the procedure for collecting it, and to establish the frequency with which it will be collected. Finally, the outputs are defined by the LFA matrix and programme staff, who determine the optimal formats of the indicator analyses and the required input information.

It is important to assume that possible modifications, new ideas on the information that should be monitored, and new potential applications will be identified during the implementation of the system and once a higher level of user confidence is reached. Therefore, there should be awareness that further development will be required shortly after the first information is entered and the first results are displayed.

Structure

The structure of the SIS was determined according to the information required by each member of the team for their specific work and targets. The main areas of the structure are water management, hygiene promotion and sanitation and, lastly, technical aspects. The system incorporates different forms for each area so that data can be entered easily and systematically, and different outputs are available for specific data searches. The information recorded by the system can be used to monitor the objectives, activities and results of the programme. Some of the information is relevant to all areas of the structure, particularly the process quality indicators such as participation or gender. These data are considered within the monitoring of all activities.

Table 1 shows some of the information collected, the outputs generated by the SIS, and the type of parameter monitored (i.e. objective, result or activity). Information collected through surveys (baselines, closelines, censuses or other specific surveys) conducted as part of the programme can also be incorporated into the SIS. This additional information can be used to perform more comprehensive analyses of the programme data and to identify correlations with the information gathered through continuous monitoring.

This information structure provides greater flexibility for defining the software framework, which can be constructed in different modules and is therefore even suitable for non-networked environments. A simple procedure is used to compile all of the data in a single database when necessary. However, it is important to guarantee a certain degree of connectivity between the modules. For the versions of the system used in Tanzania, this was achieved by defining a suitable administrative structure.

Software framework

The software framework is the generic structure required by any monitoring tool like SIS, regardless of the type of programme for which it was designed. The structure of it contains three main components: a database core, a data entry interface and an information analysis interface.

The core consists of the database itself and the macros for operating the SIS, and was developed using Microsoft Access. The database incorporates a partially connected and unconnected data structure due to the non-networked environments used by the NGO. The data entry interface was also developed using Microsoft Access, because it is a user-friendly application and provides comprehensive user help that supports capacity building among staff and end-users. Finally, the analysis interface incorporates applications that are specifically designed to analyse and exploit information stored in the database. Three options are available: (1) generate graphics to chart the evolution of different processes (using Microsoft Excel, which enables staff and end-users to manipulate the data easily for further analysis); (2) extract tables and lists using Microsoft Access; and (3) extract information according to geographical parameters (using the open-source GIS software gvSIG, see Gilabert and Polo, 2008).

Although each of these data analyses can be accessed at different user levels, the graphical and GIS geographical analyses were designed mainly for headquarters staff and provide objectives and results indicators. The tables and lists displayed in Microsoft Access were designed for field staff and contain mainly implementation indicators.

SIS use

The SIS has several tangible benefits. Most importantly, it provides real-time monitoring of current activities while the following ones are being planned. It also facilitates long-term analysis and ex-post analysis of programme performance, which enable managers to improve aspects of activities that will be replicated during the lifespan of the programme and enhance the overall efficiency. All of the data entered into the system can be used not only by the NGO but also by external researchers, which will lead to more in-depth analysis of problems in this field.

Some facts on the day-to-day use of the system can be exposed six months after its launching. Moreover a mid-term evaluation was carried out on one of the programmes and has revealed important information on its usefulness in long-term analysis (although the full functionality had not been used at this point).

Table 1. Main inputs and outputs of the SIS, specifying the type of parameter monitored (objective, result or activity).

Structure	Topic	Input	Output	Monitoring
Hygiene promotion and sanitation	Health	Data from dispensaries	Reduction in morbidity of water-related illnesses	Objective
	Sanitation	Demand for latrines	Latrines in good working condition and sanitation improvements	Objective
		Construction of latrines		
		Baseline/closeline for latrines		
	Hygiene promotion	Baseline/closeline for hygiene habits	Improvement of hygiene habits	Objective
		Attendance of PHAST sessions	Rate of population trained	Activity
		Number of sessions held		
	Chid-to-Child	Number of children in Child-to-Child curricula	Rate of coverage of Child-to-Child training	Result
		Child-to-Child activities in schools	Training of children and improvement at school level	Activity
		School reports on Child-to-Child		
Technical aspects	Water system performance	Water quality analysis	Water system working correctly under Tanzanian standards	Objective
		Incidents in system operation		
		Census		
	Water system construction	Technical aspects of the water supply system	Water system quality	Result
		Work attedance	Participation of villages in the system	Activity
	Operation and maintenance	Checklist for system maintenance	Maintenance carried out correctly	Result
Water management	Performance of water user associations	Legalisation of water user entities	Existence of water user entities	Objective
		Accountancy of water user entities	Functioning cost recovery system	Result
	Performance of water user groups	Registration with water users groups	Acceptance of the programme	Activity
	Water user entity capacity building	Type and content of training	Completion of training curricula	Activity
		Attendance of training activities		
Process quality	Participation and gender	Attendance of meetings by women and vulnerable groups	Equity in decision making	Objective
		Assessment of participation of women and vulnerable groups		

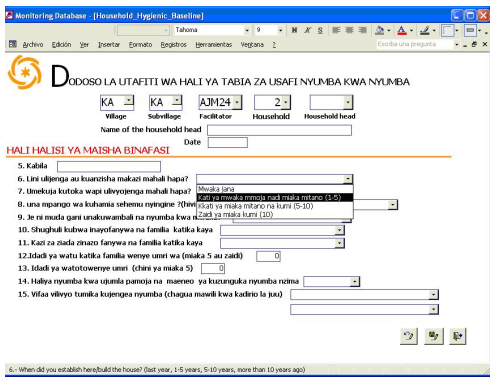

Figure 1. Input data form for baseline

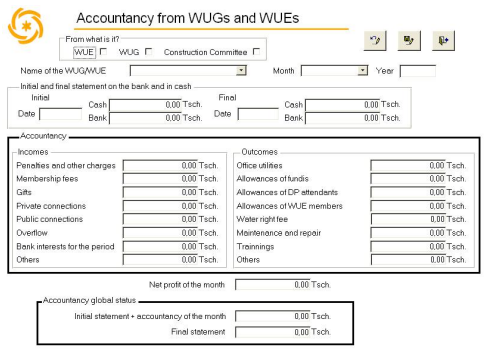

Figure 2. Input data form for accountancy

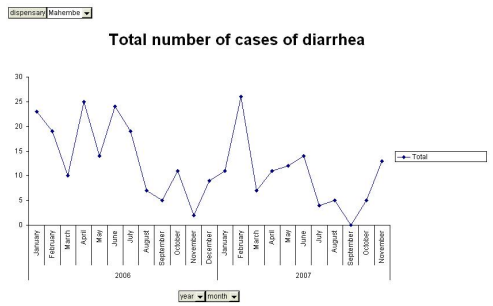

Figure 3. Output graphic from cases of diarrhea

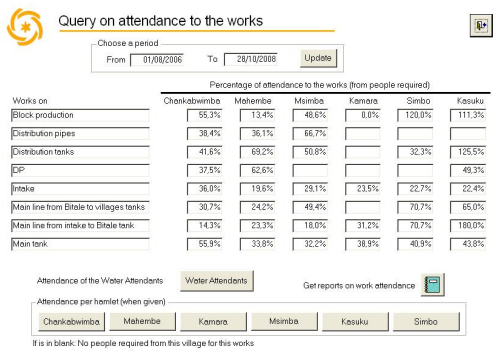

Figure 4. Output table for attendance to the works

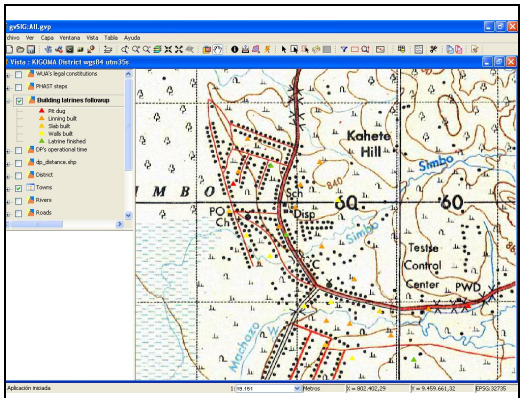

Figure 5. Georeferenced information on latrines construction as an output

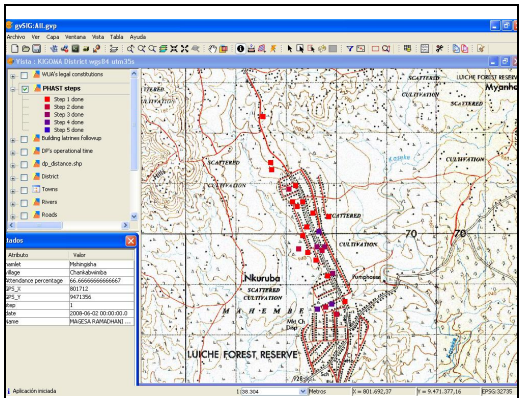

Figure 6. Georeferenced information on hygiene promotion progress as an output

Day-to-day use: continuous monitoring

Most evaluations of the implementation phase are carried out at the end of the programme. In some cases, a mid-term review is conducted or further analysis is made when a major problem arises. There is little evidence of effective monitoring. The SIS facilitates the monitoring process and detects problems when they first appear so that they can be corrected before they escalate.

Users see the benefits of the tool within only a few months. We interviewed some of our partners and found that the SIS has made their jobs easier, particularly in the reporting stage. The key advantages identified by users are the ease with which information can be accessed and the simplification of the data collection process.

As explained above, the SIS can display information required in day-to-day field work, such as the attendance of beneficiaries at different activities or their monetary contributions for the programme. These data are processed automatically and no longer require individual analysis in each case.

In addition, the system displays forms with specific fields which simplify the data collection process and enable staff to be more concise. Consequently, users can introduce and store all of the programme information systematically with a single tool and by following the same steps each time.

User perceptions of the system highlight its relevance to all areas of project work. Although developers initially considered it to be primarily a reporting tool which would be more useful for headquarters staff (as a source of field information and an accounting tool), all of the field staff consulted stated that it was useful in their work and did not fully understand its applications at headquarters.

Although the system provides some immediate benefits, there are two key conditions for implementing it effectively. Firstly, all staff must receive adequate training in operating the database and the GIS software, and secondly, the database must be updated and maintained continuously from the moment the system is introduced, even though the initial results may seem poorer than expected. The outputs generated by the SIS for subsequent use in the field are crucial for implementing the system effectively. Staff enter information that they will need to extract later in the programme, so the SIS must provide easy access to required outputs, some of which could be incorporated into mandatory monthly reports to demonstrate how the database outputs improve the efficiency of the programme.

Long-term assessment: evaluation

Evaluations provide information for improving future projects, programmes or development policies and act as instruments for disseminating information on programmes to relevant authorities and the public. The SIS is a useful evaluation tool because it provides access to information and generates outputs that can be used to analyse any type of action, so evaluators can search easily for the results of specific objectives and examine the changes that the action has brought to the beneficiaries of the programme and to society in general.

A standard evaluation considers five parameters: efficiency, efficacy, impact, relevance and sustainability. Information collected by the SIS can be used to analyse all of these components, although it is most suitable for measuring efficacy, impact and sustainability. Efficacy describes the degree to which specific programme objectives are met. The SIS stores data on specific objectives and the corresponding results and can therefore be used to determine the efficacy of a given programme. Moreover, the SIS can be used to evaluate the impact of a programme, which describes the degree to which both the specific and general objectives have been met, and the sustainability of the project. On the other hand, although the SIS considers impact and efficacy implicitly by incorporating the corresponding parameters from the LFA, it cannot do the same for sustainability. However, it is easy to enter information which may help to monitor sustainability, such as indicators of the appropriateness of the system, system management, and maintenance procedures when an incident is detected.

Of the two remaining parameters studied during an evaluation, efficiency reflects the degree to which the objectives have been met taking into account the supplies used, although the SIS does not collect complete information on supplies. Finally, relevance is designed to reflect whether the programme provided the best possible solution to the problem in question, although the SIS can only provide some of the information required for this parameter (e.g. baseline and closeline) and other sources must also be used.

In addition to enhancing the standard evaluation in the LFA, the SIS also provides information for carrying out a new type of analysis. By closely monitoring the implementation of different activities, the SIS can help to determine whether failure to meet an objective is caused by incorrect initial assumptions or by other factors related to the implementation itself. For example, if a survey on hygiene habits at the end of the project had not shown a real improvement, it could be assumed that the methodology was inappropriate, whereas the real problem could have been poor attendance of training sessions and workshops. It would be

impossible to make this distinction without the information gathered by the SIS during the implementation of training activities.

In addition to improving evaluations, the SIS can be used to analyse specific aspects of the intervention strategy that could be improved for activities that may be replicated, or even to provide information to researchers for enhancing the impact of different intervention strategies. However, it is important to remember that the system can only store and display information, and thorough analysis is needed to make a long-term assessment of the programme.

Conclusions

In this paper we present and analyse a support information system proposal for WatSan programmes. The system was developed and used to monitor two medium-scale programmes in Tanzania (with funding of €0.5-1 million/year and serving 7000-10,000 water supply beneficiaries/year). The main source of funding for both programmes is the ACP-EU Water Facility grant.

The monitoring system was designed and implemented over a period of eight months, which includes the training period for field and headquarters staff. Continuous analysis of reporting processes was used to adapt and simplify some aspects of the SIS during this period. The main strengths of the system are the simple data entry process and the multiple interfaces for visualising outputs.

The monitoring tool can be used to analyse spatial performance in Participatory Hygiene and Sanitation Transformation (PHAST, Wood, 1998), to identify the relationship between the physical location of the families and their hygiene and sanitary habits, the different levels of participation of the beneficiaries in relation to the implementation of the programme in the area where they live, or the neighbourhoods that are missing out on sanitation improvements. The system stores census data, so it can also be used to make more standard analyses, such as the relationship between the tribe of origin and the incorporation of new hygiene habits.

The SIS was developed specifically for an NGO, but it could be adapted to different projects carried out by governments and local authorities as a tool for accountability.

Although improvements will be considered, the first version of the SIS has proved to be very useful. It not only collects systematically all of the information generated by the programmes but also facilitates the analysis of data and spatial representations. Information gaps in these types of programmes often restrict strategy evaluations when procedures need to be reviewed, so a tool that solves this problem improves the overall monitoring and may enhance management decision making. As Bond (1999) states, participation, learning and flexibility are the three key elements required to define the relationship between beneficiaries and management.

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