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Project management of borehole programme

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BOPHUTHATSWANA GAINED INDEPENDENCE from South Africa in 1977 and became one of the fastest growing developing countries in the region.

Prior to the establishment of the Department of Water Affairs (DWA) in 1987, more emphasis had been placed on urban water supply, whilst an ad-hoc approach was followed for rural supply.

In 1987, it was estimated that nearly 1,5 million people in the rural villages of Bophuthatswana had no reasonable access to potable water. The Department of Water Affairs adopted a strategy which relied on requests from the rural community for boreholes, rather than attempting to supply water to all areas on a pro-active basis. This system of properly verified and prioritized requests proved to indicate those areas with the greatest need for water.

Between 1987 and 1989, the Department of Water Affairs attempted to satisfy requests for water with departmental plant and personnel. Lack of adequately trained staff and frequent breakdowns however soon rendered the operation ineffective. Work output and success rates were low and targets could not be met.

This was "development for the people, on behalf of the people..." anything but "development by the people"

Any rural water supply scheme making use of ground-water resources, involves two key role players:

- **The Project Sponsor** - This may be Government, through one of its departments, or it may be a non-governmental organisation.
- **The Community** - Those consumers in need of water.

The traditional rural water supply programmes were characterised by the initiative being vested in the Project Sponsor. The then Republic of Bophuthatswana, was no exception.

Most rural water supply projects involved consultants and contractors. All of these wedged in between the project Sponsor and the Community. This results in Management gaps - limiting the essential lines of communication between the various levels of management. (Refer Figure 1)

To add to the dilemma, there also exists functional gaps between the various working groups in the team. For instance between the geohydrological and engineering consultants, or between the drilling, testing and equipping contractors. If we superimpose the management gaps on top of the functional gaps, we find that traditional

rural water supply teams are made up of small operational islands. (Refer Figure 1)

The Bophuthatswana Rural Water Supply Programme is operational in all 5 regions of Bophuthatswana with separate contracts for drilling, testing and equipping of boreholes in each region. Allowing for the Departmental Staff and 4 Consulting Firms, approximately 200 people are directly involved in the programme on a daily basis.

A further dimension to the problem is the geographical location of the various regions of Bophuthatswana.

- 5 regions, 14 districts, although only 44 500km², it is spread over an area ranging between 5 and 600 km from the capital Mmabatho, housing a 1993 population of 2,3 million people.

The result of this traditional approach in Bophuthatswana were inevitable:

- hundreds (or even thousands) of boreholes;
- no database or borehole numbers;
- no testing records;
- no follow-up on equipping and maintenance.

We can add to this:

- no involvement of the community;
- no sense of ownership.

The Bophuthatswana Rural Water Supply Programme was launched by the Department of Water Affairs in 1989.

The long-term objectives of the programme were defined as follows:

- To provide every Bophuthatswana resident with safe, affordable and sustainable drinking water at a rate of 25 litre per capita per day, within 500m from his dwelling, before the year 2000.
- When the programme objective of "Water for all by the year 2000" was defined in 1989, it was estimated that water had to be supplied to an additional 85 000 people per year. The actual progress has exceeded this target each year since 1989.

Subsequently, these objectives have been amended to include water for agricultural use as well as the installation of yard connections in villages where a sustainable source of water is available.

The primary objective of this programme was therefore to provide every resident who has already expressed a need, with a safe, sustainable and affordable supply of water. Water was supplied to villages, schools, clinics, hospitals as well as for communal agricultural use.

The principle difference between the traditional approach and the Bophuthatswana Rural Water Supply Programme was this:

The initiative was vested in the community - they become the core of the programme.

The new strategy broke away from departmental attempts at siting, drilling, testing and equipping of boreholes and included the appointment of project co-ordinator, consulting engineers and geohydrological consultants.

The Project Co-ordinator was responsible for co-ordinating and integrating activities across multiple, functional levels. Project management principles of plan, organise, lead and control, are therefore the ingredients that cement these operational islands into a continent of co-ordinated effort.

Based on the historical expenditure on Contractors under the programme, the unit cost per person served, is estimated to be in the order of only US\$ 15.20. This is in sharp contrast to the annual cost of US\$ 41.44 per person normally paid for water when purchased from private vendors.

Within the limits of time, cost and performance, all these efforts are directed towards the common goal:

“Water for the people, by the people.”

For a sustainable supply of water a borehole must be introduced into the community with a maximum of local involvement.

The programme was request driven. Any representative of the community was allowed to submit a request for communal water.

Upon receipt of a request, members of the management team verified such a request to establish whether it is a bona fide request or not. This included a visit and a survey of existing water sources to determine whether:

- there was no existing or alternative sources of water within 500m from the desired location of the source;
- the need has not been satisfied in the meantime by somebody else;
- the request could not stand over until a regional scheme is supplied, i.e. urgency or priority of request.

Where more requests were received than could be accommodated in the budget, prioritisation was done to determine which must be satisfied first.

Prioritisation was normally done on a village basis, after which priorities between villages were assigned.

The activities of siting, drilling, testing, design and construction for each verified request are scheduled according to the priorities within the contents of the district budget.

The Consultants and Contractors proceed with the execution of the scheduled activities:

- Siting of boreholes was executed by professional Geohydrologists to ensure the highest probability of

successful drilling. The latest scientific methods were applied in a cost-effective manner.

- Boreholes were drilled by approved Drilling Contractors selected through public tender. Boreholes were drilled, lined and developed under the supervision of a Geohydrologist.
- Boreholes were tested to establish the sustainable yield as well as the water quality. Testing Contractors were selected through public tender. Boreholes were tested under the supervision of a Geohydrologist who issued a management recommendation for each borehole.
- A Civil Engineer designed each piece of equipment in accordance with the management recommendation for the specific borehole. The equipment were hand-pumps, windmills, tanks, motorised pumps and minor pipelines as may be appropriate in each case.
- Construction activities were labour-based as far as economically viable. Equipping Contractors were selected through public tender. On completion, all equipment will be handed over to the community for operation and maintenance.

Communication is a cornerstone of a successful programme. The two most important types of formal communication are meetings and standard forms.

Formal meetings are held at four levels:

- Department of Water Affairs Technical Appraisal - policy decisions, approval of reticulated schemes.
- Rural Water Supply Programme Management Team - policy and strategy.
- Project Co-ordination - overall programme co-ordination and progress.
- Regional Co-ordination - programme co-ordination at regional level, contractor site meetings, information to - and feedback from regional community representatives and other functional departments.

Minutes of these meetings, as well as all supporting documents to progress reports constitute the written formal communications in this category.

The use of standard forms is a simple yet powerful means of communication. By carefully designing these forms, a wealth of information can be communicated. This method has the following advantages:

- simple (usually single A4 size page);
- easy to understand and refer to;
- can act as a checklist;
- can act as information interchange as well as work authorization;
- backup to computerised database.

No fewer than 19 standard forms were specifically designed for use on RSWP, all properly identified and referenced by number. Whilst these forms are standardised, they are constantly under review and scrutiny for the introduction of improvements and multiutility. In

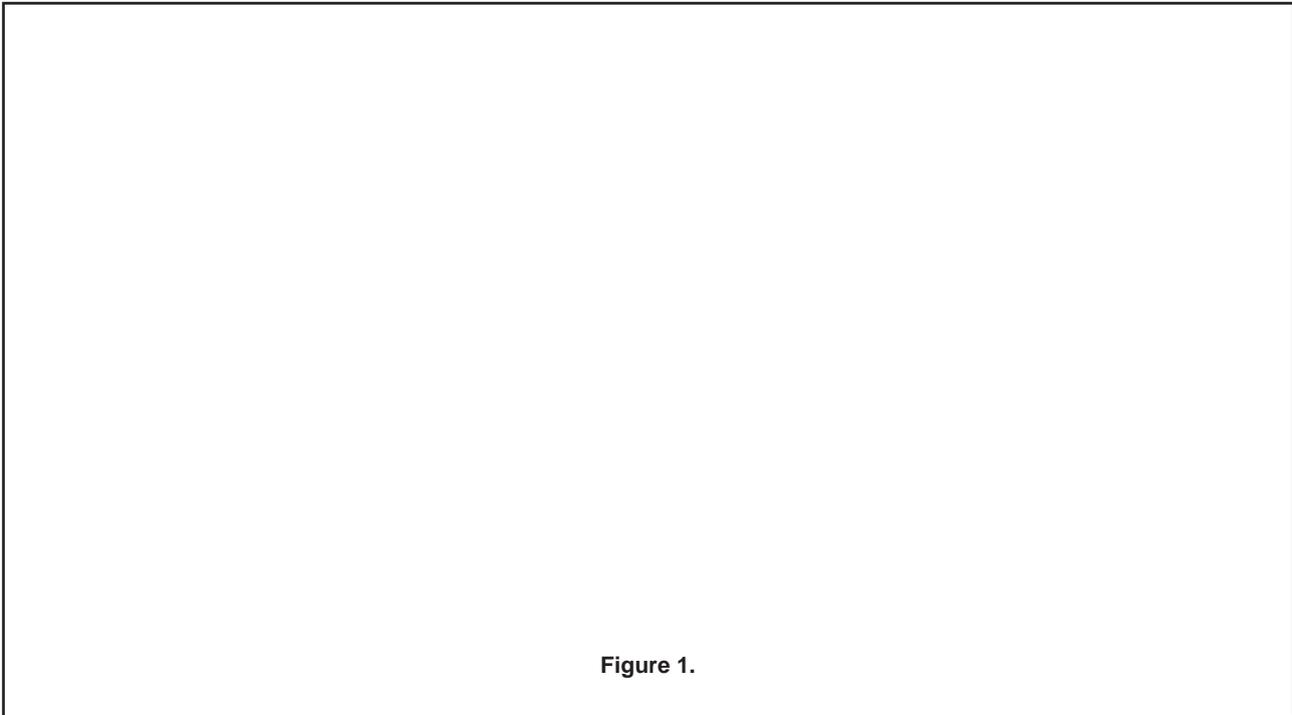


Figure 1.

many cases, standard forms have replaced lengthy written reports.

The mere accounting and reporting of the cost after the action has occurred cannot in itself control any costs. Historic data can however be used to predict future costs, and this formed the basis of the Rural Water Supply Programme cost control system.

A streamlined administration system has been specifically developed to handle an average turnover of approximately R5 million per month.

Actual and budgeted unit costs were used to forecast future costs, which taken within the constraints of the annual budget, allows a certain amount of work to be scheduled in the format of monthly Gantt charts.

Each one of the 4 500 requests received, resembled a small but unique project on its own. Each request involves site visits, borehole siting, drilling, testing, designs, constructions and even Completion Certificates. A total of 6 activities are managed per request resulting in a total of 27 000 activities on a bar-chart (each one with its unique dependencies and resources).

This allows the Civil Engineer to prepare work authorization sheets and technical designs timeously, so that contractors may order materials ahead of time and thus avoid possible delays. Costs estimates of the work to be performed are then fine-tuned and taken as committed funds, against which actual costs can then be measured, as well as the effect of committed funds on the overall budget.

Gantt charts are summaries of the logic network and trace the progress of requests from request stage to hand-over. The Gantt chart is a powerful scheduling tool, and forms the basis of monthly Regional Co-ordination Meet-

ings. Whilst the district budget dictates how many boreholes may be drilled, tested or equipped in the following month, the Gantt chart defines precisely which boreholes are to be actioned.

The growth of Rural Water Supply Programme can largely be attributed to an increased implementation capacity through more effective and efficient management of the programme, but it must be acknowledged that the availability of funds removed constraints which otherwise may have impeded progress. In the period August 1989 to the present, the management system of Rural Water Supply Programme has been going through a constant process of evaluation and fine-tuning, necessitated by the massive amounts of information generated on a programme of this nature. Effective management hinges on the capturing, processing, assimilation and interpretation of up-to-date, complete and accurate information, which of course leads ultimately to intelligent and timeous decision making.

Upon completion of the work related to a request, all pertinent information is recorded in a locality particular computerized database. This database interacts with CAD and GIS to facilitate mapping and plotting.

Apart from borehole information generated as part of Bophuthatswana Rural Water Supply Programme, information concerning existing public boreholes is constantly being collected in a national borehole census. At present there are in excess of 7 000 boreholes recorded on the database.

Since 1989, the following progress was made:

- Requests satisfied 3 775
- Boreholes drilled 2 400
- People provided with basic water 750 000

The success of the programme is seated in the strong partnership between the public service, the professional advisors and the communities. All efforts are directed towards satisfying the real needs defined by the people themselves. According to a survey conducted by the RSA Department of Water Affairs, the rural communities of Bophuthatswana are the only areas (apart from Qua-Qua) where availability of water is higher than 15 litre per person per day.

Through the establishment and training of Village Water Committees as well as the creation of employment during construction, the monies are spent in a manner that results in the greatest benefits to these communities.

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