Total asset management for water and sanitation projects in Africa

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D A L West

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WHAT IS TOTAL ASSET MANAGEMENT?

Only seldom does a completed project meet all it's objectives. Even those considered successful through to satisfactory run-up, often fail in the long-term due to operational inefficiency or complete breakdown from inadequate maintenance. One way of considering the benefits of a water or sanitation scheme is on a life-cycle basis (see Figure 1) Investment occurs from it's conception to it's commissioning. If all is well the return begins when the plant comes into use and continues until disposal. To maximise benefit the lead time to first use should be as small as possible, while operating life and the total benefit as large as possible. Such aims are difficult to achieve, but there is a growing recognition of life-cycle costs, especially in the project management area, which can make such an impact on life costs, and in subsequent maintenance.

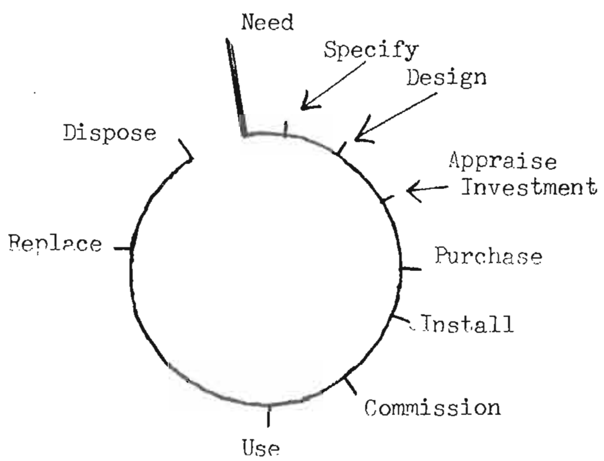

Figure 1

It is the focussing of attention on these matters which make up the concepts of Total Asset Management.

The basis is a combination of management and technology, and can be applied by users and providers of water and sanitation services. The principles can be applied at top level and also by managers, engineers, accountants and other specialists in their day-to-day working lives. Such ideas can also be applied to any enterprise. The application of asset management can result in the following benefits: lower cost of ownership of assets; better and more comprehensive specifications, leading to procurement procedures which will provide lower cost of ownership; reduction in indirect costs due to breakdown; general improvement in efficiency; improved quality of service and better material specifications; increased availability through improved reliability; more and better information available for decision making; better communication between users and suppliers, and between personnel in different functions. For management this is one of a number of concepts which can contribute to overall efficiency. Like others it can be classed as 'common sense' or 'easy when you know how' - but it requires careful thought and planning to realise the potential benefits of application.

Asset management requires no new techniques or disciplines. It is essentially a way of examining and grouping some familiar activities; a 'bringing together' of well tried methods in a way which can be used to improve management of assets in accordance with the enterprise's objectives. It is defined as - A Combination of Management, Financial, Engineering and Other Practices Applied to Assets in Pursuit of Economic Life-Cycle Costs. In practice it is concerned with the specification and design for reliability and maintainability of plant, machinery, equipment, buildings, structures, with their installation, commissioning, maintenance, modification and replacement, and with a feedback of information on design performance and costs. Asset management is essentially a multi-disciplinary approach to optimising life-cycle costs, and experience of a number of specialists is required for it's implementation. The basics can be applied without changing organisational structures, and there is no need to create a new breed of experts, but the range of skills, knowledge and experience necessary for full application is unlikely to be acquired by one person. Moreover it can only be successful with the active participation and understanding at the highest level of Senior Management. Asset management is also concerned with the 'cost of ownership'. (see Figure 2)

Application of asset management to water and sanitation projects is basically - the selection and provision of permanent assets providing the service; caring for these effectively and efficiently; co-ordinating them to help achieve overall minimum costs over

water/sanitation - life cost example	
Cap.	feasibility/dev./design purchase/install/commission training/plant staff manuals/tools/initial spares
Ops.	labour - plant ops./engineering energy materials (oil, general)
Mtce.	labour/materials/contractors o/heads (planners/supervisors/engs) spare parts holding (stores)
Loss	non-availability mal-function
Dispose	demolition

Figure 2

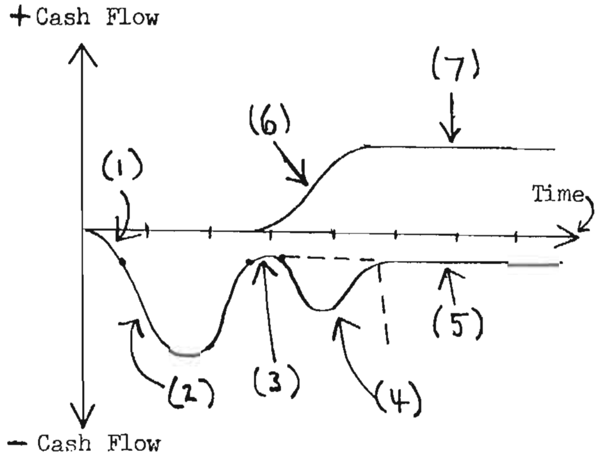

Figure 3

their life-cycle; feeding back data to improve them; which at least requires - deciding what service targets are to be met; deciding assets needed, how to use them, and achieve the targets over a specified period, taking into account their forecast cost of ownership; specifying the performance of the assets to be acquired; acquire, install and commission them; care for them; monitor their use; replace, improve the assets for better care, using the data to help minimise life-cycle costs. The successful application depends on the ability to balance factors. It brings together many techniques and disciplines, in a team situation, such as investment analysis, operational research, replacement analysis, accounting, design for reliability/maintainability, preparing specifications, installation, commissioning, maintenance methodology, information systems and technical communications, etc.

AVOIDING SOME PROJECT PITFALLS

Project investment suffers from - misunderstanding of a project as a unique and single task utilising the skills of a team working together; non-acceptance that the meeting point of all these disciplines is at the top - project organisation and direction must include a professional top management input; being unaware that the special risks concerning projects arise because attempts are being made to forecast the future. Innovation and problems of a special team, on a one-off job, can lead to not understanding ways on how problems can be tackled; not settling all the necessary decisions fairly early on. It is important that problems are thought through, policies made, and procedures set-up.

Consider the cash flow curve of a typical project (see Figure 3) It can easily be seen that the model can be considered in seven phases - 1. Planning. The period of evaluation and planning. 2. Procurement and Construction. Typically a curve, as expenditure rises, and then recedes, as parts of the project are completed. 3. Commissioning. The time between completion of construction and committing the investment to operations - testing and proving the facilities are safe and fit for use. 4. Operational Run-Up. The period between the date of operational commitment and that on which the performance is held to have reached steady-state conditions. 5. Steady-State Costs. The time span from which it is decided that problems of Phase 4 have either been solved, will never be solved, or will require a long-term plan to solve. 6. Benefits Build-Up. The term 'benefits' means the positive cash flow or 'services indicator'. The slope of this line entirely depends on prevailing circumstances. 7. Steady-State Benefits. Similar to 5, in that it is the period immediately following decisions on problems which prevent objectives being reached, are either solved or not and need further treatment.

So what is new in project work and can be learnt from experience? There are three areas of newness different from regular activities. The project team is generally composed of people brought together specifically for the task, often without any special team training and maybe many inexperienced in project work. All are expected to operate harmoniously from day one. Project teams have to shake down on the job so they must use all the practices which can help them to do it effectively. Also there is the effect on projects of the ever increasing rate of technological change. It is unusual for any large water or sanitation project today not to have some innovating part. Some consider that any investment which includes more than a modest amount of innovation will be a disaster. It is imperative to have available the competence which can judge what is acceptable, and so avoid unnecessary risk of failure. Allied to this, but separate, is the increasing complexity of systems which are appearing. They require technicians to interact with each other better than before. But again there is a limit to complexity, and ability to judge these aspects must be inherent in the team.

The disciplines of project management can be considered under six headings. 1. Finance. Three types of expertise are needed. Initially, investment planning, then others dealing with project evaluation, and thirdly, those dealing with project control, which might be described as continuous cash-flow predication. It is the last that causes the most trouble, and accountants are the least happy with. The first is allied to economic studies and the evaluation stage is largely main-streem accountancy. 2. Technical and Design. It is imperative that a clear, simple and well discussed brief is the basis. Otherwise cost over-runs and failure to meet objectives is certain. Both the nature of water and sanitation processing, together with performance standards of proposed installations must be well understood, if technical design is to be adequate. Technical inputs are often well below expectations; also sometimes inferior staffing and accepted lower standards prevail. These factors then manifest themselves on commissioning when the excess costs are attributable to lack of adequate design early enough. 3. Contracts and Contracts Structure. Good contracts are vital. Instead of a minefield of legal jargon and infinite detail, what should be is a clear, comprehensive, yet simple description, leading to a sound working relationship, on a mutually beneficial basis, between two contracting parties over a finite time period. Present weaknesses could be reduced if managements had a better understanding of the important features of this relationship, and the need to avoid ambiguity. 4. Time. Almost always regarded as important, but normally ineffectively managed. Full use should be made of the many well developed techniques and install high class co-ordination. Time management concerns all functions and dependencies between discrete events. 5. Organisation and Co-ordination. As projects are one-offs and finite, much early effort is needed to reduce to a minimum the learning period - this means specifying things normally taken for granted. 6. Resources. Too often given little forethought. Resourcing requires attention to money, manpower, machines, land etc. which is committed, so that problems are anticipated and dealt with. Manpower planning is vital.

The overall project view must accept the need to be in control of events. This means everything that has to be foreseen, is foreseen and there are no surprises or unexpected happenings. This is particularly difficult because of inbuilt uncertainties. So before financial committments are made, the main intellectual effort has to be put in before Phase 1. There are four ingredients to be implemented. 1. Planning is the setting out of an action plan, which specifies intentions, why particular options have been made and how action is to be taken. 2. Systems of measurement must be introduced for main items - the plan then compared with actual results. Regular monitoring throughout. 3. Arrangements for control of events must make sure of individual delegation of responsibility and provide for co-ordination. 4. In spite of efforts to predict and control, some drift will happen, and if regain is to be made, performance monitoring must look forward to the future events and the overall impact. Control is not analysing the past.

So concluding, if a project is to have any chance of being under control then there are four steps to be taken and completed, if possible, before any commitments are made. The Investigation - takes the idea, gives it form and substance, produces a recognisable proposition and has been compared with other competing options, gives a status and priority. This needs the skills of analysing choices to be done properly. The Project Proposal - turns the generality into a detailed and specific proposal. This is often when things go wrong, because many judgements may be made on 'best guesses'. Even when factual data is evaluated it can be unco-ordinated. The Project Plan - uses the proposal, quantifies what is going to be done, so that objectives can be met at minimal risk, and with control. This must set out policy, tactics, procedures for all items, including organisation, staffing and monitoring method. This stage can be a source of difficulty because those deciding ahead of commitment are reluctant to recognise important areas. There may be reluctance to create organisation and staffing, to allocate responsibility and commit resources to studies. The Check List - to minimise risk it is essential that this is compiled to ensure that all relevant matters requiring attention when investment is being planned will be evaluated. It will incorporate the knowledge of the organisation's executives, past experiences, discussed inter-functionally - then regarded as the pinnacle from which the project is planned.

NECESSITY FOR MAINTENANCE

Maintenance can account for about 30% of life-cycle costs - often equal to the project sum itself. Bad maintenance will mean enormous indirect expenses due to losses or permanent shut-downs. To be effective it needs not only special expertise, but high calibre managerial ability - as it is complex and demanding, especially in continuous processing, as in water and sanitation. But it has an oily-rag image, is a neglected area, and much left to inferior staff without adequate development. In the past decade this has been changing, largely due at last to recognition as a big cost centre. Maintenance must: be recognised as necessary; have time allowed for it to take place; be planned as much as possible; be preventive rather than corrective after failure; have resources allocated to it; be recognised as part of a new project with asset management. As downtime is more expensive, without maintenance there will be catastrophic results. Maintenance is Work Undertaken to Keep or Restore Assets to Acceptable Standards at Economic Costs.

The first task is to set and define objectives, which must be quantified. Maintenance will be judged by the cost and how well it does it's job, so the objectives will always reflect these criteria - and invariably, availability is the key indicator. The money, manpower, materials etc used form direct costs, but the return can be many times the outlay. It provides 'an insurance in time', where simple action now prevents major repairs later, and minimises the huge losses in service due to unavailability. So Planned Maintenance is Maintenance Organised and Carried out with Forethought, Control and Use of Records to a Predetermined Plan. This takes the form of four 'basic' steps: specify - what has, how it it, when it is, where it is, to be maintained; carry out specification - record work and notify 'corrective' actions needed; do repairs - record work details; analyse - information produced by the system, and review, modify the plan to 'optimise' within the policy and standards. Managerially this is planning needs, organising resources, controlling results, and measuring the performance of the system. A modern system will use mini or micro-computers as this leads to effective manipulation of volumes of data on large schemes, and incorporate the rapidly developing 'condition monitoring' approach, as health checks on assets, only taking remedial action when sickness trends become intolerable. But all methods will adopt the same programming approach (see Figure 4)

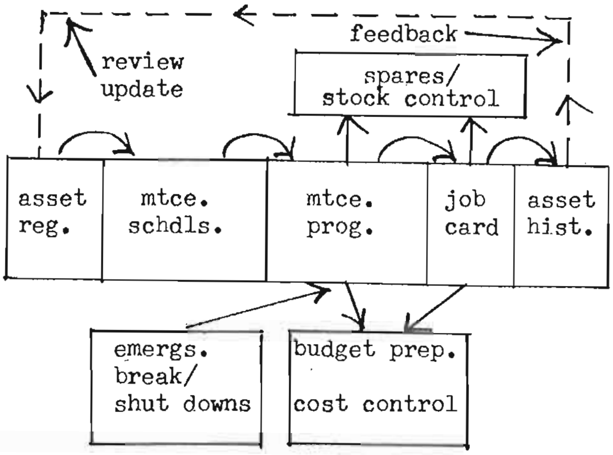

Figure 4

VITAL MANAGEMENT SKILLS

All these practices require a high level of managerial skills. A Manager is a person who is responsible for the work of others, and needs to perform the primary tasks of Planning, Organising, Motivating/Leading and Controlling. These are vital for success. But not of less importance are other skills such as personal, numerical, specialist, in order to meet on-going tasks and new projects. There are also special techniques knowledge, but of special significance, personal skills can perhaps be selected for special reference. A range will include leading, persuading, counselling, thinking creatively, writing reports, communicating, remembering, managing time etc. Most can be regarded as people skills.

Total Asset Management can only be successful, by the very nature of the concepts which concern human effort, if there is team working and total participation. Leadership features strongly and concerns mainly acknowledging the task, the team and the individual in obtaining objectives. Success can be attained through realising that people at work seek self-fulfillment. Managers having good initial attitudes can be very effectively developed. Management is, quite rightly, the first discipline embodied in the definition of asset whole-life approach. Moreover it is a team exercise. (see Figure 5)

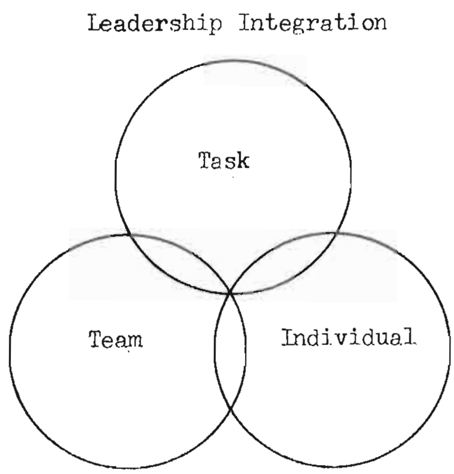

Figure 5