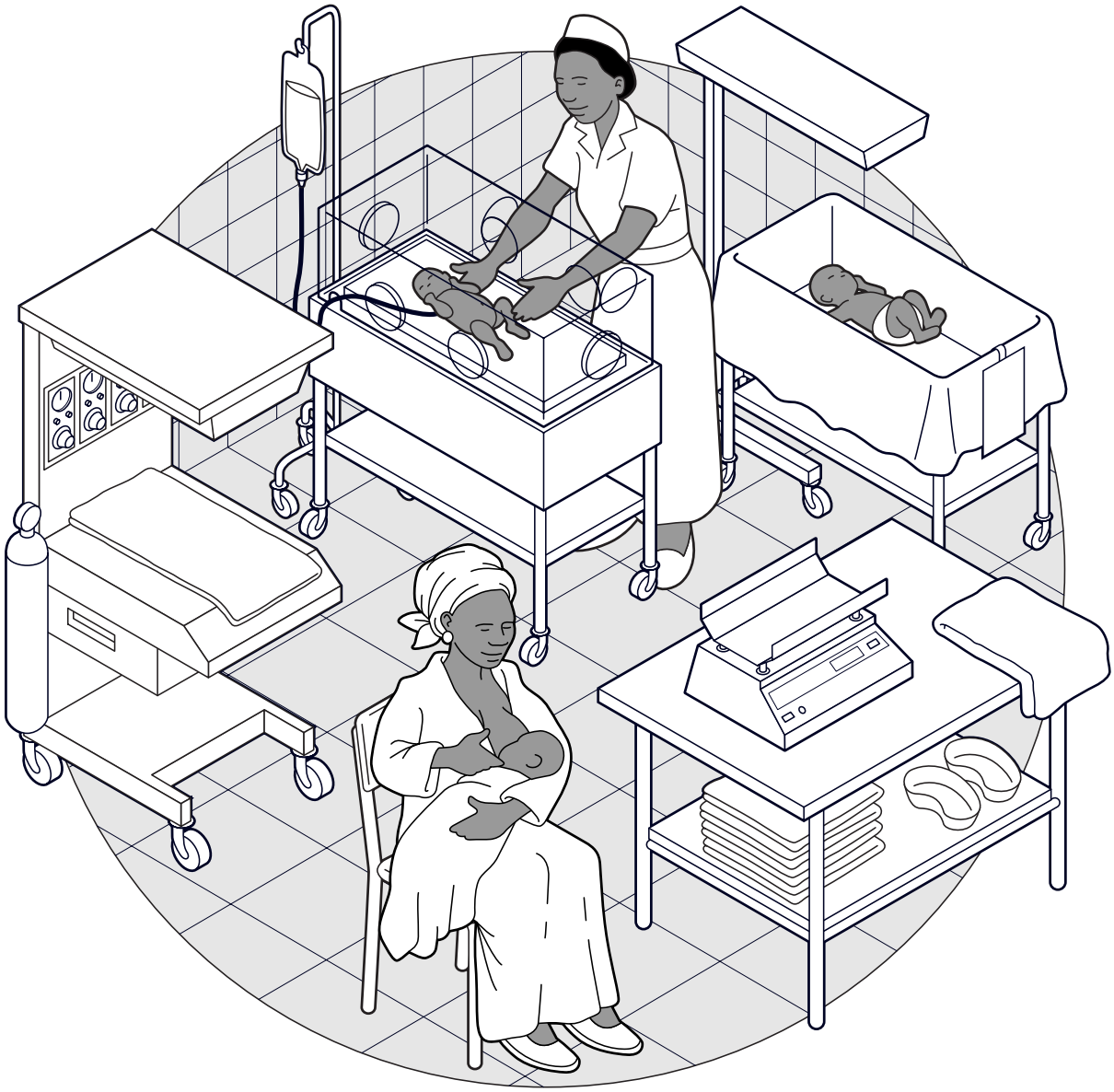
INTRODUCTION

The Introduction looks at:-

- Purpose of the Manual;
- How to Use the Manual.



INTRODUCTION – Purpose of the Manual

What is Health Care Technology?

Within health facilities there are many different types of equipment and technologies, such as: furniture; service supplies; plant; general metal, plastic and glassware; fixtures built into the fabric of the facilities; walking aids; the vast range of equipment for clinical use; consumable supplies; transport; communication equipment; energy sources; waste disposal systems; and computerised information/record systems. In common parlance now is the umbrella term of "health care technology" to cover this wide and varying range of items. Historically different types of technologies have been the responsibility of different ministries (such as Works, Health, or Supplies). Thus, the range of equipment which falls under the responsibility of the Ministry of Health varies from country to country; and each country's definition of health care technology will vary depending on the range of equipment types that they actually manage.

This Manual for the Development of Policy can be applied to as wide or as narrow a definition of "health care technology" as a ministry wishes, since the overall aim of the manual is to provide a means to: i) analyze technological problems; and ii) undertake the process required to develop policy, whatever type of technology is involved. For simplicity, the term "equipment" is frequently used in this Manual to imply health care technology.

The Problem Facing many Ministries of Health

Health care technology plays an important role in the provision of health services at all levels. The expense of procuring, running, and maintaining health care technology is a major cost to health services, governments, and donors. However, the importance of effectively managing health care technology in developing countries has only recently been recognised. For many years, ministries of health (MOH) have chosen equipment badly and allocated too little money for spare parts and maintenance, and donors have not taken the need to standardise equipment and provide for after-sales support into account in designing their projects. One indication of the unfortunate result of this neglect according to the World Health Organisation (WHO) is that less than 50% of medical equipment is in working order in most developing countries[1]. In 1987, the WHO established a Global Action Plan on the Management, Maintenance and Repair of Health Care Equipment in order to raise awareness of these issues and help countries to rationalise health care technology services[2].

One Proposed Solution

One of the principal recommendations of the WHO Global Action Plan is that public health services establish a national health care technical service (HCTS) to co-ordinate the different disciplines involved in health care technology management. The service should formulate and implement a health care technology development strategy based on a good understanding of all aspects of health care technology management in the country.

One of the essential 'tools' for this work is to develop a policy in order to provide an enabling environment for any subsequent strategies to be successful. The effective management of health care technology in developing countries is dependent on the establishment of suitable and effective policies in all areas which impact on health care technology:- management and planning, resource allocation, selection, procurement, preparation for use, continued operation, maintenance and repair, personnel, training, technology assessment and research and development, as well as local production. The pursuit of such a holistic approach to the management of health care technology is lacking in many countries. Appropriate policies cannot be developed unless there is a full understanding of the health care technology sector in a country.

This Manual is based on these holistic principles, and is a "How To" guide designed to assist countries with the task of developing health care technology policy. This Manual is also aimed at external support agencies (international donors, technical agencies of foreign governments, non-government support agencies, and financial institutions), and designed to enable them to effectively assist developing countries with the management of their health care technology sector and their policy development programme.

The Role of this Manual

Purpose A comprehensive tool for policy-makers – it is a practical step-by-step guide to developing health care technology policy.

Readers It can be used by ministries of health, other health care providers, external support agencies, regional and district health authorities, individual health facility managers, and international organisations.

However for simplicity, the text has been worded as though directed at ministries of health at national level and from their perspective. It can of course simply be adapted for other audiences and other health care providers who cover smaller geographical areas, by substituting words and modifying the text.

Contents The description of a process for developing health care technology policy which is collaborative, participatory, iterative and involves community stakeholders. It provides details of the underlying management concepts, and enables an in-depth study to be taken of the health care technology sector within a country.

For simplicity, the word 'equipment' is frequently used throughout the Manual to mean health care technology.

Premise It is not possible to develop effective policy unless sufficient information is available regarding the current state of affairs with health care technology management practices.

Approach Once the necessary commitment of resources has been made, a Situation Analysis is undertaken to outline the resources available for health care technology and to identify the constraints which exist to their effective use. Then the process is opened up to more stakeholders through a National Workshop, in order to generate recommendations for change and proposals which will improve the situation. These outputs are then fed directly into a policy formulation and implementation process.

Layout A standard template is used throughout which addresses all components of the health care technology package in a logical sequence. If a comprehensive policy is to be developed the detail is necessary. Following the same sequencing through the headings/signposts given will systematically lead to producing the final policy document.

The development of the Manual was enhanced by the experience of three countries who have followed such a process: Botswana, Ghana, and Namibia, and is based on the work undertaken in those countries.

The guidance in this Manual is based on:-

- good technology transfer principles for importing technology into the health care environment;
- an exploration of the full range of activities involved in health care technology management practice;
- an identification of the role of the many players involved with health care technology management;
- the need to only produce recommendations for change from an informed position;
- practice as found in 3 countries;
- many years of experience and background research[3-10];
- a review of other programmes and initiatives.

INTRODUCTION – How to Use the Manual

Use this Manual as a "How To" guide for developing health care technology policy. It is divided into sections relating to the **SIX** steps in the policy development process that a ministry of health can follow in their efforts to obtain a national health care technology policy.

Step 1 Describes the resources required (people, time and funds) to develop policy using this Manual. The major staffing groups required will be a Task Force and a Steering Committee.

Step 2 Provides a background briefing on the process to be followed, so that the staff who will be involved in the process can understand the overall concept and approach.

Step 3 Describes how to undertake a Situation Analysis, and provides the framework for a systematic study together with the underlying management concepts on which it is based. It is the Task Force who will consider the issues in each of 13 Study Areas (2 Background Study Areas and 11 Procedure Study Areas) and answer the questions posed, thereby helping to analyze the current situation. Once this data is gathered, they will compile it into a draft Situation Analysis document.

Step 4 Details how to widen the process to more stakeholders by running a National Workshop on the results of the Situation Analysis findings. It describes the sorts of preparations, activities, and resources required to run the workshop. The purpose of the workshop is to come up with recommendations for change which are functional alternatives to the constraints identified.

Step 5 Describes how the Ministry of Health (or other health care provider) can now proceed with writing national health care technology policy by making use of the information obtained and the recommendations devised. It provides a framework for a systematic formulation of policy under the 11 Procedure Study Areas.

Step 6 Details how to guarantee that the policy is of some use by ensuring that it is implemented. It describes the actions to be taken to ensure change and to apply the policy.

This Manual uses a standard framework of studies, sections, and headings which addresses all components of the health care technology package in a logical sequence. This framework serves as a template for the Situation Analysis, and all subsequent steps ie. policy formulation, drafting a long-term implementation plan, and compiling a procedures manual. By making use of the sequence of headings/signposts provided in the framework, it will be possible to systematically produce a comprehensive and all inclusive policy.

Steps 3 and 5 contain a series of questions which are posed to assist the Reader to think about the issues, analyze the situation, and make decisions. These questions are numbered in order that staff working with this Manual can keep track of which questions have been answered, especially if the responsibility for answering them is divided amongst different members of the Task Force.

Countries may want to adapt the use of this Manual to their own particular requirements, for example:-

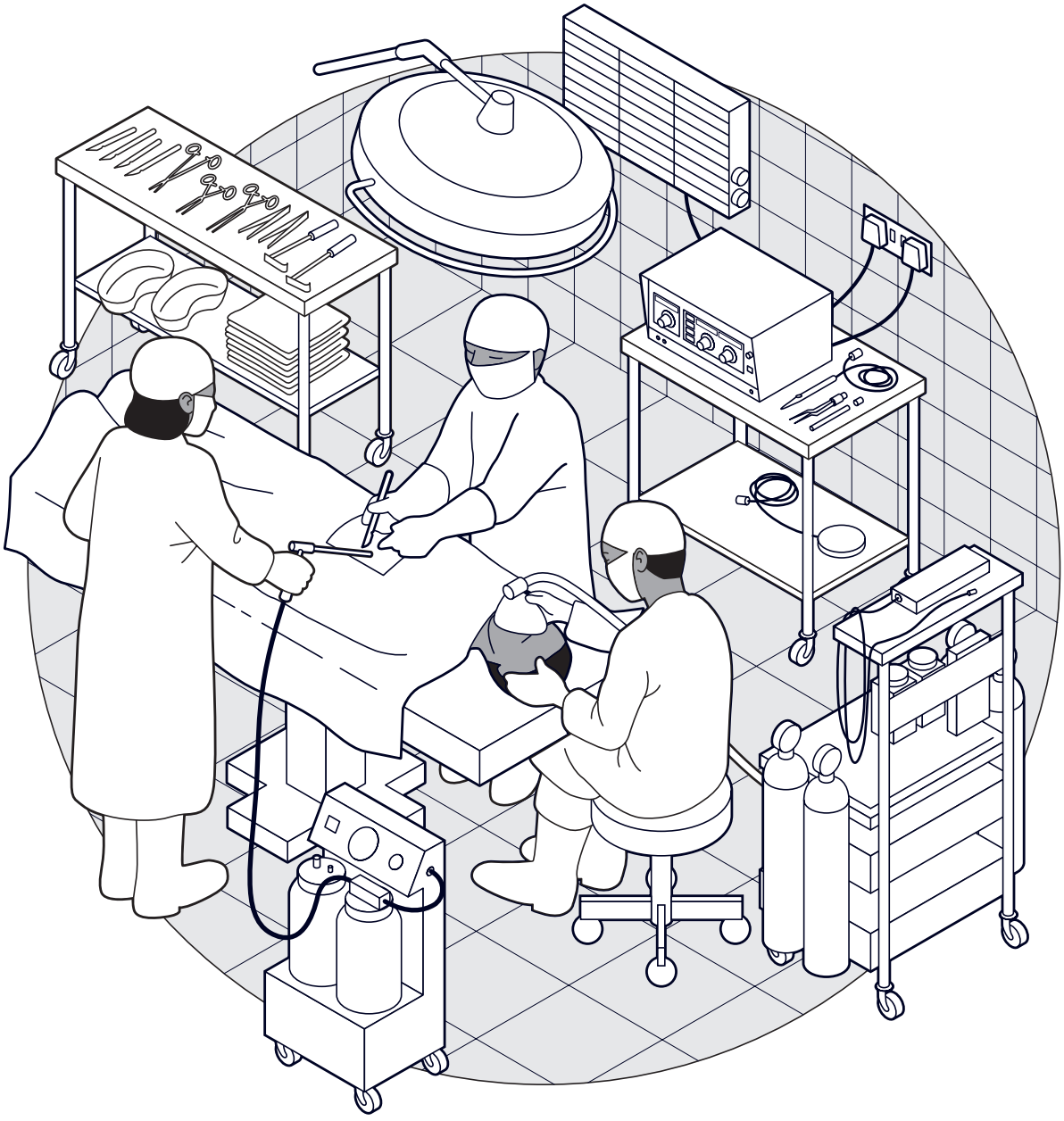
- Workshops/gatherings can be organized at any time throughout the process, especially in countries where it may be the only way to bring stakeholders together to deliberate on policy issues.
- In order to address acute problems, a country may choose to undertake an assessment of a specific Study area (eg. selection, maintenance and repair). This may help to rectify pressing problems before the process of developing a comprehensive policy is embarked upon, and may be of use when there are severe human resource constraints.
- For countries that have already developed policy, the questions posed in Steps 3 and 5 would be useful for evaluating the work undertaken and the progress made.

To the Readers: Take this Manual and adapt it or modify it to suit your needs, so that it is in a form which is of help to you. Whatever approach you decide to take, make use of this Manual as a 'tool' for the successful development of health care technology policy.

STEP 1
Make the Commitment Required to Develop Policy

This Step looks at:-

a. the need for high level support;
b. the project's purpose;
c. the principal staff groups to be involved;
d. the time requirements;
e. the cost implications;
f. the participatory approach to be taken.



STEP 1 – Make the Commitment Required to Develop Policy

Instructions

The Ministry of Health (MOH) will find it needs to commit resources – people, time, and funds – for the policy development process. It will be necessary to have understanding and support from the highest level in the ministry (eg. the Permanent Secretary and Minister). The MOH will need to take a participatory approach for there to be as broad an access by stakeholders to the policy development process as possible. This section gives some guidance and estimation of the inputs required.

Action By The *Planners* setting up the policy development process.

What To Do

- The experience of other countries has shown that it is useful to consider the implications of undertaking the policy development process before making a start, and make decisions on the following six areas:-
  a. the need for high level support;
  b. the project's purpose;
  c. the principal staff groups to be involved;
  d. the time requirements;
  e. the cost implications;
  f. the participatory approach to be taken.
- Read the following guidance and estimation of the requirements and their implications, and ascertain whether the commitment can be made to the policy development process.
- Consider critically whether there are adequate numbers of staff available with sufficient understanding of the issues to complete the process properly (strategies for increasing the numbers of such staff are presented in Step 2).

Additional Strategies

- The determinants of effective health care technology management usually fall beyond the remit of the MOH, since health care technology is influenced by several other sector ministries (due to the broad range of technologies involved). Thus, the MOH could negotiate with and encourage the other ministries involved (such as Works, Supplies, etc) to develop their own complementary health care technology policies, and collaborate with them on following a similar policy development process as outlined in this Manual.
- If the MOH finds it difficult to make the commitment necessary for the policy development process, external support agencies could be approached to provide assistance with this work and to incorporate it into their country programmes.

A. The Need for High Level Support

The development of health care technology policy is much more likely to be successful if understanding and support has been obtained from all levels of the Ministry of Health including the highest (eg. the Permanent Secretary and Minister). There needs to be a general acceptance that health care technology is of importance and recognition that there are outstanding health care technology issues which need to be addressed (a means for widening general understanding is given in Step 2). It may be necessary to convince policy-makers and health

service managers that health care technology requires a policy of its own.

Thus, amongst other things, there needs to be recognition of:-

- the effect health care technology has on the quality of service provision;
- the complementary role which health care technology plays as an important input to ensuring that health workers can execute their tasks effectively;
- the importance of an appropriate balance of budgets for different resource inputs for an efficient health service (ie. the high cost of health workers' salaries versus low recurrent expenditure levels intended for keeping equipment functioning and available for staff use);
- the need to take proper care of the large financial investment tied-up in the stock of health care technology[11,12].

Experience has shown that, if sustainable change is to be achieved, it is beneficial to have an *national expert* (or resident consultant) in health care technology, who is involved throughout to champion the policy development and implementation process.

B. The Project's Purpose

There may be a number of different objectives for undertaking the process outlined in this Manual:-

- The main purpose of the project will be to obtain a national health care technology policy in order to change the state and use of health care technology in a country (what is covered by the term "health care technology" will need to be defined by each country).
- However, it will also be a "learning exercise" for many of the staff involved, since numerous features of equipment management practice which are discovered will have formerly been unknown.
- In addition, it can provide a good opportunity to involve some inexperienced staff so that they can learn on-the-job.

There are advantages and disadvantages to the involvement of senior experienced staff and junior staff who want to learn. Senior people can answer queries from their own knowledge quickly but will have limited time. Junior staff however will require guidance and will have to undertake a steep learning curve. A balance must be sought. Planning the process and who is to be involved at each stage is essential if momentum is to be maintained and a policy attained. Ministries of Health need to critically ask themselves whether they have adequate staff available who can complete the process properly.

C. Principal Staff Groups Involved

Remember, it is most productive to choose people who are interested in the process, want to be involved, and are willing to do the work. There will need to be:-

1. ***A Task Force***, to undertake the bulk of the work, made up of a senior chairperson and other relevant personnel. It should be small (4-6 people), although some countries found it useful to include junior staff as well for the training benefit. Experience shows that the chairperson should be someone senior enough in the Ministry of Health (MOH), such as a policy-maker, with authority to make vital decisions without delay.

Who? → Technical staff (e.g. heads of central workshops) including the *national expert*, users of health care technology, planners, and policy makers; co-opted members can be used for particular study areas if required such as logistics/supplies staff.

Role? → To undertake a situation analysis of issues relating to health care technology (Step 3 of this Manual).

→ To visit health facilities in order to study technology management practices.

→ To draft the Situation Analysis document.

→ To facilitate at the National Workshop where the situation analysis findings will be disseminated and discussed, and give guidance to the workshop attendees (Step 4 of the Manual).
→ To translate workshop recommendations into statements of intent and develop them into a policy document for the future (Step 5 of this Manual).
→ To develop further instruments for the successful implementation of the policy (Steps 5 & 6 of this Manual).
→ To regularly provide feedback on progress with the policy development process to all other parties involved.

Report? → To the Steering Committee and be guided by them.

Time? → approx 55 days for each person, over one year for all 6 steps.

2. ***A Steering Committee***, to advise and oversee the process, made up of senior officials in the Ministry of Health (MOH) and possibly across different ministries (possibly 10-15 people).

Who? → Key people connected with health care technology management issues, such as a senior person from: planning, specialised/hospital services, primary health care, administration, finance, maintenance/technical services, supplies, laboratory services, radiography services, the regional and district authorities, etc. It is advisable that a senior MOH official chairs the committee, such as the Permanent Secretary.

Role? → To be familiar with the issues relating to health care technology management and the approach being taken in this policy development process (by being familiar with this Manual and Step 2 in particular).
→ To be kept up-to-date with the process through regular briefings by the Task Force as they carry out the project.
→ To steer the work of the Task Force, by regulating progress, monitoring time-scales, and advising on policy issues.
→ To seek approval for the policy document from the formal ministerial *Policy Formulating Authority*.
→ To monitor the implementation of the policy.
→ To provide regular progress reports to the Minister and Permanent Secretary.

Report? → To the Minister and the Permanent Secretary.

Time? → 2 days reading and digesting the Manual (Step 2); approx 2-hour meetings every 2 to 3 weeks throughout the whole process to hear feedback from the Task Force.

3. ***Senior Policy-Makers***, to provide high-level support to the process.

Who? → The Minister and Permanent Secretary.

Role? To recognize the importance of undertaking the process.
→ To provide support throughout the process.
→ To allocate the resources required for the activities undertaken as part of the process.
→ To promote the policy-development process as being important enough to warrant the support of external support agencies through their country programmes.

Time? → Intermittent briefings.

4. ***Workshop Attendees***, to broaden the informed debate, made up of a good mix of personnel representing different disciplines, different levels of the health service, and the different organisations involved in health care technology management (possibly 40-50 people).

Who? → Representatives from different disciplines – technical, medical, planning, training, supplies, etc.
→ Across different levels of the health service – facility, district and regional authorities, and ministerial level.
→ From the different organisations involved – health care providers, ministries who care for buildings, services and plant, equipment supplier companies who provide support to technology, external support agencies who play a role in technology management.

Role? → To familiarise themselves with the state of health care technology management (by reading the Situation Analysis document or Workshop handouts).
→ To prepare for the Workshop by considering and developing their input.
→ To brainstorm around the constraints found, and make recommendations for change which offer functional alternatives to present problems.

Report? → To the Workshop Facilitators and be guided by them.

Time? → 2 days reading and digesting briefing documents and preparing their input, and approximately 3 days attending the Workshop.

5. ***Workshop Facilitators*** (in addition to the Task Force members), to bring the best out of the workshop, made up of personnel experienced with such a task (approx. 2 people).

Who? → Experts who can either be health care technology consultants (local or foreign), representatives of external support agencies with experience in this field (such as WHO), representatives of neighbouring countries who have already developed policy, or staff with experience of successfully facilitating workshops.

Role? → To familiarise themselves with the state of health care technology management (by reading the Situation Analysis document).
→ To help the Task Force prepare for the Workshop.
→ To support the Task Force to facilitate the Workshop.
→ To participate in presentations at the Workshop.
→ To enable the workshop attendees to brainstorm and generate practical coherent recommendations.

Report? → To the Task Force.

Time? → 2 days reading and digesting briefing documents; 3 days for preparations and follow-up to the workshop; and approximately 3 days attending the Workshop.

6. ***General Stakeholders***, to broaden the participation, made up of members of the wider community who are daily involved with all aspects of health care technology management.

Who? → Many varied personnel to be questioned for their views in the data gathering process (see section E below).

Role? → To inform Task Force members honestly of the procedures, strengths and weaknesses of the current situation.
→ To implement the changes as a result of the policy developed.

Report? → To Task Force members.

Time? → Most people will only be required to talk to Task Force members in approx. 1-hour informal interviews; some people will spend additional time showing Task Force members around their workplace. Also some people will need to spend several hours compiling data for the Task Force if requested.

7. ***Consultants*** (if required), to assist with the process, made up of experts in health care technology management (possibly 1).

Who? → Local or foreign private sector experts, or advisors from external support agencies (such as WHO).

Role? → To support the Task Force, if required, in one or all of the following activities: undertaking the Situation Analysis, running the Workshop, writing policy, preparing implementation plans, etc.

Report? → To Task Force members and the Steering Committee.

Time? → Dependent on the activities they support.

8. ***Secretarial Support***, to provide office back-up.

Who? → Preferably staff from the ministerial secretarial pool, or they could be contracted in for particular activities if ministerial staff are in short supply.

Role? → To support the Task Force throughout the whole process.

Report? → To Task Force members.

Time? → Dependent on the activities they support.

D. Time Requirements

It is important at the outset to realistically estimate the time needed to undertake the project as specified. If the different principal staff groups are to undertake the tasks as listed in section B above, the following approximate time estimates have been calculated as a guide only. Policy implementation will be of course an on-going requirement:-

Task Force (4–6 people) including the national expert

Initial Familiarisation:	3 days for each person over a fortnight.
Situation Analysis:	20 days for each person over a 4 month period.
Running the Workshop:	7 days for each person over a fortnight.
Writing Policy:	7 days for each person over a fortnight.
Ensuring Change:	14 days for each person over a 4 month period for the initial work, then and on-going commitment.

Steering Committee (10–15 people)

Initial Familiarisation:	2 days for each person over a fortnight.
Rest of the Process:	Approx. 2-hour meetings every 2 to 3 weeks to guide the process, over a year.

Senior Policy-Makers (2)

Throughout the Process: Intermittent briefings.

Workshop Attendees (40–50 people)

Initial Familiarisation: 2–3 days for each person over a fortnight.
Attending the Workshop: 3 days per person.

Workshop Facilitators (2)

Initial Familiarisation: 2 days for each person.
Running the Workshop: 7 days for each person.

General Stakeholders (100s)

Situation Analysis: Approx. 1-hour per person for informal interviews;
Some people only – an additional 1 hour to provide a tour of their workplace.
Some people only – additional hours to compile data for the Task Force.

Consultants (1)

Dependent on the activities they support, as above.

Secretarial Support (2–3)

Dependent on the activities they support, as above.

There is a danger in underestimating the time required; trying to limit the time allowed will restrict how well the policy development process is performed. Do not plan only according to how much time people think they have available; instead correctly estimate the person-hours required and find ways of providing this input. For example, if the estimated time commitment required is greater than the time available from the staff involved, there are a number of options to consider:-

- The project is abandoned or postponed until more time is available.
- Consideration is given to involving more junior administrative staff to undertake some of the information-gathering/compiling tasks.
- Consultancy support or external technical assistance is sought for parts of the process (such as undertaking the Situation Analysis, or running the Workshop).

The support obtained for the project from the start from senior ministry officials, will provide a 2-fold effect on time requirements:-

- The staff time required is approved by the relevant minister so that those involved have a mandate to make alternative arrangements for their other work.
- The minister will expect to see the result of the project thereby placing a higher priority on completing the study on time.

The selection of staff for the Steering Committee and Task Force can influence the impact of time limitations. The Task Force should be small enough to enable simple scheduling of meetings but large enough to limit the time any one person needs to dedicate to the process.

E. Cost Implications

The policy development process will require funds implicitly and explicitly:-

Hidden Costs

Time:	Person-days of staff.
Office support:	Photocopying, paper, telephone, postage, etc.

Expenses

Task Force members:	Travel and subsistence for Situation Analysis visits.
National Workshop:	The venue, food, accommodation for participants, travel and subsistence for participants, contracts for facilitators, secretarial support, visual aids, etc.
Report writing:	Materials.
Secretarial support:	Contracts if required.
Consultants:	Contracts if required.

It may be possible for Ministries of Health to approach external support agencies for assistance with the costs required to develop policy; this would be done through the normal channels and procedures for such funding. External support agencies should be encouraged to incorporate support for policy development processes into their country programmes.

F. Participatory Approach

1. Consultation

The policy development process should be collaborative, participatory, and iterative if there is to be community ownership of the result. The perspective of all stakeholders should be sought; this includes staff at all levels of the system and parties inside and outside the MOH, as well as parties inside and outside government.

For example, the wide range of people who will need to be consulted and visited during the process are staff from:-

- all divisions within the MOH;
- regional health authorities;
- health facilities;
- other health care providers, such as missions, mines, local government authorities, the private sector;
- maintenance workshops;
- the ministries (such as Works) or other bodies (such as the Water Board) responsible for hospital buildings, services, plant etc.;
- equipment supplier companies and maintenance providers;
- other ministries and ministerial bodies involved, such as the Ministry of Finance, the Ministry of Trade and Industry, the Public Service Commission, the Tender Board, etc;
- training institutions such as universities, technical colleges, nursing schools;
- external support agencies – international, governmental, and NGOs;
- relevant members of the private sector support environment – industry, research, management, etc.

2. *Feedback*

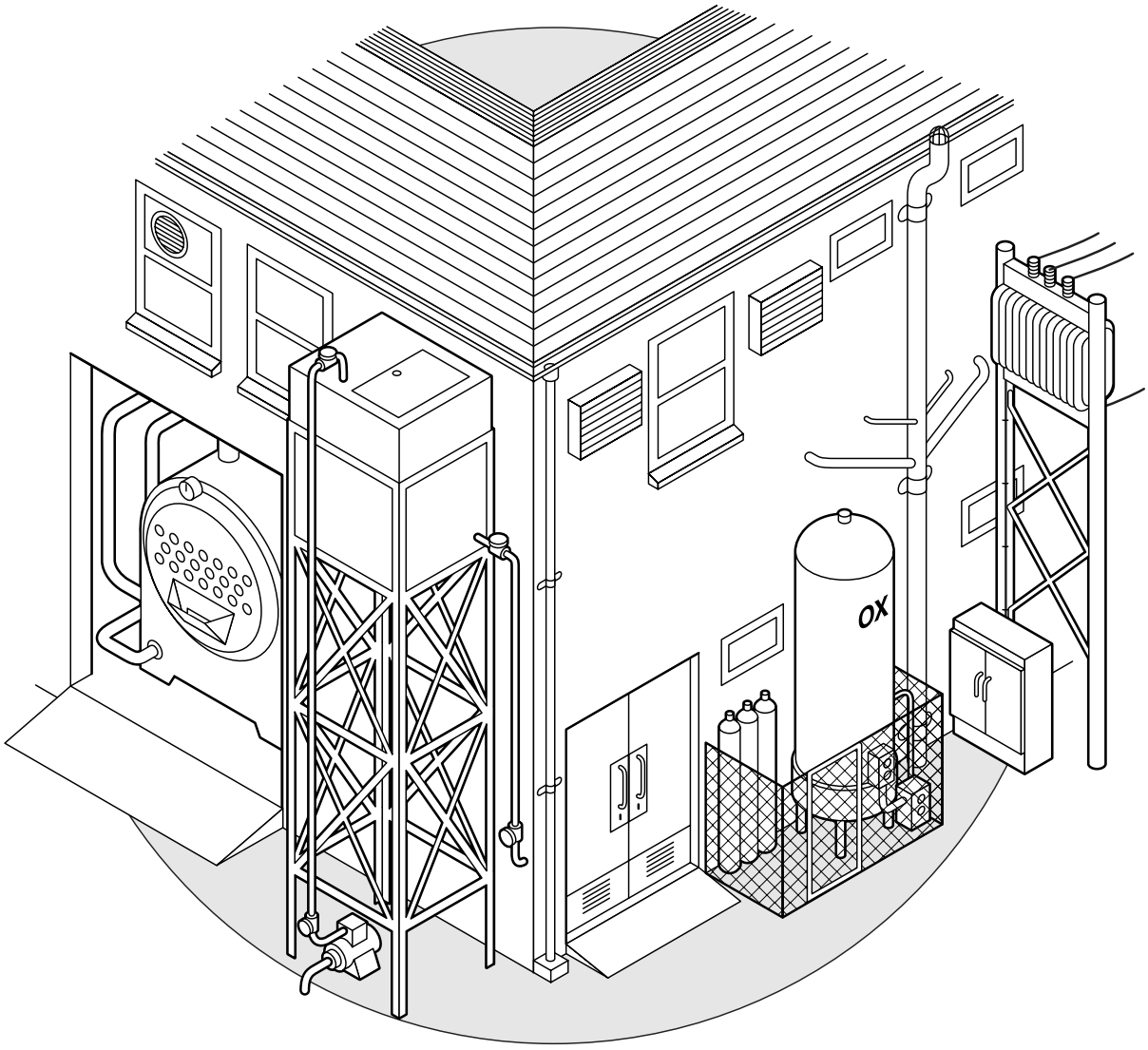
It is important throughout the process to inform the persons consulted of current progress with the project. It has been found that the people consulted and visited, the workshop attendees, and the senior supporters of the process all have their awareness and interest raised by being part of this process. Thus if there is no regular feedback they are left wondering what is happening and feel de-moralised. The Task Force must keep people informed of progress so that hope is sustained.

STEP 2
UNDERSTAND THE APPROACH TO BE TAKEN

This Step looks at:-

The Briefing required to:

- develop a critical number of staff with sufficient understanding and insight of health care technology issues;
- widen the general understanding of the policy development process to be followed, before it begins.



STEP 2 – UNDERSTAND THE APPROACH TO BE TAKEN

Instructions

It has proved to be beneficial if the staff involved in the policy development process start off with a Briefing which describes the overall concept behind the process and the approach to be taken.

Action By The *Task Force* and *Steering Committee* members.

What To Do a) Read the following Briefing Guidelines
b) Organize any additional measures necessary for 'priming' the people who will be involved in the process (see strategies below).

Some countries may already have a fairly well established system in place for health care technology management with a large number of different cadres involved. However many countries will need first to develop a critical number of staff with sufficient understanding and insight, who will then go on to execute the subsequent Steps in the process. Here are some possible strategies for increasing the number of different cadres who will support the process, enhancing the ownership of the project, and providing opportunities for generating a vision of the final goal, at an early stage in the process.

Additional Strategies

- A seminar for staff from all levels of the system as a capacity building exercise. They could be introduced to the health care technology package through the framework presented in the Briefing Guidelines here, and the background information provided for each component (see the series of Guiding Principles presented in each Study in Step 3).
- Study visits within the country to "well" functioning health care technology management units either government, NGO, or private.
- Study visits abroad to countries that have a generally well developed health care technology programme, or at least where some of its components are functioning well.

BRIEFING GUIDELINES

It is important for ministries of health to fully understand the resources available to the health care technology sector, the people involved, the factors which influence the effective use of technology, and the constraints within their current situation. Only from an informed position, can they propose recommendations for change which will improve the situation. A Situation Analysis produces ideas and recommendations which should feed directly into the development of realistic Health Care Technology Policies.

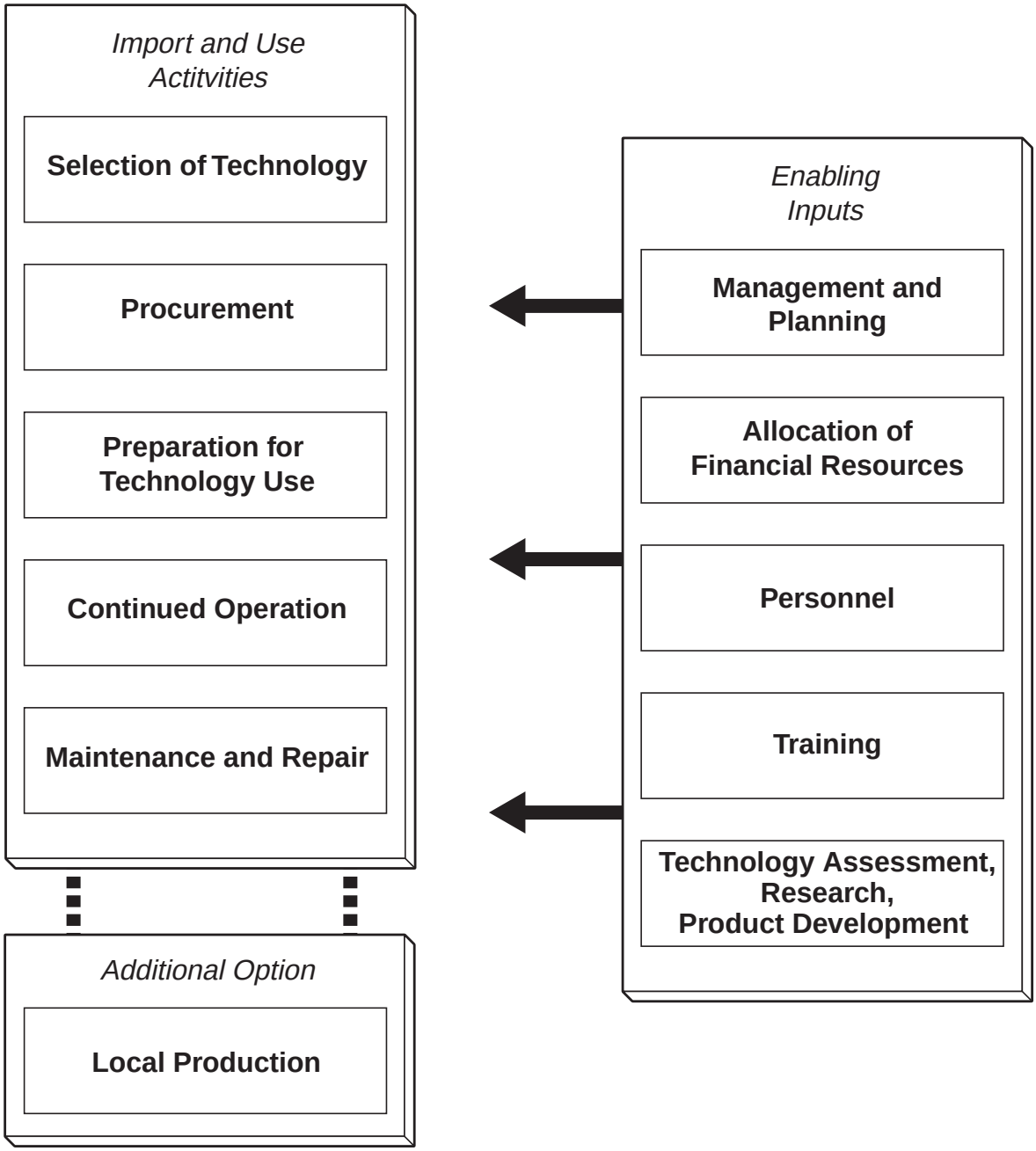
a. Framework for a Situation Analysis:-

The effective use of health care technology involves more than the purchase and installation of a piece of equipment. It requires a number of technical and administrative inputs. A number of institutions in the public and private sectors within importing countries and in the medical equipment exporting countries provide different kinds of services (e.g. procurement, technical consultancy, maintenance services, etc.). In addition, a number of international organisations and donor agencies are involved. However, the resources which are available are not well known

and, in consequence, are not well used. Furthermore, there exist a number of policies and administrative procedures which make the implementation of a more effective system of management of the health care technology service difficult in many countries[13]. The aim of the Situation

Analysis is to outline the resources available, identify the constraints which exist to their effective use, and propose measures which could be taken to improve the situation.

Diagram 1: The Health Care Technology Package



The Health Care Technology Package (HCTP)

The transfer of technology involves a package of inputs (see Diagram 1), only one of which is the actual piece of equipment. When equipment is acquired, all the following components of the package have to be provided:-

Management and planning. The effective use of imported health care technology has to be planned as an overall process. Both the immediate need to establish a functioning technology service and the longer term goal of increasing national and regional self-sufficiency must be kept in mind.

Allocation of financial resources. In most countries, the funds allocated for the purchase of technology, spare parts and maintenance services are much less than would be required to keep the service functioning. Existing regulations with regard to budgeting for depreciation, the procurement of imported spares, and payment for private maintenance services often prevent more effective use of resources. Often training requirements for the maintainers of technology are not included in training budgets.

Selection of technology. The assessment of technology requirements for health provision requires a team which includes health workers, technical personnel and planners. In many cases very little accurate information is provided to those who choose technology. There are a number of potential sources of the required information, and strategies are required to ensure that it is available, along with the capacity to utilise it, when decisions are being made.

Procurement. Effective procurement of technology and related fittings on the international market requires expertise. Where mistakes are made, the cost can be high. One issue requiring study is the functioning of the tender system. In many countries the only consideration is cost, with no attention being paid to the need to ensure effective after-sales support for example.

Preparation for technology use. There is a need for effective installation, commissioning, acceptance testing and user training for technology in the first instance which will require a combination of in-house maintenance units, other public sector workshops, suppliers and other technical support services. If these issues are not addressed adequately, technology may remaining non-functioning from the start.

Continued operation. The continuous use of technology must be planned for with an adequate supply of consumables. Many examples exist of ineffective or even dangerous use of technology, therefore plans are required for on-going safety and performance testing and refresher training courses for users. There needs to be an automatic and effective system in place for the disposal and replacement of equipment when it reaches the end of its life, only in this way will any health service offered to the community continue to be provided.

Maintenance and repair. Maintenance of health care technology is likely to involve a combination of institutions. These may include in-house units of the MOH, other public sector workshops, companies in a relationship with foreign suppliers, local private companies, small enterprises, and support provided by international agencies and donors. The mix varies with the complexity of the technology. Whereas in the industrialised world the supplier companies provide quite substantial after-sales services to buyers, this is not the case in many other countries. There is a need to identify new models for the provision of longer-term support to health sectors in the region by these companies. However, the establishment of an effective maintenance system is dependent on the level of commitment of the ministry of health and on its capacity to manage the use of the services offered by the providers of health care technology.

Personnel. It is essential to have health workers with the necessary skills for all aspects of the use, maintenance, and management of technology. Often such skills are lacking and the best use is never made of technology, or conditions are insufficient to retain the staff who are skilled.

Training. A number of forms of training are available for technology operation, application, maintenance, and management. These include formal degree courses, in-service training with the MOH, shorter courses provided in the region, and up-dating workshops run by supplier companies. A rationalisation strategy will aim to make the best of these resources.

Technology assessment, research and development. Very little research on appropriate technology is taking place in developing countries/regions. There may be scope for collaboration between regional institutions and research bodies in the health care technology exporting countries.

Local production. Opportunities for the local production of health care technology or spare parts may open up in the future, as more appropriate technologies are developed, and the market for basic items is stabilised.

Institutions Involved in the Health Care Technology Sector

The components of the health care technology package are provided by a number of public and private sector institutions within countries, regions, and abroad. A single institution, the MOH for example, may be responsible for a number of components of the package. On the other hand, some functions such as maintenance, may be provided by a whole variety of institutions. A well managed health care technology service will make good use of these resources. This requires an understanding of the local health care technology sector, and of the services available on the international market. Such information is not always available at present.

A Situation Analysis covers 4 broad categories of institutions involved in the health care technology sector:-

Users of health care technology: Public and private hospitals and co-ordinating bodies such as the MOH, other ministries with a major involvement in the provision of health services, and the Mission Hospital Association.

Public sector maintenance workshops: The major public sector workshops which provide maintenance services to the health sector, or with the capacity to do so, including workshops within MOH and those operated by other ministries.

Private sector institutions: Distributors, manufacturers, agents for international suppliers, and independent maintenance contractors.

The national support environment: A number of institutions (various ministries, the Tender Board, professional associations, training establishments, and foreign donors who provide support to the health sector) have functions with relevance to health care technology.

The Situation Analysis undertaken will seek to identify those procedures and regulations which work effectively, and those which create constraints to the rationalisation of the sector.

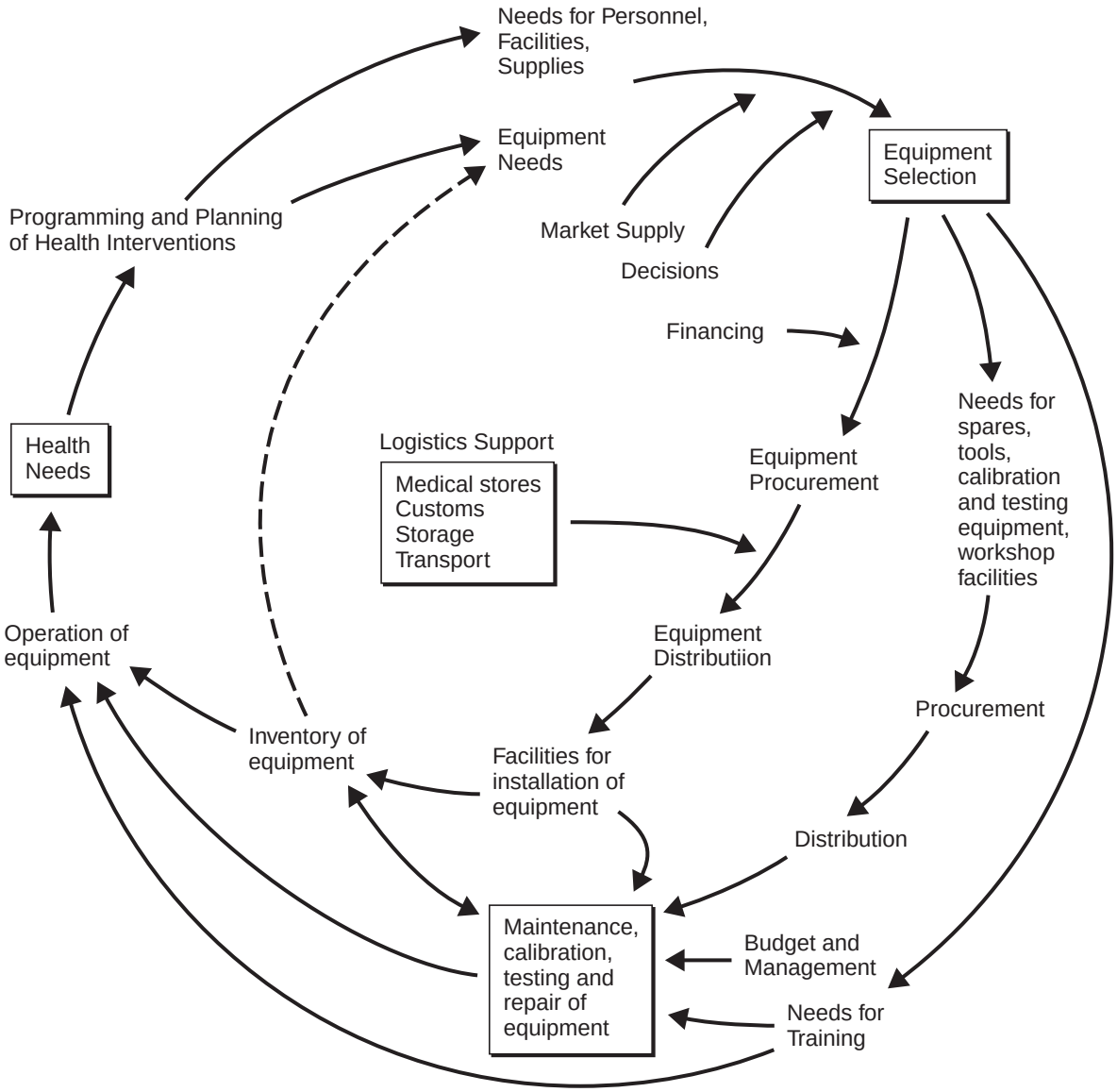
The framework has 13 Study Areas: 2 Background Study Areas which provide brief statements of the kinds of information required, and questions to help you describe your country's situation; and 11 Procedure Study Areas which provide guiding principles for an 'ideal' situation, and questions designed to help you analyze your own circumstances. Each study area is laid out with sub-headings to help you through the various topics. These sub-headings are used as 'signposts' throughout the Manual. The data gathered will be written up into a Situation Analysis document.

b. Widening Participation:-

The data gathered in the Situation Analysis needs to be presented to a wider audience in order to: be verified, raise awareness, find solutions to problems, and consider new models which will encourage longer-term planning of the health care technology service. A National Workshop is a suitable forum for such a presentation, and the attendees should come from various backgrounds with differing involvement in technology management, such as: users, maintainers, managers, and suppliers of technology, etc.

A great number of people from different health facilities, levels of administration, and sections of government make decisions every day which affect the life of health care technology (see Diagram 2). Thus technology management cannot be divorced from the policies and practices of the health service as a whole. Many of these 'players' work in isolation from the technology itself, and have no idea of the implications of their decisions. Those who do work directly with technology equally have little understanding of the other administrative constraints which affect them. This can lead to lack of collaboration between the different sections to reach the most appropriate and workable solutions.

Diagram 2: Interlinking Decisions and Activities that Affect the Life of Health Care Technology



This information is taken from: WHO, 1987, *Interregional Meeting on the Maintenance and Repair of Health Care Equipment, Nicosia, Cyprus 24-28 November 1986*, WHO/SHS/NHP/87.5, page 105.

Many of the participants attending the National Workshop will not realize the range of problems found in the health care technology sector and experienced by the Ministry, will be very interested in the issues presented, and will contribute positively to the main aim which is to develop "functional alternatives" to the constraints identified. Initially the participants will develop recommendations for change to address the constraints identified in each component of the Health Care Technology Package. A number of major common needs will emerge from these recommendations, and the participants will proceed to develop more detailed solutions for these 'key issues'.

c. Framework for Formulating Policy:-

The Situation Analysis and National Workshop will provide an understanding of: the resources available to the health care technology sector; the people involved; the factors which influence the effective use of technology; the constraints within the current situation; as well as recommendations for the resolution of the problems. From this informed position, the Ministry of Health can take the ideas and plans for change which were produced and feed them directly into the development of realistic policies.

The Policy Document is structured around the Situation Analysis format, using the 'signposts' provided to enable consideration of all the issues to be addressed. Objectives will be developed for each study area, and strategies will be developed for each sub-heading. The strategies are obtained by translating the recommendations for change into statements of intent.

If technology is to be managed effectively, several major policy issues will have to be addressed by MOH itself and in discussion with other bodies, such as: ministries of finance, works, and external aid, as well as agencies dealing with public service conditions and tender procedures. The framework has 5 stages covering the drafting of the Policy Document, consultation on its contents, costing its implications, and its revision.

d. Ensuring Change:-

New policy is only of any use if it is followed by action. Procedural guidelines need to be developed for its implementation, as well as a timetable to ensure the implementation goes ahead. The Policy will only be implemented effectively if it is disseminated widely and staff are trained in its use. A valuable part of the process is to monitor and evaluate the policy in action so that it can be modified or steered to achieve total acceptability and applicability.

STEP 3
UNDERTAKE A SITUATION ANALYSIS

This Step looks at:-

Part A: Background – The Health Care Technology Environment, by covering 2 Background Study Areas

Part B: Procedure – Current Management Practices within the Health Care Technology Package (HCTP), by covering 11 Procedure Study Areas

STEP 3 – UNDERTAKE A SITUATION ANALYSIS

Instructions

In order to develop an effective health care technology policy appropriate to your country, the Ministry of Health needs to have sufficient information available to understand the current situation in detail. The situation in your country can be studied by following the framework provided here.

The framework is structured in two parts:-

Part A – Background the **health care technology environment** in your country (Background Studies 1 & 2);
Part B – Procedure how the **components of the health care technology package** (HCTP) are currently undertaken (Procedure Studies 3–13).

Within these 13 Studies, the framework covers various issues. In Part A, each study begins with a brief statement of the kinds of information required, and in Part B each study begins with a presentation of the kinds of activities which should occur. These "ideal" descriptions are followed by some questions designed to prompt the process of analyzing your situation, and identifying the strengths and weaknesses in your own country. Each study ends with the chance to consider any recommendations for change for the constraints identified.

Action By The *Task Force*.

What To Do
- Consider the issues as described.
- Visit, meet, and discuss the issues with many people – see Step 1, section F1.
- Answer the questions shown in *italics* thereby assisting you to analyze the situation and identify the strengths and weaknesses in your country.
- Make use of the numbering of the questions in order to keep track of which ones have been answered, especially if the responsibility for answering them is divided amongst different members of the Task Force.
- Tabulate the answers wherever possible or useful; this will aid understanding and make later presentations easier.
- If possible, consider any recommendations for change for the constraints identified (these ideas should be taken forward to the National Workshop where functional alternatives for the future will be developed – see Step 4).
- Write up the Situation Analysis findings for dissemination to a wider audience and the National Workshop.
- Make use of the framework format (sections and sub-headings) as a layout for the findings in your Situation Analysis document; these 'signposts' will be useful later on.

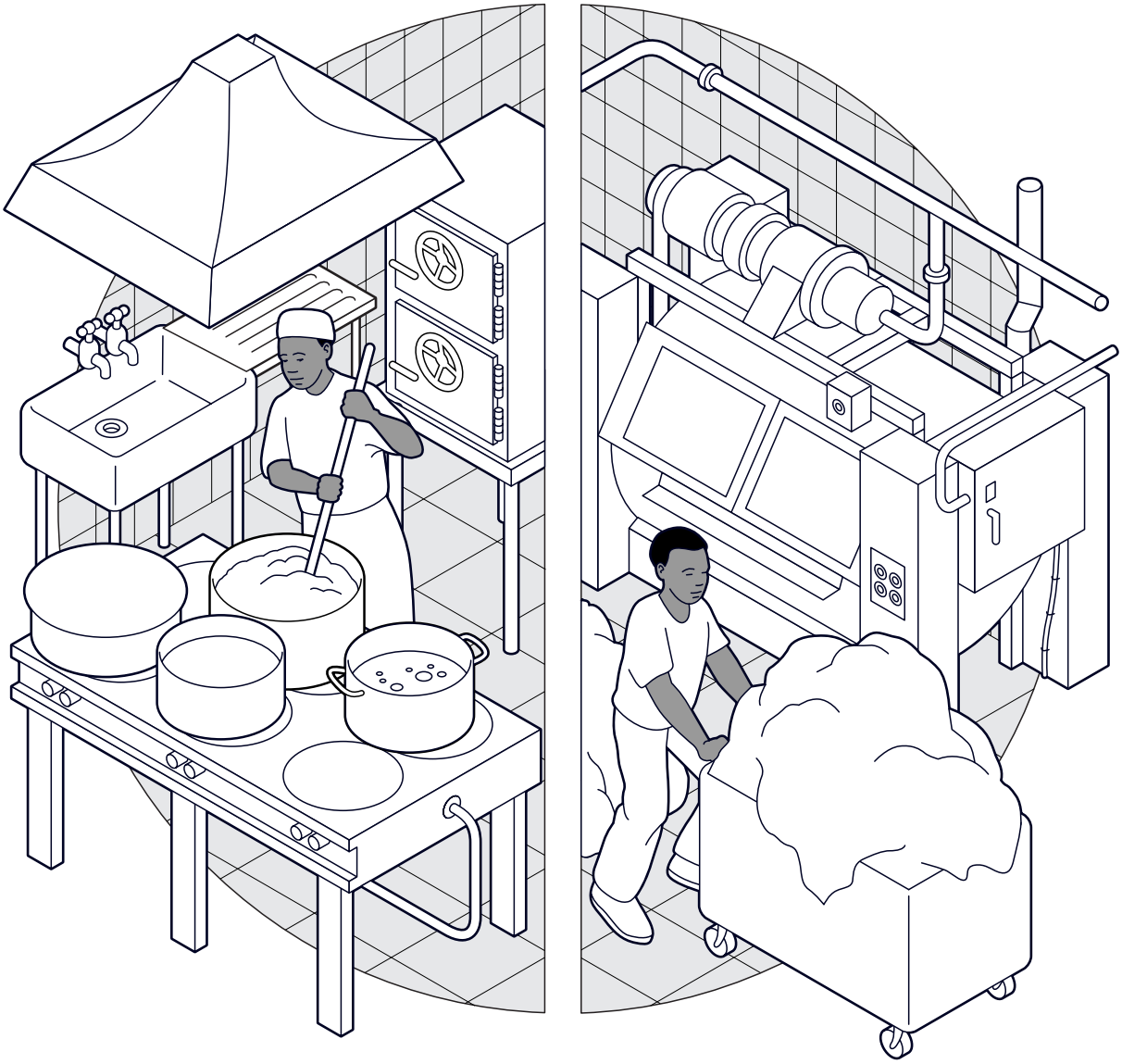
Additional Strategies
- Since the effectiveness of health care technology management is influenced by by several other sector ministries (such as Works, Supplies, etc), the MOH should negotiate with the other ministries involved to carry out their own Situation Analyses according to the 11 Procedure Study Areas.
- If the MOH has a particular pressing problem (such as selection, or maintenance) they could, outside the policy development process, use a specific relevant Study Area (or combination of Areas) to undertake a rapid assessment of a particular component of the health care technology package.

Step 3: Part A

The Health Care Technology Environment

This Part looks at the Background through:-

Study 1: The Health Sector of your Country
Study 2: Institutions involved in Technology Management



Step 3: Part A – The Health Care Technology Environment

Instructions

Part A of your Situation Analysis enables you to cover the Background by describing the environment in which health care technology operates.

These issues are discussed in:-

Study 1: The Health Sector of your Country

This includes a look at the health of the nation, how the health sector operates, and the health care delivery system.

Study 2: Institutions involved in Technology Management

There is a wide range of staff from many different disciplines (administrative, technical, medical, etc.) who make decisions every day which affect the life of health care technology. Most of these people work in isolation from the technology itself, and have no idea of the implications of their decisions.

Those who do work directly with technology equally have little understanding of the other administrative constraints which affect them. This can lead to a lack of collaboration between the different sections for reaching the most appropriate and workable solutions.

Also there is a wide range of public and private institutions which have a role to play in the life of technology, thus it will be necessary to look at the role of different divisions of the MOH, other health care providers, other government departments, local and foreign suppliers of goods and services, as well as external support agencies.

Action By The *Task Force*.

What To Do

- For each Study, read the statements describing the kinds of information required.
- Undertake any research necessary and compile data.
- Answer the questions in *italics*.
- Write up your findings under each sub-heading (signpost).

Study 1 – The Health Sector of your Country

1.1 Introduction

This section should provide a brief background to the health sector.

1.1.1 What is the population of your country and where are they mainly located?

1.1.2 What are the prevailing climatic, industrial, economic, social conditions, etc.?

1.1.3 What has been the overall direction of development of the health service against such a background?

1.2 The Referral Network

This section should briefly describe how the network of health facilities provides a mixture of services.

1.2.1 What are the different types of health facilities in your country (referral hospital, district hospital, clinic, etc.), and what different level of services do they provide? What are the average bed numbers, staffing norms, and population served for each type? Can this information be tabulated?

1.2.2 Are there any problems with this network; have norms not been developed, etc.?

1.3 The Major Providers of Health Services

This section looks at the at the relative size and function of the different health care providers.

1.3.1 For your country, summarise (tabulate) the number of health facilities (and their bed numbers) per region and per each facility type. This summary should include facilities belonging to government, mission, mine, private, defence and any other health providers.

1.3.2 What is the legal status of the providers; does MOH have overall responsibility for health in your country; does it set general goals, priorities and direction for the provision of health services in your country as a whole?

1.3.3 Are there any problems with co-operation between the different health care providers; how does co-ordination take place?

1.4 The Growth of the Health Sector

This section summarises the expansion in the health sector in the past, up to the present day. The information can be tabulated.

1.4.1 How has the health sector expanded over the past decades? Has there been an increase in the total number of facilities; and increase in total bed numbers? Has investment concentrated in certain types of facilities and not others?

1.4.2 How has the size of the health sector workforce expanded? Are there still shortages of certain skilled personnel?

1.4.3 Has expenditure on public health services grown? How have development budgets changed? What of recurrent budgets, have they matched the increased staffing and recurrent requirements of development projects?

1.4.4 What have been the problems/constraints?

1.5 Development Priorities for The Future

This section examines any planned expansion for the health sector in the future. The information can be tabulated.

1.5.1 Are there any planned health facility upgrading projects? Will they substantially increase the number and size of facilities?

1.5.2 Are there any planned development budgets over the next 5 years for MOH? What are they as a % of public sector development expenditure as a whole? What are the planned recurrent budgets over the same period for MOH, and as a % of public sector recurrent expenditure as a whole?

1.5.3 If expansion is being planned, how much is being funded by government and how much by other funding agencies?

1.5.4 If there are health projects, how many include funds for the purchase of equipment? Is it possible to tell how much money is to be invested in equipment over the next 5 years?

1.5.5 Is there a separate project specifically for equipment purchase, so that equipment can be purchased whether a facility if being upgraded or not?

1.5.6 Do the other health care providers have planned investment programs for upgrading their facilities, and for purchasing equipment?

1.5.7 Are there any planned development budgets/projects for MOW which will enable them to invest in replacement plant at MOH facilities? What are the planned recurrent budgets over the same period for MOW that will be used to maintain MOH facilities and plant, and as a % of public sector recurrent expenditure as a whole?

1.6 The Problem of Health Care Technology

This section briefly summarises the perceived major problems/constraints concerning equipment in health facilities.

1.6.1 What seem to be the major problems with equipment at present? For example, are their shortages; is much equipment not functioning; is there an insufficient system for maintenance and repair; is equipment too sophisticated in some facilities?

1.7 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Study 2 – Institutions Involved In Health Care Technology Management

In this section, consider all the different institutions involved in health care technology management in your country; it can be surprising to discover how many people take decisions, and perform functions which affect the daily life of equipment.

2.1 Ministry of Health (MOH)

This section tries to identify all the people involved in the central MOH who are making decisions that affect the life of equipment.

2.1.1 What are the different divisions in the MOH which have a role to play in health care technology management, and what are their responsibilities? [i.e. departments dealing with primary health care and specialised facilities; those dealing with particular vertical programmes (radiography, laboratory, orthopaedic services); those responsible for equipment users and maintainers, their recruitment and training; those in charge of the budgets, supplies, procurement; those who make plans and develop procedures, etc.]

2.1.2 How are these departments co-ordinated for health care technology issues?

2.1.3 What are the problems/constraints with the system as it is now?

2.2 Decentralised Health Bodies

This section tries to identify all the people involved in the de-centralised bodies of the MOH (regional health directorates, etc.) who are making decisions that affect the life of equipment.

2.2.1 What are the different de-centralised bodies of the MOH and what are their responsibilities?

2.2.2 What role do the decentralised bodies play in health care technology management, and what are their responsibilities? [ie. do they procure equipment, contract maintenance, hold budgets for technology activities?]

2.2.3 How are their actions co-ordinated with those of the central MOH with relation to equipment management issues?

2.2.4 What are the problems/constraints with the system as it is now?

2.2.5 Do health facilities have any authority over their health care technology or are all decisions made for them elsewhere?

2.3 Other Providers of Health Care

This section looks at other health care providers such as mission, mine, private, defence force, etc.

2.3.1 How do the other health care providers manage equipment? Within each organisation/ network of facilities, does each health facility operate independently in matters concerning equipment? Or do the organisations have equipment policies and guidelines that cover all their health facilities?

2.3.2 How do the health care providers: address the issue of standardisation; provide maintenance services; undertake procurement, etc.?

2.3.3 Do the other health care providers use makes and models of equipment which are different from those found in the public sector?

2.3.4 Do the other health care providers have links with MOH in order to share information and advice relating to equipment, such as: norms, standards, sources, safety protocols, maintenance and training resources, registered suppliers and contractors, etc.?

2.3.5 What are the drawbacks with the system as it is now?

2.4 Other Government Departments

This section describes which other government departments are involved in equipment management issues, such as departments of Works, Transport, and Supplies, as well as the Tender Board, etc.

2.4.1 What other government departments (in which ministries) are involved in the purchase and maintenance of equipment for health facilities? What are their roles in equipment matters?

2.4.2 What are the problems with their performance and the system as it is now?

2.4.3 Is there an established structure for inter-ministerial discussions concerning the problems of the management and maintenance of equipment in health facilities?

2.5 Sources of Supply – Local and Foreign Private Firms

This section considers organisations such as: equipment manufacturers, suppliers, packaging/ turnkey agents, consultants, maintenance contractors, and training institutions.

2.5.1 Can you identify the major sources of supply to the MOH for equipment related activities and the countries they are from? [ie. tabulate the number of manufacturers from different countries; the number of companies which are subsidiaries/agents of a parent company from different countries; the number who are simply suppliers from different countries; the number of turnkey operators, consultants; and those offering maintenance work only, etc.]

2.5.2 How many of these providers of equipment services are companies from your country? In your country, do most companies sell other peoples' products, or offer maintenance support, rather than actually manufacture equipment? Do any companies manufacture equipment in your country?

2.6 Funding Agencies and Donors

This section summarises the external aid organisations who provide support to the equipment sector for MOH.

2.6.1 Who are the major funding agencies and donor organisations providing support to equipment, i.e. whose projects include the supply of equipment, who donates equipment, who provides assistance to support maintenance or management of equipment?

2.6.2 Are there any problems with these arrangements?

2.7 Recommendations

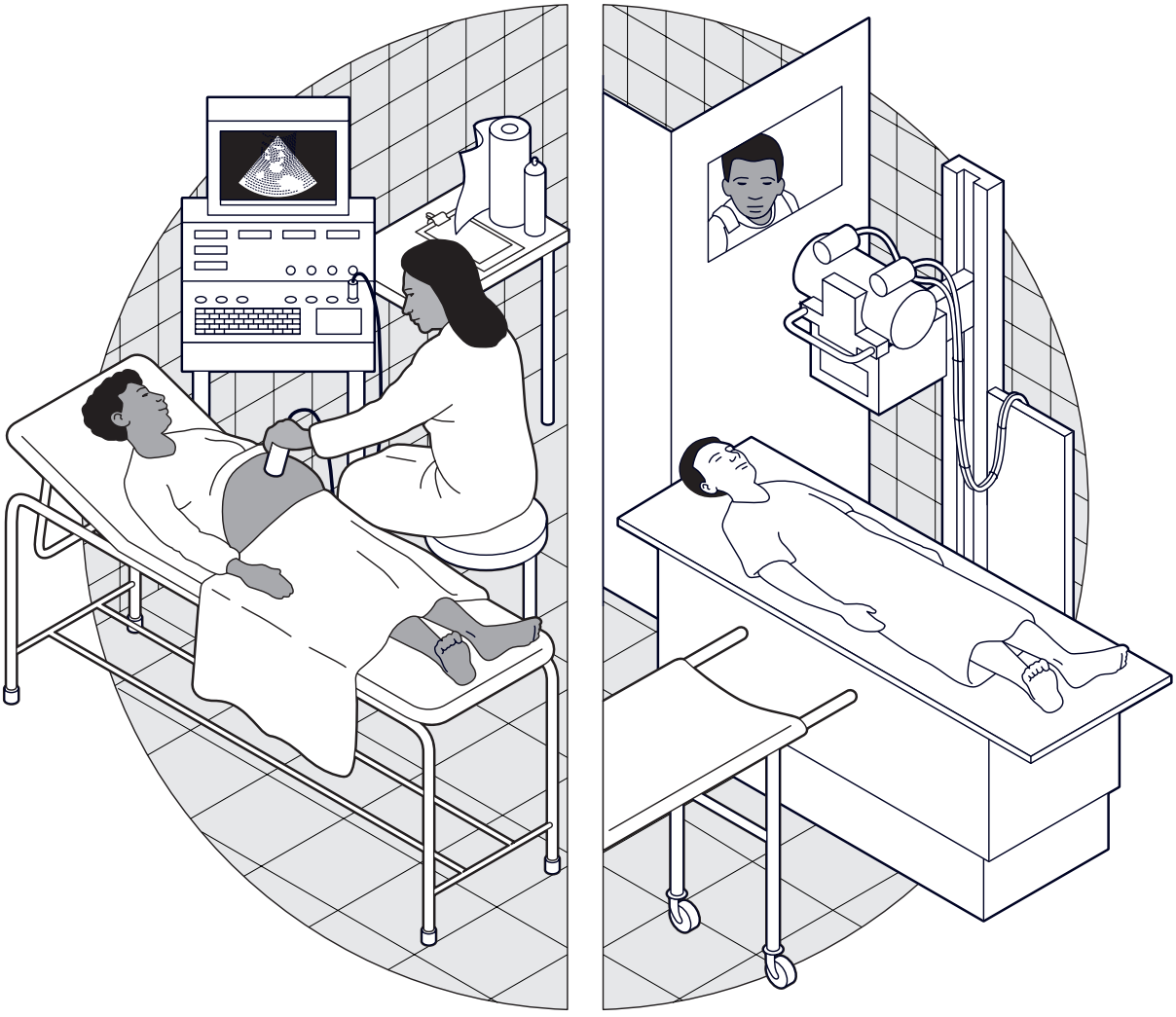
Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Step 3: Part B

Current Management Practices within the Health Care Technology Package (HCTP)

This Part looks at Procedures through:-

Study 3: Management and Planning
Study 4: Allocation of Financial Resources
Study 5: Selection of Technology
Study 6: Procurement
Study 7: Preparation for Technology Use
Study 8: Continued Operation
Study 9: Maintenance and Repair
Study 10: Personnel
Study 11: Training
Study 12: Technology Assessment, Research & Development
Study 13: Local Production



Step 3: Part B – Current Management Practices within the Health Care Technology Package (HCTP)

Instructions

Part B of your Situation Analysis enables you to cover current Procedures by describing the management of health care technology in your country.

The acquisition of a piece of equipment represents the introduction of a new technology into the health care environment. The successful adoption of such a technology involves a number of activities in addition to the purchase of the hardware, including: staff training, supply of consumables, maintenance, and development of safety procedures. The framework provided here refers to this full range of activities as the "health care technology package"; and this is the subject of Part B. The components of the package are discussed in Studies 3 to 13, as follows:-

- **management and planning (Study 3);**
- **allocation of financial resources (Study 4);**
- **selection of technology (Study 5);**
- **procurement (Study 6);**
- **preparation for technology use (Study 7);**
- **continued operation (Study 8);**
- **maintenance and repair (Study 9);**
- **personnel (Study 10);**
- **training (Study 11);**
- **technology assessment, research and development (Study 12);**
- **local production (Study 13).**

Action By The *Task Force*.

What To Do
- For each Study, read the Guiding Principles which present the kinds of activities which should occur (the 'ideal' situation).
- Undertake any research necessary and compile data.
- Answer the questions in *italics*.
- Write up your findings under each sub-heading (signpost).

Study 3 – Management and Planning

3.1 Guiding Principles

Establishment of a management structure. The first step a MOH needs to take to improve their management of health care technology is to establish a health care technical service (HCTS) with the capacity and authority to oversee all aspects of health care technology[1]. This service would be the organization within the health sector that employs technical staff. Such a National Technology Management Division (NTMD) should have: a head office within the Ministry itself led by the most senior technical manager; a national network of workshops making use of technical staff to cover maintenance as well as equipment management tasks; and Technology Management Units (TMUs) in decentralized health authorities and health facilities, responsible for overseeing daily equipment management activities through a combination of technical and other health staff.

The Division must establish mechanisms to improve co-ordination between the many players and organisations involved in the health care technology sector (see Step 1, section F). It will be essential to make technology management philosophy and practice operational at all levels (central, regional, district, and facility). Other management bodies will also be required, such as Technology Advisory Committees (TAC).

If the MOH is not in control of all health care technology and other government bodies play a significant role in managing particular types of technology (ie. Works, Water, Local Authorities), these bodies will also need to address their management capabilities and develop health care technology management structures.

Formulation of plans. Box 3.1 outlines a process for the formulation of a health care technology expenditure plan. An inventory needs to be undertaken to identify the amount of technology that the health service owns and its state of repair. The minimum complement of technology required to deliver the necessary health care at each level must be defined. A standard list of essential technology should be prepared for each kind of facility. It is then possible to calculate shortfalls and estimate how much technology is needed to equip existing facilities fully. Only when this core health care technology has been funded should attention be given to additional sophisticated items.

Box 3.1 Formulation of a Core Technology Expenditure Plan (CTEP)

Identifying the health care technology stock and requirements:

- Undertake an inventory of the stock of health care technology and document its state of repair.
- Clarify the functions of each level of health care service delivery.
- Establish standard lists of health care technology for each kind of facility.
- Calculate the size of the shortfall of technology in existing facilities.
- Assess the health care technology needs of new facilities.

Calculating expenditure required:

- Estimate the cost to replace worn out health care technology.
- Estimate the cost of maintenance, including spare parts and service contracts.
- Estimate the cost of consumable items and replacement of worn out accessories.
- Estimate the cost of training staff to use and maintain the technology.
- Estimate the cost of preparing sites and installing equipment.
- Define a core expenditure plan which estimates the amount of money required to ensure that all facilities are provided with functioning health care technology at the level defined by the standard lists by the end of a specified period (possibly 5 or 10 years).

The MOH needs to have a clear policy on health service delivery and needs to have defined its Health Goals. It must decide what health care is to be provided at each level (eg. which facilities should provide Caesarean deliveries; which laboratory tests should be undertaken where, etc), and develop Essential Service Packages which are realistic, appropriate, and affordable. This makes it possible to develop rational standards for health care technology needs.

As soon as health care technology is purchased it begins to deteriorate and will eventually reach the end of its useful life and need to be replaced. Replacing technology simply maintains the status quo; it is neither an extravagance nor an expansion of services. However effective replacement requires forward planning, budgeting, and mechanisms which enable equipment to be condemned, written-off, and automatically replaced, if each activity (eg. dentistry, eye testing, physiotherapy, autoclaving) is to be offered continuously without a break in the service.

A Human Resource Development Plan will need to be produced and costed (see Studies 10 & 11) to cover the skills development required for all staff involved with health care technology (eg. users, maintainers, managers).

Once a MOH has developed its own health care technology plans, it is in a much stronger position when negotiating with external support agencies for support to this sector.

Organisational procedures and guidelines. The management of health care technology is affected by the activities of many parts of the health care delivery system. For example, the departments involved include those responsible for supply, finance, personnel, training, planning, and equipment use and maintenance. Their procedures affect the provision of adequate technology services (eg. financial rules which deny a petty cash system to cover the daily needs of a workshop, training plans developed without the inclusion of any equipment maintenance training scholarships).

In addition, staff need guidelines which outline the correct procedures to follow (such as, how to request support from the correct maintenance organization, where to order equipment accessories from, when requisitions for new equipment can be submitted, who can procure items up to a certain value). A Technology Procedures Manual (TPM) will detail the procedures for staff to follow for each technology management activity (selection, maintenance, etc), and should cover the different procedures at central, regional, district, and facility level (see Step 6, Action 2).

Monitoring, supervision and feedback. Part of the organisation of technology-related activities is the identification of problems and needs. All technology-related activities should be monitored and the performance of technology, staff, and departments should be supervised (this applies to all clinical, technical, and support departments). Staff need feedback on their activities, and answers to their queries, in order to benefit from experience and feel a part of the system as a whole. In order to obtain the facts necessary for planning, and to find out how technology-related activities are performed, it is important to have some methods of collecting information (such as, the numbers of equipment not functioning, consumable usage rates, equipment shortages, training deficiencies). It may be possible to incorporate this data gathering into any existing Health Management Information System (HMIS). This will help enable evidence-based planning to take place.

Communication. The MOH needs effective communication channels with all parties involved in health care technology management, ie. ministries of finance and works (regarding constraints and collaboration); other health care providers (regarding sharing policies, standards, information, and strategies); and users (regarding correct procedures, future plans), etc.

Legislation. The MOH needs to investigate any medico-legal implications of using high technology items on patients, by staff, and around the public/visitors (eg. ethical issues, policing of national standards, risks, litigation, etc).

3.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

Establishment of a Management Structure

3.2.1 Is there a division within the MOH responsible for equipment management? Is it linked to a national network of maintenance workshops, or technology management units in health facilities and decentralized health authorities? Is there a Chief Clinical or Hospital Engineer in charge of all health care technology issues? Is advice sought from technical personnel when equipment issues arise? Is there much awareness of equipment issues at Ministry level? Are there Technology Advisory Committees?

3.2.2 In Study 2.1 you will have identified many departments involved with equipment issues, are their relative roles in the selection, purchase and maintenance of equipment clear?

3.2.3 In Study 2.2 you will have identified the role of decentralised health bodies, are they part of the equipment management structure? Are there any problems with the operation of technology management practices at the different decentralised levels? What technology management decisions can be taken at facility level?

3.2.4 In Study 2.4 you will have identified many other government departments involved with equipment issues, are their relative roles in the selection, purchase and maintenance of equipment clear?

3.2.5 In Study 2.3 you will have identified other health-care providers, is there any liaison with MOH concerning equipment issues?

Formulation of Plans

3.2.6 What plans and policies are there? Do you have:-

- an equipment inventory;
- a definition of health goals and essential service packages;
- standard equipment lists linked to the defined health goals;
- an equipment purchasing policy;
- an equipment replacement policy;
- realistic recurrent expenditure plans;
- a human resource development plan for the health care technology sector;
- a coherent technology negotiating position for discussions with external support agencies?

Organizational Procedures

3.2.7 What organisational procedures and guidelines are there? Some procedures may hinder the provision of effective equipment services. Other procedures may be unknown to health personnel, who need guidelines to explain how the systems work, such as:-

3.2.7.1 Is it clear which divisions within the MOH and its decentralised bodies hold budgets for different aspects of equipment use (eg. purchase of new and replacement equipment, purchase of consumables, purchase of spare parts, purchase of maintenance support)? Do the budget holders vary for different types of equipment (laboratory, kitchen, operating theatre, etc.)?

3.2.7.2 Is it clear at health facility level how they get hold of:-

a. New and replacement equipment items, and which organisation they must order them from (medical stores, general stores, other bodies, etc.)? Do the

procedures vary if the items are simple or complex items (oxygen gauges or diathermy units), or for different price levels?

b. Different equipment consumables (electrodes, ultrasound gel, ECG recorder paper, laboratory reagents, x-ray film developer, soda lime, etc.), and which organisation they must order them from (medical stores, general stores, other bodies, etc.)?
c. Replacement equipment accessories (patient leads, diathermy electrodes, breathing circuits, cuvettes, lead aprons, etc.), and which organisation they must order them from (medical stores, general stores, maintenance workshop, other bodies, etc.)?
d. Maintenance support (a service contract, support for a breakdown/ repairs, PPM, etc.), and which organisation they must order it from (central maintenance workshop, other bodies, etc.)?

3.2.7.3 Is there a maintenance management system with: job request/fault reporting forms, equipment identification codes, equipment histories, records of contractors' visits, write-off certificates, etc.?

3.2.7.4 At health facility level, are the management teams aware of equipment issues and problems, and do they use the laid-down procedures for procurement, operation and maintenance of equipment?

3.2.8 Have all these different procedures and guidelines been compiled into a Technology Procedures Manual? Is it clear how the procedures differ for staff at central, regional, district, and facility level?

Monitoring, Supervision, and Feedback

3.2.9 What monitoring, supervision, feedback and quality control is there for equipment?
a. Is there adequate supervision of equipment use and safety?
b. Are there national peer group meetings for different cadres?
c. Are there national regulatory bodies to provide professional support?
d. Does MOH regularly consult staff in the districts on equipment issues?
e. Is there a channel for feedback from users on poor performance of equipment which will make a difference to subsequent purchases?

3.2.10 Is there a unit which collects information from all health facilities and compiles statistics? Is there a HMIS? Are these routes also used to regularly collect data about equipment, such as numbers of: non-functioning equipment, outstanding repair jobs, visits by different maintenance bodies, etc.

3.2.11 Is evidence-based planning undertaken for health care technology? How is such a system implemented – what data is collected by whom, at what levels, for which decisions?

Communication

3.2.12 What communication channels are there to discuss health care technology issues with the other bodies involved in its management?
a. How are important issues for discussion entered into with, for example, ministries of finance and works?
b. Does the MOH share information, standards, and initiatives with other health care providers?
c. Does the MOH oversee health care work undertaken in the private sector?
d. Could a suitable forum be established, or regular meetings set-up to ensure collaboration within this field?

Legislation

3.2.13 Does the MOH take any role in investigating and pursuing the medico-legal implications for the use of high technology equipment? Does its jurisdiction only cover the public sector, or do they monitor the activities in the private sector as well? What are the ethical issues, risks, and litigation possibilities?

3.3 Recommendations

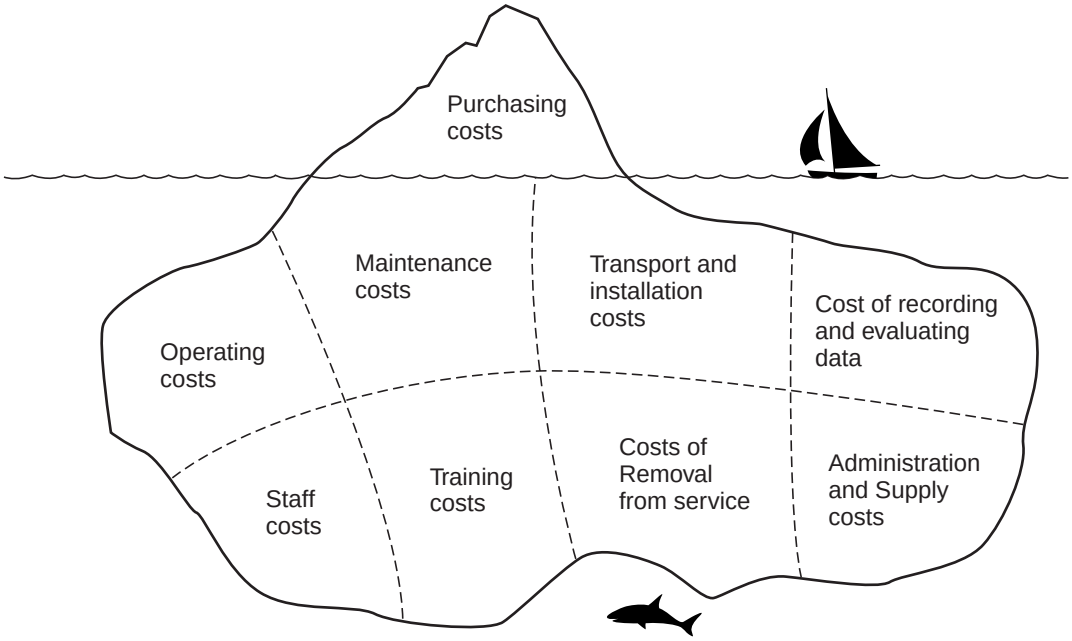
Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Study 4 – Allocation of Financial Resources

4.1 Guiding Principles

It is important to remember that most costs related to health care technology are hidden, this is illustrated in Figure 4.1 by the use of the image of an iceberg[14].

Figure 4.1 The Iceberg Syndrome in Life Cycle Costs of Health Care Technology



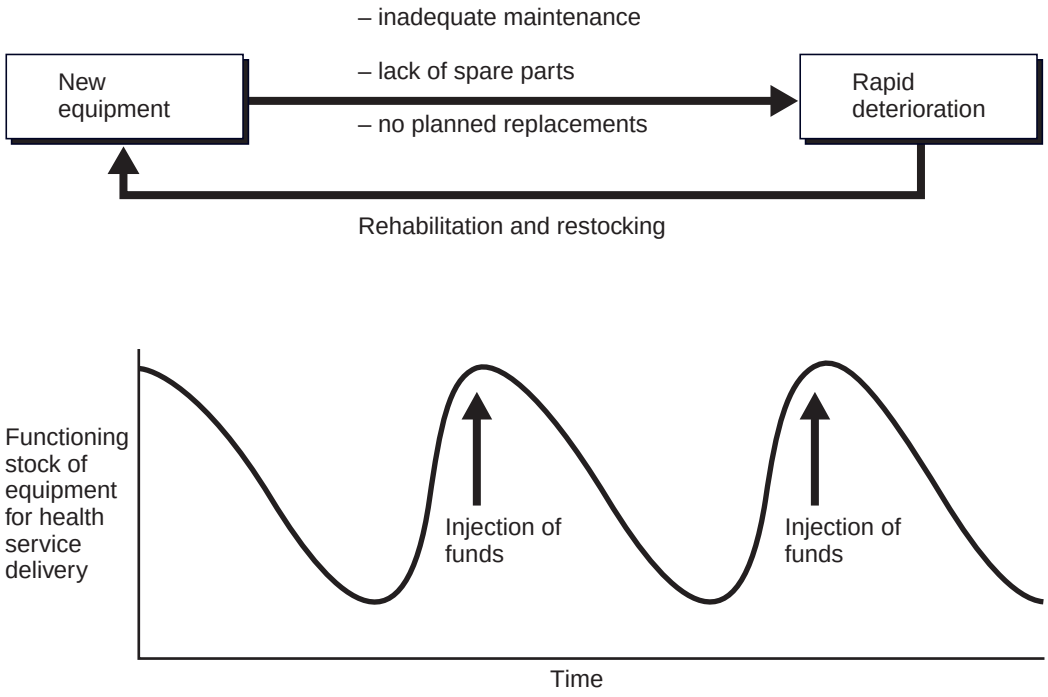
Source: Pfeiff H, *Hospital Engineering in Developing Countries,* GTZ, 1986

It is also important to recognize that there is a recurring cycle in the equipment sector in a number of countries, as shown in Figure 4.2, whereby: new equipment is purchased; its effectiveness decreases rapidly due to unskilled use, poor maintenance, and insufficient investment to support it; a crisis occurs because so much technology is non-functioning that health service delivery is compromised; and a new round of procurement takes place. The injection of funds required for purchases may be found locally during a period of relative prosperity, or by an external support agency. This cyclical approach to funding is costly and provides little benefit to patients, since the quality of the health service delivered is never constant and goes through frequent periods of deterioration.

Planning expenditure In order to avoid such wastage, health services need to prepare expenditure plans which estimate annual requirements over a period long enough to achieve rationalisation – perhaps ten years. Resources need to be allocated to cover the life-time cost of the equipment, which will comprise many factors including purchase, installation, operation and maintenance. All of this information can be summarised in a core technology expenditure plan (see Box 3.1, Study 3).

Frequently budgets are not structured to sufficiently delineate between different types of expenditure (eg. maintenance for equipment as opposed to maintenance for buildings and grounds), nor to sufficiently differentiate between expenditure points (ie. to show maintenance expenditure by facility); this makes planning difficult.

Figure 4.2 The Health Care Technology Cycle



Budgeting for depreciation. The expenditure plan should provide for the replacement of worn out equipment (depreciation). Most equipment needs to be replaced within 5-20 years depending on the type of technology (eg. typically 5 yrs for an ecg monitor, 10 yrs for a suction pump, 15 yrs for an operating table, 20 yrs for an electricity generator)[15]. It should be noted that the useful life of equipment can be shortened by a harsh environment, frequent use, unskilled handling, and neglect of maintenance. By taking the average life-time, a reasonable estimate of the cost to retain the status quo of the health service is 10% of the technology stock value every year. This will simply cater for the normal demise of the proportion of existing stock which will reach the end of its life in any given year. If many years go by without an annual replacement budget, the MOH will find a critical reduction in the health services they can deliver, and will ultimately face the major capital investment implications of having to undertake bulk replacements all at once[16].

It is common for ministries to try to cover replacement needs by using some of the development funds allocated for health facility upgrading projects. Although this may help on a one-off basis, there remains the problem of the facilities which fall outside the upgrading programme, as well as the immediate needs of facilities who must wait several years before upgrading begins. Alternative strategies are required to cater on a continuous basis for annual requirements. In addition, the responsibility for funding and undertaking replacement of some types of health care technology (such as plant, office equipment, vehicles) may fall to other ministries. Either they must also be encouraged to undertake annual replacement budgeting or the MOH must take over the responsibility for it, if health facilities are to remain functional.

Budgeting for maintenance and repair. The expenditure plan should provide for maintenance of equipment. Technology can only be used at its optimum performance level if it is regularly maintained. Experts suggest that maintenance and repair costs ought to be around: 5-6% of stock value per year for medical equipment, 2-3% of construction costs for buildings per year, 3-4% of purchase and installation costs per year for service supplies and plant[11,17,18]. It is common for countries to have maintenance budgets so low as to be less than 1% of the equipment stock value, making it impossible to keep their equipment functioning or safe.

Life-time costs. Many pieces of equipment require operational funds because they use consumable items, such as x-ray film, chemical reagents, recorder paper. It is quite common for

hospitals to be unable to function effectively during much of the year because they cannot obtain these inputs, many of which are imported. Their cost should be included in expenditure plans, and taken into account when decisions are made about equipment purchases. It is often necessary to introduce a new initiative specifically for gathering data on the usage rates and requirements for the major equipment consumables, accessories, and spare parts; and incorporating it into any existing HMIS. During the life-time of the equipment there will be other costs which must not be forgotten such as site preparation work and installation (Study 7), and training of staff (Study 11), etc.

Links between capital and recurrent expenditures. Differences in procedures with regard to development and recurrent expenditure often cause confusion in decisions about purchases of equipment. Equipment is paid for out of investment funds when a new facility is constructed or a major rehabilitation or upgrading takes place. It can be difficult to pay for routine replacement out of development funds, and recurrent budgets often make little provision for equipment purchases. One reason for this problem is that government accounting systems often do not make provision for depreciation. This means that each purchase of a major item is viewed as a new investment. It is often easier to fund new projects than the routine replacement of existing capital stock. A major problem is that although new purchases may be planned under development budgets, the parallel increase in recurrent funds necessary for the running of this new equipment is frequently not reflected in recurrent budget lines.

Control of finances. In many instances it is useful for some decentralization of budgetary control; health facilities need to make plans according to their own financial strategies, as well as be able to finance expenses which occur on a daily basis. However in certain instances it may be beneficial to control a budget centrally especially if funds are short or there is insufficient management capability at the decentralized level, ie. if there are limited technical staff and Planned Preventive Maintenance (PPM) is run from a central workshop, a centralized budget can ensure PPM takes place as a priority activity rather than being suspended at random by districts when funds are short.

Preparation of annual action plans and budgets. The Core Technology Expenditure Plan needs to be translated into annual action plans covering the health care technology purchases and rehabilitation for that year. They will lay out the annual goals for the completion of activities and the allocation of funds; they may reflect ministerial priorities for the rationalization of the health care technology sector. Within these goals, there needs to be a mechanism for equipment users (individual facilities or units) to present their requirements and obtain the budgetary allocations required for the maintenance, operation, and routine replacement of equipment so that the annual goals can be met.

Resource allocation. The core technology expenditure plan needs to be accepted by all those who provide funds for the health service. It is important that the Ministry of Finance (MOF) integrates it into the budget of the public health service. If responsibility for health care technology is covered by more than one ministry (ie. Health and Works), it is essential that the MOF introduces similar financial strategies for both ministries. The decision to allocate enough money to keep the health care technology service fully operational will create the financial basis for the establishment of a maintenance capacity, and for the negotiation of longer-term commitments from suppliers.

Aid packages. External support agencies should explore alternatives to their preference for equipping new facilities. The purchase of equipment could instead be coupled with the commitment of funds to keep it in running order for a number of years. For example, the supply of equipment should include: the supply of consumables and manuals, user and maintenance training, and support to maintenance workshops and after-sales services. These issues can be presented when negotiating with donors (see Study 4).

Cost benefit analysis. It is important for ministries to study the relative cost implications of different strategies, and to consider the cost-effectiveness of the different options facing them, ie. maintenance versus new purchases, high versus low technology, contracted maintenance versus in-house teams, cheap initial purchase price versus life-time expenses, capital investment for replacement versus down time of services.

4.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, whilst bearing in mind the following questions:-

Planning Expenditure

4.2.1 Do you have a Core Technology Expenditure Plan? If not, what sort of plans have been made in the past for financing health care technology?

a. Is it possible to tabulate the expenditure for the purchase of equipment over the last 5 to 10 years? Has it been sufficient or are health services deteriorating?
b. Is it possible to determine what have been the equipment recurrent expenditures over the same period (for consumables and maintenance)?
c. Does this only reflect MOH expenditure? What about capital and recurrent expenditure on health facility equipment other ministries (such as Works) over the same time period? Can that be tabulated?

4.2.2 What sort of plans have been made for the future?

a. Is it possible to tabulate the planned expenditure on equipment during the next National Development Plan (NDP) period?
b. What is the planned equipment recurrent expenditure over the same period?
c. What about planned capital and recurrent expenditure on health facility equipment by Ministry of Works (MOW) for example, over the same time period?

4.2.3 Are the budget lines structured in such a way as to sufficiently delineate between different types of expenditure (purchase, replacement, consumables, equipment maintenance, general maintenance, etc)? Do the budget lines differentiate expenditure by facility? Can the MOW also provide such details for its expenditure on behalf of MOH?

Budgeting for Depreciation

4.2.4 Does either MOH or MOW undertake depreciation accounting?

a. Are there any budget lines specifically for replacing equipment at the end of its life?
b. Does it prove difficult to replace equipment by MOH, MOW, as well as Ministry of Supplies (MOS) for example?
c. What % of the equipment stock value is set aside each year for replacement of technology?
d. If MOH is facing a massive capital investment programme for bulk replacement, has the overall cost been calculated?

4.2.5 Is replacement usually only covered when development budgets are allocated for facility upgrading programmes? What happens to the annual needs of facilities who fall outside of these upgrading plans? What happens to the annual needs of facilities whilst they are waiting to be upgraded

Budgeting for Maintenance and Repair

4.2.6 What is the value of the various MOH maintenance budgets? What has been the % increase over the last few years? What are the budgets as a % of equipment stock value? Are health facilities subsequently short of maintenance support?

4.2.7 Similarly, what are the maintenance budgets for health care technology held by other organizations involved in the maintenance of health facilities (ie. MOW, MOS, etc)?

Life-time Costs

4.2.8 Can the equipment running/consumable costs be separated out from the budgets for medical supplies (bandages, gauze, etc) or general supplies (floor polish, light bulbs, blankets)?

4.2.9 Are consumable/equipment running costs funded sufficiently? Are health facilities short of functioning equipment due to the lack of consumables?

4.2.10 To help with budget calculations, is data gathered from health facilities which shows the actual consumable requirements and usage rates?

4.2.11 Is there sufficient funding of other life-time costs, such as site preparation, installation, training of staff, etc? Are training courses and scholarships for health care technology use and maintenance sufficiently represented in national training plans and budgets?

4.2.12 When new equipment is evaluated in the tender process, are life-time costs calculated and taken into account?

Links between Capital and Recurrent Expenditures

4.2.13 Are routine equipment purchases funded regularly, or can they only be covered under development projects? Are health facilities subsequently short of equipment?

4.2.14 When new facilities/major equipment purchases are planned, are parallel increased maintenance and running costs automatically reflected in recurrent budgets?

Control of Finances

4.2.15 How much decentralization of budgetary control is there? Do hospitals control their own budgets? Are some funds centralized to guarantee the implementation of certain priority activities?

4.2.16 Are there cumbersome administrative procedures for obtaining funds for even small purchases or contracting work from the private sector? Do health facilities have access to cash imprests for any amounts of money?

Preparation of Annual Action Plans and Budgets

4.2.17 Are there procedures for consultation with facility heads during annual budget preparations, or do the allocations simply reflect the previous year's expenditure? Can hospital managers influence how money is spent on their behalf for the purchase and running of equipment?

4.2.18 Are the annual submissions from decentralized health bodies required to conform to central priorities for the development of the health care technology sector (ie. conform to the goals laid out in the CTEP)?

Resource Allocation

4.2.19 Has the core technology expenditure plan been accepted by the Ministry of Finance? Have negotiations been held with them regarding any of the budgetary changes required? Do these discussions also include similar strategies for the other ministries responsible for health care technology?

Aid Packages

4.2.20 Do external support agencies have to conform to MOH criteria on the 'suitability' of products judged on the recurrent costs, maintenance costs, and availability of after sale support for the technology proposed? Do they have to conform to MOH criteria on a 'package' of inputs requiring them to supply consumables, spare parts, training, and maintenance support as well as the piece of equipment? If they fail to comply, are they asked to support the increased recurrent cost implications for the technology they supplied?

Cost Benefit Analysis

4.2.21 Are cost-effectiveness issues considered for different health care technology strategies? Who in the MOH undertakes cost benefit analysis?

4.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

STUDY 5 – Selection of Technology

5.1 Guiding Principles

The selection of suitable health care technology requires a significant investment of time and resources. The following elements need to be considered:-

Appropriate choice. Ideally technologies should be found which are "appropriate" to national conditions. Factors which need to be taken into consideration in the selection of equipment include: safety; ease of use; appropriateness to priority health problems; geographical and climatic conditions; level of technological sophistication; price and life-time cost; local maintenance and repair support; availability of spare parts; quality of the materials and the manufacturing process; and requirements of international standards. Often it may be inappropriate to purchase complex models with every advanced feature, both because they are expensive and because they provide poor service where conditions are harsh and users do not have the skills to operate and maintain them.

Personnel involved. A team approach is essential since advice on selection is required from a number of disciplines:-

- health workers define the services required, and the capacity for effectively using different kinds of equipment;
- technical staff (from various ministries) advise on the conditions the equipment will face, the ability to maintain it, safety factors, technical suitability, and building and service supply requirements;
- planners and managers assess the costs and benefits of different kinds of equipment in the context of the country's health priorities and available resources; and
- procurement officers advise on sources of supply.

Such cadres could form Technology Advisory Committees (TAC) either at facility or ministerial level to provide advise to management on appropriate selection of health care equipment.

The request process. A process needs to be established through which the views of individual facilities around the country can be reflected in the choice of health care technology, so that not all decisions are made by central ministerial staff or by those based in large referral facilities. There needs to be a formal process to enable health facilities to submit their requests for equipment purchases, perhaps at certain times a year, for consideration in the overall Core Technology Expenditure Plan (Study 3) and the Annual Action Plans (see Study 4). A mechanism is required to cater for emergency requirements outside these planned purchases.

Information and advice required. Decision-makers and staff need access to information about developments in health care technology and they need to be able to use it in choosing suitable equipment. Technical information about equipment is available in company catalogues and brochures as well as in a variety of international publications[19-22], and software packages[23,24]. In addition, the Technology Advisory Committee needs to review any technology assessment data available (see Study 12). When a major re-assessment of the health service's stock of equipment is carried out, it may be worth paying for the services of an experienced consultant. Also, a system is required for feedback from users regarding the equipment in use in case they have had bad experiences with it, before it is purchased again.

Health goals and standard lists. The MOH should have defined its health goals and essential service packages for each level of the health service (see Study 3). Then it is possible to develop standard equipment lists for each kind of facility and for each department. The existence of such lists makes it much easier to establish priorities for new acquisitions, and facilitates the selection process. The availability of such lists also simplifies the procurement

process and negotiations with external support agencies, making it possible to invest more management effort in each purchasing decision.

Standardization. The MOH needs to limit the variety of equipment which it buys. For example, it might chose two or three brands of a particular kind of equipment for the entire health service. This would mean that health workers would not have to learn how to use a different model each time they move to a different health facility; technical staff would not have to learn how to maintain such a wide range of products; procurement officers and stores staff would not have to source, purchase, distribute, and control such a vast array of different consumables, accessories, and spare parts; and financial savings would be able to be made from bulk purchasing.

Introducing an element of standardization therefore provides financial, administrative, operational, and technical advantages. In addition, standardization can create a situation where suppliers compete for relatively large contracts, and can potentially establish long-term markets. This gives them a greater incentive to provide after-sales support at reasonable cost. The Ministry of Health's new position as a larger customer will also improve its negotiating power regarding the terms and conditions of any purchase agreement.

Generic specifications. Specifications need to be written which describe the equipment to be purchased. Generic specifications, not linked to a particular manufacturer or model, should describe the functions and criteria that the equipment must fulfil; the full package of inputs required with the equipment (consumables, spare parts, manuals, training, after sales support, etc); and the quality of materials and manufacture, safety standards, and level of technology required. Those who are responsible for procurement can then look for the equipment which meets these needs at the most attractive terms.

Donations. Many items of equipment may be chosen and supplied by external support agencies, charities, or individuals, and can range from substantial equipment procurement projects to gifts of small quantities of items. It is important to ensure that donor organizations conform to national requirements regarding selection of health care technology. The MOH will be in a much stronger position to negotiate the contents of such donations if they have management tools, such as: technology policy, health goals, standard lists, specifications, and standardization practices.

Poorly thought out donations can introduce more problems for the MOH than they solve; often the equipment is inappropriate, cannot be used, is costly to run, does not contain the full package of inputs required (consumables, parts, manuals, etc), and has no provision for after sales support. Sometimes the equipment provided may be second-hand, introducing additional problems associated with age and lack of parts, manuals, or servicing support. Although some organizations undertake the comprehensive rehabilitation of second hand goods in order to improve their life-spans, many do not. In the worst donation cases, the MOH may need to consider turning back shipments or refusing such gifts[25,26].

5.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

Appropriate Choice

5.2.1 What evidence is there that there are problems arising from poor selection of equipment? For example, are there items unsuitable for the staffing skills available or inappropriate for the climate; units which fall apart quickly or are hazardous; regular shortages in specific areas; etc.?

5.2.2 In your country, is use made of basic through to complex technology? Is the balance right? Are there conflicts between doctors and nurses about the level of technology that can be easily used? Can the types of technologies found be maintained?

Personnel Involved

5.2.3 Who advises on equipment selection? Is there a Technology Advisory Committee, who sits on the committee, is there technical representation? What does the committee do? Are there any problems with the selection process? Are the districts and regions represented? What happens in the regions/districts? Which staff are consulted?

5.2.4 If any health care technology is selected by another ministry, do they have an adequate selection and advisory process? Do technical staff from the MOH liaise with them on the appropriate choice?

The Request Process

5.2.5 Is there a mechanism for the views of individual facilities around the country to be reflected in the choice of health care technology? Are there any problems with this system? Are all decisions made only by central ministerial staff or by staff based in the large referral facilities?

5.2.6 What is the formal request process that health facilities are supposed to use when requiring new or replacement equipment? What are the problems? How many times a year can requests be submitted? What happens in an emergency?

Information and Advice Required

5.2.7 Do sufficient people have access to product brochures, suppliers' catalogues, professional journals, etc.? Is there a technical library/database? Are technical assessment reports studied?

5.2.8 Is advice taken from consultants, suppliers, maintenance contractors, etc.?

5.2.9 How can staff report on the past performance and their experiences of equipment or particular supplier companies?

Health Goals and Standard Lists

5.2.10 Have general goals for service delivery at different kinds of facility been defined? Have these been translated into clear guidelines of equipment needs? What standard equipment lists does the MOH have? Are all the facilities concerned aware of them/have copies?

Standardization

5.2.11 How much standardization of the equipment has the MOH managed to introduce? What are the constraints/where does the policy fall down? Do the regions/districts/facilities know of and use the standards chosen?

Generic Specifications

5.2.12 Have generic equipment specifications been written? Do the regions/districts/facilities know of and use the generic specifications?

Donations

5.2.13 Is a substantial amount of equipment provided through donations? What problems are there with the technology chosen by donors? Are many of the items second-hand?

5.2.14 Has the MOH produced guidelines or procedures for negotiating with donors regarding the choice of technology and the necessary package of inputs? Does the MOH make donors conform to national technology requirements and technology management tools (ie. specifications, standardization practice)? Has the MOH ever taken a strong stand and refused unsuitable items? Has the MOH made a decision about whether they will accept second-hand products?

5.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

STUDY 6 – Procurement

6.1 Guiding Principles

Once the selection process is over, the next step is to undertake purchase and delivery. The procurement process includes the following issues:-

People responsible for procurement. Usually government procurement has to be undertaken according to treasury and tender board rules which dictate where the responsibility will lie depending on the cost of a purchase. Often there is one body within the MOH responsible for procurement (such as the Supplies Department), however sometimes individual divisions act independently. The body which will prioritize and authorize the orders will differ depending on where budgetary control lies for the activity concerned (such as, development projects, service contracts, daily consumable needs, etc). Other ministries (eg. Works, Supplies, Transport) may also have the responsibility for purchasing some types of health care technology (eg. plant, furniture, vehicles).

Principles of procurement. To ensure a unification of equipment provision, it is important for all bodies to procure according to set principles. Equipment procurement should be in line with the MOH Procurement Policy and Replacement Policy which ensure that any available funding is used for valid requirements and for priority needs first. Procurement must also conform to the MOH Specifications, Purchase Agreements, and Purchase Contracts to ensure that the products obtained conform to agreed selection criteria for "appropriate" technology.

Writing specifications and deciding the contents of purchase agreements. It is important to describe fully the equipment to be purchased so that suppliers can provide the correct product. Thus specifications are required to adequately describe the function of the equipment, its technical characteristics, the quality of materials and manufacture, safety standards, and the level of technology required. Simple two-line descriptions will not be sufficiently detailed enough to prevent suppliers from finding and exploiting loopholes. It is generally preferable to write generic descriptions (see Study 5), but there may be times when an exact make and model is required (for example, if you have standardized to a particular product) and the specification will state this. Writing effective specifications is a skilled technical task, and staff may need training or consultancy support.

The contents of the purchase agreement (or tender document) should cover the whole package of inputs that the equipment will require in order to function over its lifetime. These include: performance guarantees, installation and hand-over, after-sales support, spare parts, consumables, accessories, user and maintenance training, operation and service manuals, and maintenance contracts. Also guidance should be given on other administrative requirements, such as: payment procedures and terms, delivery arrangements, import procedures, relevant environmental factors (such as climate, electricity supply,), etc.

Choosing the supplier. Equipment may be bought in a number of ways including: placing a direct order with a company; open tender (national, regional or international); or selective bidding, whereby a small number of companies are approached. Effective tendering can achieve substantial savings, but it is complicated and needs well-prepared documentation, specialised skills, and careful tendering procedures. Tendering may give too much weight to the purchase price rather than the overall cost of the equipment package, and it may also conflict with standardization policies. It is important to have sufficient adjudication skills and technical input into the analysis of bids, in order to ensure that the best cost benefit ratio of any choices are considered. In this way the quality, life-time cost, standardization issues, and maintenance and training implications of each purchase are taken into account. Paying a higher initial price may prove more economical over the lifetime of the equipment.

Using purchase contracts. Once suitable sources of supply have been found through tendering procedures, companies are sometimes given purchase contracts for a fixed term (eg. 1 or 2 years) to supply the agreed type of product nationally on request throughout the year. Thus the need for repeated tendering by individual facilities or regions is avoided. Facilities need adequate guidelines specifying which are the correct sources of supply for them for different types of goods (ie. private firms, the central medical stores, general stores, laboratory services, etc).

Safe delivery, customs, and transport. Once a supplier has won the contract, the equipment needs to be delivered safely. The important issues are:-

- proper packaging to avoid damage;
- suitable carriage (air, sea, rail, etc) chosen depending on the fragility and heat susceptibility of the equipment;
- adequate documentation to aid prompt customs clearance;
- suitable holding arrangements at customs to prevent damage due to heat and handling;
- arrangements for collection and checking of equipment and contents by suitable staff;
- suitable storage facilities;
- suitable onward transport provision to site;
- insurance for the whole journey; and
- monitoring this delivery process to detect delays and problems.

Freight forwarders are specialised companies which ensure that these steps are taken care of. The prices quoted by the supplier often include freight terms, or the customer can ask for the terms they want. The options for organising and financing shipping are shown in Table 6.1.

Table 6.1 Different freight arrangements depending on price terms quoted

Price Quoted	Supplier's Responsibility	Customer's Responsibility
Ex-Works Ex-Works	• None. (May crate equipment ready for freighting if asked)	• Packing, unless supplier is told to crate equipment for freighting • Transport from factory to hospital • Insurance for whole journey
Free-on-Board (FOB)	• Packing for freighting • Transport from factory to freight carrier chosen by customer	• Freight to country • Local transport to hospital • Insurance for whole journey
Carriage and Freight (C & F)	• Packing for freight • Transport from factory to port of entry of customer's country	• Local transport to hospital • Insurance for whole journey
Carriage, Insurance, and Freight (CIF)	• Packing for freighting • Transport from factory to port of entry of customer's country • Insurance from factory to port of entry	• Local transport to hospital • Insurance from port of entry to hospital

Storage warehouses, stock control, and despatch. It is necessary to have suitable storage facilities both in central warehouses and at health facilities. They should be enclosed, free from dust and damp, vermin-proof, air-conditioned if necessary, with both shelved and open spaces. They will require suitable equipment for moving heavy items (trolleys, dollies, fork-lift trucks). Storage facilities need a proper system for unpacking and checking goods on arrival, as well as a stock control system which records: incoming items, stock levels, dates and destinations for despatch, expiry dates, re-ordering prompts, etc[27,28].

Payment. There needs to be an effective system of payment which may involve letters of credit and foreign exchange allocations. There can be long delays in delivery if these arrangements are not dependable. It is beneficial to use partial payments so that suppliers receive initial payments only for the goods themselves, and subsequent payments only when services (such as installation, training, etc) have been completed. It is also advisable to consider suitable retention terms to safeguard against non-completion or poor performance of contracts (ie. retaining a % of the contract price until the provision of products and services has been satisfactorily completed). In addition, there needs to be a mechanism for health facilities and maintenance services to hold some funds to cover daily purchase requirements, otherwise there can be long delays when trying to purchase even the simplest of items.

6.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

People Responsible for Procurement

6.2.1 Who is responsible for procurement for all government departments? Within the MOH, who usually carries out procurement? Does any part of the health sector undertake purchasing without referral to the MOH procurement body?

6.2.2 Is the procurement of technology properly planned and coordinated? Who can prioritize and authorize orders for different activities (development projects, service contracts, daily needs, etc)?

6.2.3 Does the MOH have any input into the procurement practices of other ministries who purchase health care technology on their behalf?

Principles of Procurement

6.2.4 Are goods procured according to set principles to ensure:-

a. that any available funding is used for valid requirements and for priority needs first (ie. according to a Purchasing Policy, Replacement Policy, etc);
b. that products are obtained which conform to agreed selection criteria for "appropriate" technology (ie. according to specifications, purchase agreements, etc)?

Writing Specifications and Deciding the Contents of Purchase Agreements

6.2.5 Who is responsible for writing equipment specifications; and is there adequate clinical and technical consultation? Are there any problems with the specifications (is suitable equipment obtained)? Do other parts of the health sector (eg. regions) procure according to different specifications?

6.2.6 Is there a procedure to ensure that the whole "package" is procured whenever equipment is bought? What problems have arisen due to parts of the "package" being missing? Who decides on the contents of the purchase agreements?

Choosing the Supplier

6.2.7 How are suppliers selected?

a. Is it by direct purchase, open tender, or selective bidding? Does it depend on the value of the goods? What happens if you have a standardization policy?
b. When are registered tenderers used; do the regions/districts also use them?
c. Who adjudicates offers; are users and technical staff involved?

d. Is the adjudication criteria mainly cheapest cost or is the overall "package" judged? Can technical issues and after sales support be introduced into the adjudication? Is there a method of appeal?
e. Are the procedures for selecting suppliers different for district, regional, or central level procurement?
f. Are there guidelines for these procedures; are they clear; are they followed; should they be changed?

6.2.8 In Study 2.5 you will have identified the major sources of supply to the MOH for supply of equipment, maintenance services, etc. Is there much equipment supplied outside of this, such as through donations or tied-aid?

Using Purchase Contracts

6.2.9 Are there Purchase Contracts allowing successful tenderers to supply agreed goods to government over a fixed time span? Does everyone make use of them, or do some parts of the health sector (eg. missions) act independently?

6.2.10 From the health facility point of view, what are their sources of supply (ie. they may not buy from companies, but request equipment from various government bodies such as medical stores, general stores, laboratory services, regional authorities, etc.)? Are there guidelines clearly detailing the various sources for different types of equipment and the procedures to follow for procurement?

Safe Delivery, Customs, and Transport

6.2.11 What are the guidelines for freighting to your country? How is equipment safely and carefully transported within the country to health facilities? Is insurance used? Are there any problems?

6.2.12 What are the arrangements for customs storage and clearance, and provision of correct documentation? Are technical staff involved with checking the goods?

Storage Warehouses, Stock Control, and Despatch

6.2.13 Does the MOH have sufficient, equipped warehouses? What about the regional health authorities? What are storage facilities like at health facilities?

6.2.14 Do the storage facilities have proper procedures for unpacking and checking goods on arrival? Are there adequate stock control systems?

Payment

6.2.15 What payment procedures are used for equipment?
a. Do the payment procedures introduce problems (eg. delays in supply awaiting credit agreements, no partial payments held back to ensure installation and training are completed, reluctance of companies to supply due to non-payment in the past)?
b. Are suitable retention terms detailed in tender documents, and how are they enforced?
c. Do health facilities and the maintenance service have petty cash for small purchases?

6.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

STUDY 7 – Preparation for Technology Use

7.1 Guiding Principles

When a new piece of equipment is introduced into the health service a number of steps must be taken to ensure that it will function reliably and safely. Before the equipment arrives, it is necessary to ensure that all preparatory work has been undertaken at its proposed site. Then, before the equipment is used, it is necessary to ensure that it is in a reliable and accurate working condition.

Site preparation can include construction work, and provision of services such as electricity, water, gas, and waste pipelines. It is necessary to ensure that the room or space for the equipment is suitable in terms of size, position, layout, and materials, and that the environment is adequate for the particular purpose (for example, air-conditioned, dust free, away from running water). The necessary instructions must be requested from the equipment manufacturers. Funds need to be made available for such 'pre-installation' work, to ensure that the site is ready before the goods start to arrive[27].

Installation involves fixing the equipment into place, and can range from building equipment into the fabric of the room, to simply plugging it into an electrical socket.

Commissioning includes a series of tests performed to check that the equipment is functioning correctly.

Accepting equipment into service (acceptance testing) usually involves three activities:-
- checking that the complete order has arrived;
- ensuring that the equipment is electrically and mechanically safe for users and patients, through a series of tests;
- logging the equipment into the records by giving it an inventory number, allocating it to a department, and registering it onto maintenance service records.

Initial calibration provides a chance to adjust equipment to prevailing conditions (climate, electricity supply, altitude, etc.) so that the readings are true.

Initial operational training is needed to familiarise users and technicians with the specific characteristics and operational procedures of the machine, as well as the methods for caring for and maintaining the equipment. There is a need for user manuals, care and safety protocols, as well as service manuals and maintenance protocols.

Application training is required to ensure that operators fully understand the correct clinical application of the equipment. As a simple example, staff can be taught how to operate an ophthalmoscope (switch it on, look through it, change the bulb and batteries), but must also be taught how to apply it clinically for diagnostic purposes (what they can expect to see through it, when different apertures should be used, how to move it in relation to the patient, different procedures for common disorders, etc). Application training is of increasing relevance the more sophisticated the item, or when equipment is purchased to offer a service which is new to staff (eg. defibrillation, ventilation, ultrasound scanning). Without correct application training new equipment will often remain unused even if staff know how to 'operate' it.

Health training institutions may be short of technology for training purposes, and their students may graduate without sufficient experience in the application of taught procedures. Application training is not usually offered by the manufacturers when they provide operational training. Therefore it will be necessary for health planners and managers to organize a series of training sessions run by existing experienced clinical staff if newly acquired equipment is to be utilized effectively (see Study 11).

Hiring staff. Equipment may be purchased in order to provide a new service to patients, and this may require new staff with specialist skills. Any such staff need to be hired and in place before the equipment arrives, otherwise it will remain unused for a long time (see Study 10).

7.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

Site Preparation

7.2.1 Who prepares the sites for equipment installation? If it involves another body (such as MOW) are there problems co-ordinating/collaborating on the work? Are sufficient details sought from the manufacturers? What have been the problems with site preparation?

7.2.2 Are funds allocated specifically to cover 'pre-installation' work, or is it difficult to cover such expenses? Do goods arrive without the sites being ready?

Installation

7.2.3 Who undertakes equipment installation? If it involves another body (such as MOW or contractors) are there problems co-ordinating/collaborating on the work? What have been the problems with equipment installation?

Commissioning

7.2.4 Is all equipment automatically commissioned, and by whom? What have been the problems with commissioning of equipment?

Accepting Equipment Into Service

7.2.5 Does acceptance testing of equipment automatically occur, and who undertakes it? Are there records of all new equipment which entered the health service? If so, who keeps them? What have been the problems with acceptance testing of equipment? Do you have sufficient test instruments?

Initial Calibration

7.2.6 Does initial calibration of equipment automatically occur, and who undertakes it? What have been the problems with calibrating equipment when it first arrives?

Initial Operational Training

7.2.7 Do health facility staff automatically receive training on the use, care, and safety of equipment when it first arrives? Do the equipment suppliers provide the training? If not, who does? How do staff on different shifts learn to use medical/hospital equipment? What are the problems with the present system?

7.2.8 Do health service technicians automatically receive training on the use and maintenance of equipment when it first arrives? Do the equipment suppliers provide the training? If not, who does? How do staff on different shifts learn to maintain medical/hospital equipment? What are the problems with the present system?

Application Training

7.2.9 Are there many examples of equipment which cannot be used because staff are unsure of how to properly utilize it? Which types of equipment commonly present problems?

7.2.10 How is application training currently organized? Is there some sort of system in place which ensures that it occurs when equipment arrives? Who are the trainers?

Hiring Staff

7.2.11 Does much equipment remain unused waiting for the correct operator staff to be hired?

7.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Study 8 – Continued Operation

8.1 Guiding Principles

Once a piece of equipment has been introduced into use, measures must be taken to keep it in service and to retain its reliability, accuracy, and safety throughout its life. For the health service that equipment helps to provide to be continuous (ie. a dental service at district level), there needs to be suitable mechanisms to dispose of and replace equipment automatically when it reaches the end of its life.

Consumables, such as recorder paper, disposable electrodes, chemical reagents, ultrasound gel, x-ray film, washing powder, gas, and so forth are essential for the use of many pieces of equipment. Without them the equipment cannot function. Many consumables are specific to the equipment for which they are designed and suitable sources of supply must be found. Sufficient funds need to be allocated to ensure the purchase of these items throughout the life of the equipment, and arrangements made to store them safely.

Accessories of the equipment are essential items which fit onto equipment and provide the connection between the patient and the machine, for example patient leads, face masks, breathing tubes, electrodes, and so forth. The equipment cannot function without the correct accessories. They are not usually consumable items, but they do need to be replaced from time to time as they are subject to daily wear and tear. Since they are usually specific to the model of equipment, they should be bought at the same time as the equipment and suitable sources of supply must be found. Money needs to be allocated to purchase these often expensive items, and arrangements made to store them safely.

Spare parts, maintenance materials, tools, and test equipment are essential items for the maintenance and repair of equipment. The maintenance materials are general consumable items such as oil, grease, washers, cable, cement, etc. The spare parts will need to be replaced at regular intervals, and since they are usually specific to the model of equipment, they should be bought at the same time as the equipment and suitable sources of supply must be found. Tools are generally universally available items, but test equipment is more specialized and specific for different equipment types. Money needs to be allocated to purchase these often expensive items, and arrangements made to store them safely.

Manuals provide instructions and guidelines to assist with operation, calibration, care, and maintenance of the equipment. Copies of operator and service manuals need to kept in places where staff have sufficient access to them (such as: user departments, workshops, hospital and ministerial libraries).

Calibration of the equipment is necessary to ensure that it provides dependable results. When this is not done, it may not function properly. For example, an autoclave could go through its operational cycle without reaching the correct temperature to sterilise its contents. On-going recalibration is required throughout the life of the equipment to ensure that it is in a proper, accurate, working condition. These tasks will be undertaken by users, maintenance technicians, and manufacturers' representatives depending on the type of equipment and its sophistication.

Care and cleaning of equipment is required regularly in order to extend its useful life. Users have a major role to play in the care of equipment, and need to know how and when to clean it. There needs to be an adequate supply of the correct cleaning materials otherwise equipment can be damaged. Equipment also needs to be properly decontaminated between uses and before being sent for maintenance, in order to protect users, patients, and maintainers.

Planned preventive maintenance (PPM) is undertaken with the aim of preventing breakdowns and ensuring that equipment is operational and safe. A PPM programme is the implementation of a timetable of scheduled maintenance activities, in order to diminish the amount of time equipment is out of service. Schedules are required both for the simple PPM tasks to be undertaken by users, and the more technical PPM work undertaken by maintainers. Sufficient funds must be available to cover the resource requirements for this work (such as: maintenance materials, spare parts, travel, subsistence, stationery, training, contracts).

Storage and stock control procedures need to be established to ensure that equipment, accessories, consumables, and spare parts do not deteriorate due to dust, heat, humidity, or damage while they are waiting to be used or repaired. Adequate stock control procedures are necessary to calculate usage rates, trigger re-ordering, and ensure that sufficient stocks are available when required. Also it is necessary to ensure items are issued for use rather than hoarded in stores. There also needs to be adequate security measures to prevent the loss of these items, and means of recouping the cost if they are stolen by staff.

Safety procedures need to be established for different types of equipment to protect patients and users from exposure to, among other things, radiation, electric shock, and infection. For example, attention needs to be given to correct practices covering hygiene, waste disposal, and incineration, as well as procedures for fire-fighting, wearing protective clothing in hazardous areas, and handling samples and chemicals in laboratories. Standards, guidelines, training, statutory bodies, and inspectors will be required in the many various safety fields.

Refresher training for staff needs to take place regularly, in order to cover the normal gradual loss of skills to a department and the problem of high staff turnover. Staff who undertake the initial user and maintenance training courses when equipment arrives can easily lose their skills. There is a need to run refresher training courses to orient new staff and to brush up the skills of the rest.

Effective use of equipment. It is important to realise that much equipment will continue to be used although it is not working effectively (centrifuges which can only run at low speed, dental chairs whose position cannot be altered), or it is working at fault (photometers which give inconsistent readings for the same samples, autoclaves which do not reach the correct temperature). The users are often, but not always, aware of the sub-standard performance. Other equipment will be functioning satisfactorily but cannot be used due to: staff shortages, staff not knowing how to operate it, incomplete accessories, or the equipment remains unissued in stores. Some equipment may be damaged or lost by staff, and mechanisms will be required to make staff accountable for such behaviour. A combination of the strategies mentioned in this Section will be required to address these problems.

Monitoring the state of equipment. In order to manage equipment properly it is necessary, at any given time, to know what you own (an inventory), what state the equipment is in, and how it is being used. It is necessary to gather and analyze statistics about equipment in order to help make better use of it (eg. consumables usage rates, equipment down-times, operator problems, accidents, etc).

Disposal and replacement procedures need to be established to deal with equipment when it is at the end of its useful life. Formal mechanisms are required to examine and condemn worn out equipment, and then to ensure that it is safely and promptly disposed of in order to avoid the large equipment graveyards commonly found at health facility sites. Health service and facility level policies and procedures are needed to ensure that written-off equipment is automatically replaced, otherwise it will not be possible to guarantee the continuity of health service provision for the general public. Effective disposal and replacement procedures also need to be implemented by any other ministries (Works, Supplies, Transport, etc) who may be responsible for different categories of health care technology (plant, furniture, vehicles, etc). Without equipment replacement policies the health service that can be provided will deteriorate.

8.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

Consumables

8.2.1 Who supplies most consumables for health care technology in health facilities (is it Medical Stores)? Do other bodies supply consumables (such as the laboratory service)? Internal to a health facility where are the consumables kept (with the pharmacist or general stores for example)? Are there shortages, lack of funds, procedures not understood, items hospitals do not know where to source, etc?

Accessories

8.2.2 Who supplies replacement accessories for health care technology in health facilities (is it Medical Stores)? Internal to a health facility where are the replacement accessories kept (with the pharmacist or the maintenance workshop at a referral hospital for example)? Are there shortages, lack of funds, procedures not understood, items hospitals do not know where to source, etc?

Spare Parts, Maintenance Materials, Tools, and Test Equipment

8.2.3 Who supplies maintenance materials and spare parts for health care technology in health facilities (is it Central Stores)? Internal to a health facility where are the spare parts and maintenance materials kept (with the General Store or the maintenance workshop for that region for example)? Are there shortages, lack of funds, procedures not understood, items hospitals do not know where to source, etc?

8.2.4 Are there adequate quantities of tools and test equipment for maintainers? Where are they located (at the closest workshop to the health facility)? Are they owned by individual maintainers or do they belong to the health facility?

Manuals

8.2.5 Do most departments in health facilities have equipment operation manuals? Are they accessible for staff to refer to? Do the maintenance workshops have copies?

8.2.6 Do the maintenance workshops have sufficient technical/service manuals? Are there central or regional libraries which store copies of them?

Calibration

8.2.7 Are operators undertaking routine calibration of their equipment? If so, on what items? Do they have guidelines available to work from? What have been the problems with calibration by users?

8.2.8 Does anyone carry out routine technical calibration on equipment? If so, on what items? If it involves another body (such as MOW, manufacturers' representatives, or maintenance contractors) are there problems co-ordinating/collaborating on the work? Are guidelines available to work from? What have been the problems with technical calibration?

Care and Cleaning

8.2.9 Are operators undertaking routine care and cleaning of their equipment? If so, on what items? Do they have care/cleaning schedules available to work from? Do they have

guidance on the correct cleaning materials to use? What have been the problems with care and cleaning by users? Is there much damage due to the use of incorrect chemicals?

8.2.10 What methods of decontamination of equipment are used for different equipment types? Is equipment always decontaminated between uses, and before it is sent for maintenance? What have been the problems with decontamination?

Planned Preventive Maintenance (PPM)

8.2.11 Does anyone carry out routine planned preventive maintenance on equipment? If so, on what items? If it involves another body (such as MOW or private contractors) are there problems co-ordinating/collaborating on the work? Is PPM undertaken according to written schedules, and does MOH have copies of these?

8.2.12 What have been the problems with PPM? Are sufficient materials, spare parts, and test equipment available? Are there problems with staffing levels, travel, stationery, and budgets, etc?

8.2.13 Are operators undertaking simple PPM tasks on their equipment? If so, on what items? Do they have PPM schedules available to work from? What have been the problems with PPM by users?

Storage and Stock Control

8.2.14 What are the storage facilities like in health facilities (number, size, condition, security)? How many are there (pharmacy, general stores, CSSD, laboratory, workshop)? Are there adequately trained personnel undertaking stock control? Are they generalists, or can they recognise the equipment consumables, accessories, and spare parts they order and store?

8.2.15 Is there a reluctance to issue new equipment, and a hoarding of stocks? Is old equipment clogging up the stores awaiting disposal? Are there many graveyards of broken or written off equipment?

8.2.16 What are the security arrangements to prevent theft of equipment, stocks of spare parts or consumables, and maintenance tools? If staff steal items, are they held accountable and is the money recouped?

Safety

8.2.17 Is there a good understanding of safety issues amongst equipment users?

a. Are there infection control officers, or safety inspectors for different fields (such as fire, boilers, radiation, etc)?
b. Are there national regulatory bodies, or professional bodies where standards and good practise can be agreed? Which fields do they cover (ie. laboratory, radiography)?
c. Are there safety guidelines/protocols for staff to follow? If so, for which types of equipment and which types of safety practices?
d. Who monitors departments regularly and controls the quality of equipment performance, results, or staff health?
e. What are the typical safety problems?

Refresher Training

8.2.18 Are there regular programmes of refresher training for operator and maintenance staff to keep their equipment skills fresh? How are equipment skills transferred to new members of staff?

Effective Use of Equipment

8.2.19 Is there a problem of sub-standard performance of equipment? If so, is it generally recognized by the operators? Do you have rules detailing which staff are skilled enough to use certain equipment?

8.2.20 Are there problems with mis-use and under-use of equipment and tools? Are staff held accountable for damage to equipment and tools, and what are the penalties imposed?

Monitoring the State of Equipment

8.2.21 Is it possible to assess in (government) heath facilities:-

a. how big the shortfall is in equipment stock required to carry out basic functions of the health service?
b. how much equipment is broken (as a %)? Is it markedly different for different types (laundry, theatre, etc)?
c. how much is in use but is not working effectively or is working at fault (as a %)?
d. how much is not in use due to shortage of specific skills/personnel (as a %)?
e. the average age of the equipment stock (as a %)?

[Either from an inventory exercise, standard lists, from facility or regional authority reports, from maintenance contractors reports, from purchasing records, from reports of division heads, etc].

8.2.22 What else is being assessed related to equipment, such as:-

a. underutilization or overloading of certain types of equipment?
b. consumable usage rates?
c. accident reports?
d. reports of operator problems or complaints about certain products?

Disposal and Replacement

8.2.23 Is there a write-off procedure for equipment and tools, and who undertakes it? Once written off, how are goods disposed of? If it involves another body (MOW, Supplies, Local Government bodies, etc) are there problems co-ordinating/collaborating on the work? What have been the problems with write-off and disposal? Are goods disposed of safely and promptly?

8.2.24 Does the write-off process automatically activate a procedure for the replacement of the equipment by the MOH? For certain types of technology, does the write-off process automatically activate a procedure for the replacement of the equipment by another ministry? If not, how is replacement equipment obtained? What are the problems with the current process?

8.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

STUDY 9 – Maintenance and Repair

9.1 Guiding Principles

In order to provide a safe and effective service, equipment requires periodic adjustment and repair. Equipment will deteriorate quickly if not maintained, and corrective repairs are required when it breaks down. An effective equipment maintenance and repair service is important to ensure continuity of patient services; accuracy of diagnosis and treatment; and the safety of patients and staff. Unreliable or inaccurate equipment is often worse than no equipment at all. For example, an autoclave must be hot enough to sterilise its contents, and an x-ray machine must produce diagnostic quality radiographs. Users of faulty equipment and patients can be at risk of exposure to hazards such as radiation, electric shock, or infection.

People responsible for maintenance. Manufacturers, equipment operators, and maintainers all have a role to play in keeping equipment in running order. The operators play an important role in the daily cleaning and care of the equipment. Maintainers in government hospitals can either be "in-house" teams (ie. government personnel) or personnel contracted from the private sector both local and abroad. The "in-house" teams can belong to the Ministry of Health or to other ministries such as Works, etc; however the division of maintenance between organizations with differing obligations can be detrimental to the condition of health facilities. For example, when several different maintenance organizations work at health facility sites there are often problems such as: being accountable to different authorities, conflicts of interests, differing priorities, duplication of skills, difficulties with co-ordinating work, delays in execution and completion of tasks, etc.

The relative roles of the public and private sectors will vary with the sophistication of the equipment. For example, routine maintenance of basic equipment is done by in-house teams in most countries, but assistance is often sought from manufacturers and their representatives for more complex items.

Maintenance and repair work. Most repair work is done as a response to operator request for help and is therefore unplanned. However, the maintenance and repair service should include a planned preventive maintenance (PPM) programme; this comprises a predetermined schedule of simple maintenance procedures to be undertaken at regular set intervals. In this way potential problems can be detected early and corrected; this will diminish the amount of time the equipment is out of service.

Maintenance facilities. The establishment of an in-house team requires a substantial investment in management effort. It will not be enough simply to train basic technicians. They have to be provided with adequately equipped workshops and work within an organised service which provides reasonable levels of pay and a well-defined career structure.
It is important to have a National Technology Management Division (NTMD) to advance technology management principles throughout the country (see Study 3). Besides its ministry level head office and Technology Management Units in health facilities, there should be a national network of maintenance workshops all of which require:-

- offices and adequate budgets;
- fixed and mobile workshop facilities with tools, test equipment, spare parts, maintenance materials, and adequate security arrangements;
- vehicles for outreach work and communication facilities;
- adequately trained and skilled technical personnel and established maintenance procedures;
- adequate representation within decision-making bodies in order to provide the technical input required.

Other ministries responsible for different types of health care technology also need effective national technology management services, including maintenance facilities with the necessary

resources as described above.

The national maintenance service needs to be supported by other technical bodies. Not only will a proportion of maintenance have to be supplied by private maintenance organisations, they will be a source of advice, information, spare parts, training, and support. Therefore, open communications need to be developed with manufacturers, suppliers, their agents and technical departments, so that long-term support can be developed in order to keep equipment functioning. In addition, national units should investigate what regional initiatives can be developed in this field through collaboration with neighbouring countries.

Maintenance management. Improvements in maintenance techniques, productivity, and problem-solving can be addressed only if there is sufficient information, management skills, and data available for analysis. To this end, the maintenance service needs a variety of management "tools", such as:-

- an inventory of equipment to be maintained;
- a stores stock control system;
- a maintenance request and job allocation system, with feedback on job completion;
- records of problems found, jobs done, parts used, hours taken, and other costs, all incorporated into service histories for individual machines;
- PPM schedules and safety testing checklists;
- well-written contracts for private sector support and procedures for monitoring their work;
- maintenance and management resources, including both manufacturers service manuals and internationally available guidelines[29-36];
- a system for gathering equipment and maintenance statistics, and providing feedback and reports on maintenance performance;
- budgeting, accounting, and forward forecasting systems;
- methods of studying and improving productivity, efficiency, and personnel management.

Maintenance budgeting and accounting. Keeping equipment in good running order will require adequate funds throughout the life of the equipment. International guidelines suggest that maintenance and repair costs ought to be around: 5-6% of stock value per year for medical equipment, 2-3% of construction costs for buildings per year, 3-4% of purchase and installation costs per year for service supplies and plant[11,17,18].

It is essential for maintenance budgets to be held by people who see maintenance as an important and priority task, otherwise it is common for maintenance funds to be diverted for other uses. When funds are short it may be necssary to ring-fence certain activites, such as PPM, and ensure that their funding is guaranteed if equipment is to remain safe and in working condition.

It is necessary to document, monitor, and review maintenance expenditure; then it will be possible to undertake effective forward forecasting of budgetary requirements, as well as undertake cost-benefit analyses of maintenance interventions. For example, as equipment grows old it becomes uneconomical to maintain and a point will be reached when it is more cost-effective to replace it than to try and repair it.

9.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

People Responsible for Maintenance

9.2.1 Who are the public sector maintainers who play a role in the maintenance of technology in government health facilities?

a. Is it possible to draw up a table showing who repairs different types of equipment

(medical, plant, furniture, services, office, vehicles, etc.), and from the health facility point of view who they contact (local depot, head quarters), through which route (head of hospital, supplies officer, etc.) in order to get work done? Is there any equipment, for any health division, which is left out (such as fire extinguishers, equipment at training institutes)?

b. Is the maintenance support provided by many different organisations, and does this complicate the execution of tasks? Is there over-lapping of skills? Are health facility staff clear of who they should contact for the maintenance of different sorts of equipment? How is maintenance work co-ordinated between the different organisations? Or has the MOH taken over responsibility for all maintenance skills under one organization which works for the good of the health facilities?
c. What is the maintenance response and service like? Are there any problems with maintenance provision as it is now?

9.2.2 How much use is made of private sector support?

a. How many of the equipment suppliers to MOH have technical support available within your country? Do the technical representatives have adequate workshop facilities? What range of services do they offer (after sales support during warranty period, after warranty period, maintenance contracts available as standard or only on request, a source of spare parts, etc)? [A table may be useful].
b. Does the MOH make use of these resources? Are contracts arranged and paid for centrally?
c. Do health facilities make much use of local artisans for repair work? Can health facilities hire and pay for private sector support themselves?
d. What type of maintenance work is done by in-house teams and what is covered by contracts with private maintenance organisations (either large firms or local artisans)?
e. What are the problems/constraints with the service from the private sector?

Maintenance and Repair Work

9.2.3 Do the maintenance organisations cover only corrective repairs, or PPM as well? If PPM is undertaken, for which types of equipment?

9.2.4 Is the scope of the maintenance work broader than this, or are there plans to broaden it?

a. Bearing in mind the numbers of broken or faulty equipment (assessed in Study 8.2), what additional activities will the "in-house" maintenance service have to undertake (PPM, user training, provision of "handymen" on site, etc)?
b. Bearing in mind the future upgrading projects (assessed in Study 1.5), what plans are there for increasing the "in-house" maintenance service? Or increasing the contracted private sector support?

Maintenance Facilities

9.2.5 What are the common problems with maintenance irrespective of the maintenance organisation (insufficient budgets, shortage of staff, maintenance given a low priority by planners, shortage of manuals, tools, and spare parts, etc)?

9.2.6 Specific to the MOH in-house maintenance service:-

- Is there a network of workshops, is there a central co-ordinating workshop? Is there technical representation in the MOH?
- How many MOH "in-house" units are there? What additional maintenance initiatives are being undertaken by MOH at present, such as mobile units?
- What sorts of maintenance personnel are available and where are they based?
- Are there sufficient resources?
- What are the constraints/problems with the maintenance service?

9.2.7 What are the maintenance facilities and resources like for the other ministries who care for some types of health care technology? What are their problems and constraints and how do they affect the MOH?

9.2.8 Have any initiatives been taken to collaborate with neighbouring countries to develop regional capabilities in certain maintenance fields? Have initiatives been undertaken with any manufacturers to develop national capabilities to provide long-term support for certain types of equipment?

Maintenance Management

9.2.9 Has the in-house maintenance service developed a maintenance management system? Which of the management "tools" listed are in use? What are the constraints?

9.2.10 Are there any useful management lessons to be learnt from other organizations?

a. Are there similar numbers of broken down equipment in the facilities of other health-care providers (mission, mine, private, defence, etc.)? How do they organise and provide maintenance services?
b. Are there examples of organizations in your country (either private or public) who manage to maintain their technically sophisticated equipment (more) effectively than MOH? Which of their management initiatives or strategies could be adopted?

Maintenance Budgeting and Accounting

9.2.11 Are maintenance allocations sufficient? Can private sector support be contracted on a regular basis? Can PPM be financed?

9.2.12 Who are the maintenance budget holders? Do they consider maintenance as a priority, or are maintenance funds diverted to other uses?

9.2.13 Is maintenance expenditure documented, monitored, and reviewed? Are forward forecasts made for maintenance allocations? Is it possible to determine when maintenance on items has ceased to be economic?

9.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Study 10 – Personnel

10.1 Guiding Principles

Users. It is necessary to have health workers with skills sufficient to perform their allotted role. They require the basic training for their profession, but also require training in: the operation of equipment, the application of equipment, care, cleaning, maintenance, and safety procedures. Staff need to use the available equipment effectively and safely, and therefore need a full understanding of working in a technological environment (eg. the basic do's and don'ts, being competent with technology, etc).

Maintainers. A national maintenance system requires a broad spectrum of personnel. Due to the differing terminology around the world for technical staff in this field, the WHO has broadly described the staff required as falling into three categories A, B and C (outlined below). Although the descriptions may seem to distinguish the staff by skills it is important to realise that within each Type there is a wide progression of skills, and a member of staff may spend their whole career as one Type gaining full job satisfaction by progressing to the highest level of skill achievement. Other members of staff may want to attain additional skills and progress from Type to Type through their careers. Although the WHO provides a full description of the three categories of staff [1,37], the Types can be very briefly described as follows:-

Firstly for medical equipment:-
- Type A staff require electrical and/or mechanical craft skills and will have a broad understanding of common electro-medical equipment;
- Type B staff require additional technical, supervisory and planning skills;
- Type C staff are managers with an engineering or technical background.

Secondly, there needs to be similar cadres of staff for the maintenance of all other technology areas: plant, service installations, buildings, vehicles, office equipment, furniture, etc. They will require skills in areas such as carpentry, plumbing, bricklaying, electrical installations, mechanics, refrigeration, and automotive work. These skills may be spread amongst different maintenance organizations, but it is preferable for health facilities to have multi-disciplinary teams whose members work together for the good of the facility as a whole.

Managers. Technical staff with management skills are required to manage health care technology through the National Technology Management Division. However management skills will also need to be attained by the many different cadres in the health service who will be involved in implementing equipment management principles on a daily basis. It is difficult to import health care technology management activities into a workplace if there is a general shortage of management skills; many countries are short of hospital administrators, departmental managers, district directors, etc.

Other cadres. Safety inspectors are needed in the areas of electricity, radiation protection, buildings, boilers, laboratory quality control standards, etc. Also associated cadres of staff, such as purchasing officers, tender adjudicators, stores personnel, are required to have an understanding of technological issues.

Working conditions. For all types of personnel, attempts should be made to retain staff and to maintain their morale. Staff require an adequate career structure, and for a new service such as the NTMD attention must be given to numbers of establishment posts, correct labelling of posts linked to entry qualifications, promotion possibilities and requirements, etc. Adequate conditions of service need to be framed, covering salary rates, job descriptions, access to further training, recognition of further qualifications, etc[14]. It is also important for staff to be represented by professional bodies (national ones, or international bodies such as IFMBE, IFHE,

AFTH) to provide them with the technical support and advice of their contemporaries. Attention should be given to the Human Resource Development (HRD) initiatives which can help morale, such as open staff appraisals, personal goal-setting, feedback on performance, training for career progression, etc.

Expatriate staff. Whilst local skills are being developed, it may be necessary to recruit people with special skills from abroad. Care should be given to language compatibility and mechanisms for transfer of skills.

Recruitment and retention may be governed by a body (such as the Public Service Commission) with complex regulations. The MOH will need to liaise closely with the PSC to improve: understanding of the requirements for technical staff, recognition of their qualifications, and the time it takes to hire staff.

10.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

Users

10.2.1 Are particular types of health cadres in short supply? Are most health cadres available as graduates from national training institutions, or do some cadres have to be trained abroad, or have to be recruited from abroad?

10.2.2 Do the national health cadres graduate with adequate skills and experience of the equipment they will encounter when they start work? Are they sufficiently skilled in equipment operation, application, care, and maintenance of equipment? Is there a good basic level of technological competence in the health workforce?

Maintainers

10.2.3 Does the MOH maintenance network have the full range of staff types (A, B & C) available? Are there:-

- workhands and labourers?
- basic level general purpose maintenance personnel, and what tasks do they undertake?
- technicians specifically trained in health care technology maintenance?
- specialised technicians (for dental, x-ray, laboratory, or refrigeration equipment, for example)?
- multi-disciplinary teams including artisans from many trades (electrician, welder, plumber, etc)?
- engineers, and from which fields?
- technical managers?

10.2.4 Is there an obvious source of more staff like this, what are the entry/recruitment requirements, and does the MOH plan to employ them? What are the personnel development plans for the maintenance service? What are the constraints to hiring further staff?

10.2.5 Which skills are covered by other maintenance organizations? Do they have the full range of staff types (A, B & C)? Are there plans to absorb these skills under one organization within MOH?

Managers

10.2.6 What is the general level of management skills like? Are there shortages of staff such as hospital administrators, departmental managers, district directors, etc? Are there sufficient health care technology managers from facility through to central level? What are the constraints to their development?

Other Cadres

10.2.7 Are particular types of cadre in short supply? Are there sufficient inspectors? Have the staff who undertake associated equipment tasks (such as procurement, stock control, etc) had sufficient training to understand the technological issues involved in their work?

Working Conditions

10.2.8 Is there an establishment structure for the NTMD with sufficient posts? Are the technical staff correctly classified (as engineer, technician, etc) as per industry? Or are they held against other posts (laboratory technician, cleaner) which limit their salaries and promotion opportunities?

10.2.9 How do the public sector pay scales compare with those in the private sector for technical staff? What work is in progress to develop job descriptions, link them to salary scales and entry level qualifications, and recognize qualification obtained through further training, for all technical staff?

10.2.10 Are there problems with staff retention (for technical staff), or low morale (user and technical staff)? Do human resource development initiatives cover areas such as: open staff appraisal methods linked to feedback on performance, personal goal-setting, training, and career progression?

Expatriate Staff

10.2.11 Is much use made of expatriates? In which fields? Are their skills transferred to local staff? Are there any problems (such as language differences)? Are new initiatives planned? Are expatriates difficult to recruit, and why?

Recruitment and Retention

10.2.12 Are there any problems with the recruitment and retention procedures of the government body responsible (such as the PSC), eg. long delays in recruiting staff? For the NTMD, does the MOH liaise closely enough with this governing body to obtain sufficient establishment posts, correct entry level qualification, realistic salaries, recognition of training, etc?

10.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Study 11 – Training

11.1 Guiding Principles

Training needs. One of the biggest causes of equipment problems is not failure of technology, but operator faults and misuse. Another area of concern is equipment which is not used to its fullest capacity because staff do not know how to apply it clinically. Thus it is essential to train health workers in the operation, application, care, and safe use of equipment. National training institutions need to have adequate stocks of equipment available, in order to train health workers in the correct use and application of the kinds of equipment they will work with on graduation. The curricula need to contain specific modules covering these issues.

Technical training for health care technology maintenance personnel is complex due to the range of equipment involved, and its application. For much of the basic equipment, knowledge is required of both electrical and mechanical processes together with workshop and repair skills. As equipment becomes more sophisticated, knowledge of electronics, microprocessors, automation, and control theory is required. In addition, modern medical equipment also requires understanding and practical experience in fields such as (radiation) physics and clinical measurement. Technical staff need to understand the application and principle of operation of each piece of equipment – only then will they be able to maintain it correctly and safely. As medical equipment connects directly to patients, safety is another extremely important issue. It must be stressed that simply taking electrical installation graduates and asking them to maintain medical equipment will usually fail. Therefore, maintenance personnel will require a series of training periods throughout their careers in order to obtain these wide ranging skills[37].

In addition, training is required in a number of other areas: management skills are required by all sorts of cadres involved with health care technology; skills in selection, specification writing, tender adjudication, and procurement, in order to ensure the acquisition of suitable technologies; and skills in stock control, management, and budgeting.

A training plan. Training is a very important component of the health care technology package and must be seen as a planned developmental process. The Ministry of Health needs to develop a strategy for the training, deployment, and management of each cadre; special consideration needs to be given to technical staff as they may be a new cadre within the health service. The MOH will need to consider the advantages of the different options available to them: hiring basic level technical graduates and training them on-the-job; hiring higher level graduates and offering in-service training opportunities to increase their skills; hiring and bonding staff then sending them abroad for training; taking clinical staff with a technical aptitude and turning them into technicians. They will need to make use of existing courses on offer from available training bodies (nationally and internationally). They will also need to investigate the possibility of developing new courses, such as liaising with trade test authorities to obtain recognition and qualifications for health care technology maintenance artisans.
The training plan for the health care technology sector needs to be incorporated into the MOH overall HRD plan, and money set aside for such training. The MOH will need to liaise with external support agencies to obtain scholarships for some of these requirements, and will have to flag health care technology training as a specific and important component for the country programmes of external support aganecies.

Training bodies outside the Ministry of Health. Training can take the form of long or short courses, undertaken locally or abroad, by academic and vocational institutions, manufacturers, trade testing agencies, or international bodies. All possible combinations should be pursued.

Ministry of Health training capacity. Since medical equipment is specific to the MOH alone, national training organisations may not have developed appropriate courses. Thus ministries of health may have to develop their own in-service training capacity; this will require:-

- preparation of curricula;
- recruitment of trainers and development of training programmes;
- establishment of training facilities;
- certification of cadres linked to job descriptions;
- establishment of a career structure.

If any of these steps are missed out there is a danger that the trainees will not be employed successfully in the health service.

Renewal of skills. Training is an on-going process. In order for staff to retain their skills and to develop new skills, and to counteract rapid staff turnover, it is necessary to have a regular programme of refresher courses. The MOH needs to have a rolling programme of in-service training to cover the renewal of skills, sufficiently organized, funded, and implemented.

11.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, consider the reality for staff in the districts and regions, whilst bearing in mind the following questions:-

Training Needs

11.2.1 During basic training in your country:-

a. Do health staff get good exposure to the kind of equipment they will find in the workplace, either in the training institute or through access into health facilities?
b. If there are problems, are there any plans to improve the situation?
c. Are specific training modules on the use and care of equipment integrated into the basic level training curricula for health personnel?
d. Do staff have adequate access to equipment in order to obtain sufficient experience in the application of taught procedures?

11.2.2 Bearing in mind the numbers of equipment not in use (assessed in Study 8.2), is there evidence of lack of skills in the operation of equipment, the application of equipment, the care of equipment, and equipment management procedures? What are the known training requirements?

11.2.3 Given the range of skills technical staff require in order to understand the use and maintenance of the many types of health care technology, is there evidence of lack of skills in the maintenance and management of this technology? What are the known training requirements?

11.2.4 What other training needs are there related to equipment issues (such as supplies officers, tender adjudicators, safety inspectors, managers, etc.)? What training institutes are available locally or in neighbouring countries? Are there plans to make use of them?

A Training Plan

11.2.5 Does MOH have a comprehensive training plan for all aspects of health care technology management? Does it adequately cover the needs of maintenance staff, and provide them with sufficient skill-development during their careers? Has the MOH considered all the different options available to them for increasing the technical skill base? What initiatives are they investigating or trying out?

11.2.6 Has the training plan for the health care technology sector been incorporated into the overall HRD plan of the MOH? Is health care technology training adequately supported by external support agencies, and reflected in their country programmes?

Training Bodies Outside MOH

11.2.7 Who undertakes what sort of basic training for health personnel in your country? What sort of cadres have to be trained abroad?

11.2.8 What training institutes are available locally for producing artisans, technicians, and engineers, and of what type? Are staff recruited from these courses? If not, why not?

11.2.9 What training institutes are available locally and internationally for producing technicians, engineers, and managers for health care technology maintenance? Are staff recruited from these courses, or hired and sent for training? If not, why not?

11.2.10 How many of the equipment suppliers to MOH offer user training, and maintenance training (available as standard or only on request, locally or abroad)? [A table may be useful]. Does the MOH make use of these resources?

11.2.11 Does MOH make use of training opportunities offered by international organisations such as IAEA, WHO, IFS, UNIDO, UNESCO, IFMBE, IFHE, Medical Research Councils, etc?

MOH Training Capacity

11.2.12 What training capacity exists within MOH (eg. curricula, trainers, facilities, certification) to cover health care technology subjects? Is this capacity applied to the courses at the national training organizations, or for in-service training programmes? Which types of cadre are trained?

11.2.13 Are general maintenance staff taken on and given on-the-job training to orient them to health care technology work? If so, is the training formalised, and recognised in their career progression? Is it certified by a relevant body such as the Trade Testing Authority?

Renewal of Skills

11.2.14 Is there a rolling programme of in-service training to cover renewal of skills? Is it adequately organized, funded, and implemented? What form does the training take – on-the-job, external courses for long or short periods, workshops/seminars?

11.2.15 When and how is refresher training organized?

a. Do new staff automatically get induction training in departmental procedures, and does this include how to use the equipment in the department?
b. Do health facilities regularly have in-service training days/seminars? Have they been used for equipment issues?

11.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

STUDY 12 – Technology Assessment, Research and Development

12.1 Guiding Principles

The health care technology industry is evolving rapidly. In 1987, the Canadian Department of Health and Welfare reported that 5–10 per cent of medical devices on sale had not been available during the previous year[38]. Health services around the world utilize these costly and potentially risky technologies without very much evaluation. This had led to interest in the following areas:-

Technology assessment. The introduction of so many new and continually changing technologies has led to an increased interest in assessing their efficiency and efficacy. However, only a small number of studies have addressed the use of equipment in developing countries. The need to ensure that the limited resources available for health care are used cost-effectively in these countries makes this kind of research especially important. Also, there is a great need to ensure that the products chosen are "appropriate"; one role of the Technology Advisory Committees would be to investigate any technology assessment reports for consideration during the selection process (see Study 5).

Internationally there are different initiatives to assess and evaluate equipment; equipment procurers and maintainers can subscribe to publications/databases which regularly evaluate equipment[23b,39]. In addition, organisations, such as the WHO, have in the past proposed various specification guidelines to assist purchasers to identify equipment which is suited to harsh climates and easy to maintain[40-43].

A number of international bodies have carried out, or proposed, studies to assess the use and maintenance of advanced technologies in developing countries[44-46]. An International Society of Technology Assessment in Health Care (ISTAHC) was established in 1985, and has over 300 members from 21 countries. The international standards authorities IEC and ISO have growing medical device programmes. Canada, the UK, and the US national health departments have for several years had tripartite staff meetings to discuss medical device problems of mutual concern. There are also national initiatives, for example in 1993 the Medical Research Council of South Africa set up a National Information Centre on Health Services Research and Health Care Technology.

Research and development of equipment. Investment in research is the motor which drives change in health care technology. Virtually no such expenditure is being made in developing countries, and manufacturers say that they do not have an economic incentive to undertake research aimed at the needs of poor countries due to the very small portion of the market that such countries represent. This area requires international support in order to encourage the development of equipment suited to the needs of developing countries.
Most manufacturers feel that they receive very little feedback regarding their products or the performance of their representatives. Very little can be changed unless there are more open lines of communication between manufacturers and their customers in developing countries.

Research topics. A number of topics require research as part of an international programme to support the more effective use of health care technology in developing countries. These include:-

- the development of "appropriate" equipment;
- the assessment of existing technologies;
- research into alternative ways of structuring the relationship between suppliers of health care technology and the health sector;
- operational research applicable to different parts of the world (such as cost benefit analyses, usage rates of equipment and supplies, equipment down-time, maintenance costs, etc).

Research facilities. Ministries of Health may undertake research themselves; they may also collaborate with other research bodies which can be private or fall under higher education establishments. Research can be undertaken nationally, regionally or internationally. Methods are needed for dissemination of information, so that ministries can benefit from research carried out by others.

12.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, whilst bearing in mind the following questions:-

Technology Assessment

12.2.1 Has the MOH evaluated equipment purchased, evaluated equipment in use, or assessed the level of technology employed? Are efforts made to choose the most appropriate equipment?

12.2.2 Does the MOH subscribe to available organisations for their publications and databases? Has the MoH collected resources and guidelines to help assess available technologies and evaluate equipment on sale?

12.2.3 Has the MOH entered into any internationally run technology assessment programmes, or linked up with other international bodies in order to benefit from their research?

12.2.4 Is technology assessment data taken into account in the equipment selection process? Does a body, such as a Technology Advisory Committee, study such data?

Research and Development of Equipment

12.2.5 Does the MOH provide feedback to manufacturers concerning equipment performance and problems, or the performance of the manufacturers' representatives?

12.2.6 Does the MOH collaborate with manufacturers on the development of suitable equipment for the region?

Research Topics

12.2.7 Is the MOH undertaking any research in the topic areas listed? Is the MOH collecting any data which could be used for operational research in the future (such as analysis of equipment usage rates, equipment downtime, typical problems, spare parts usage rate, consumables usage rate, comparable costs for the operation or maintenance of different equipment, etc.)?

12.2.8 Is MOH undertaking research in any other topic areas? What areas are these?

Research Facilities

12.2.9 Are any national organisations undertaking equipment assessment and research? If so, in which fields? Is the information disseminated regionally to neighbouring countries, or elsewhere?

12.2.10 Are there suitable research facilities (nationally or internationally) with which MOH could collaborate in the future? What areas of research could there be collaboration on?

12.3 Recommendations

Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

Study 13 – Local Production

13.1 Guiding Principles

The local production of health care technology products can yield a number of associated benefits. It can stimulate local economies and increase local technical capacity. It can enable attention to be focused on items that are applicable, acceptable, and affordable. The national support environment will be strengthened with increased local availability of technical knowledge, and thus create a greater ability to sustain products in the long term. Locally produced items may also find a regional market amongst neighbouring countries. Also if products are bought from neighbouring countries, there may be the possibility of better after sales support due to their closeness of the manufacturer.

The industrial sector. A number of health care products could be manufactured even in countries with relatively weak industrial sectors. These include consumables (medical supplies, IV fluids, gases), furniture (desks, trolleys), prostheses, walking aids (wheelchairs, crutches), physiotherapy and occupational therapy exercise aids (parallel bars, wobble boards, bean bags, posture supports), simple laboratory equipment (microscopes, photometers), etc. Many of these items can be made from locally available materials. A number of organisations have produced guidelines for the local production of such products[47-50]. In addition, parts can be produced, or there can be assembly of entire units from imported components.

A stable market. For local production to be economically viable, a stable market for health care products must be established. This depends on a number of factors which include:-

- assured funding for the health services;
- a reduction in the number of brands serving the market;
- allocation of adequate funds to purchase on-going services such as maintenance and spare parts;
- progress in regional integration.

In the past obstacles to the success of national initiatives have been: larger international and neighbouring country competitors who have killed national initiatives by lowering their prices; and the inability or unwillingness of governments to protect local enterprises, or even to place orders with them thereby undermining the potential market. For local production to be successful, strategies which positively support it will be required.

13.2 Situation Analysis and Problems

Consider all the issues under the headings in the introduction, reflect on the true situation as found in your country now, whilst bearing in mind the following questions:-

The Industrial Sector

13.2.1 Is the private and industrial sector in your country large and long-established, or not? What are the main areas (eg. heavy industry, agricultural plant)? What areas does the manufacturing sector mainly support (ie. steel and concrete for the construction boom)? Is there limited manufacturing of products related to health care?

13.2.2 In Study 2.5 you identified how many companies from your country are selling to the medical sector, is the number increasing? Are most of their products imported?

13.2.3 Do most imported goods come from international sources, or from neighbouring countries? What products are purchased from which neighbours? What have been the

advantages or disadvantages of purchasing from neighbours? Have you received better after sales support?

13.2.4 How many companies:-

a. locally manufacture goods that are used in health facilities, and what do they produce (ie. wheelchairs, hospital furniture, orthopaedic devices, physiotherapy exercise equipment)?
b. locally assemble, from imported parts, goods that are used in health facilities, and what do they assemble (ie. microscopes, hospital furniture)?
c. locally produce medical consumables, and what do they produce (eg. medical gas/air, IV fluids, laboratory standards)?
d. locally produce spare parts for health care equipment, and what do they produce?

A Stable Market

13.2.5 Has the MOH made any efforts to support local production, such as standardize to local products, collaborate on design improvements, order in bulk, purchase spare parts, etc? Are there trade restrictions or incentives to do this?

13.2.6 Has the MOH made any specific efforts to support production in neighbouring countries (such as standardizing to regional products, collaborating on design improvements, etc)? Are there trade restrictions or incentives to do this?

13.2.7 Are many of the health care items produced in your country exported to neighbouring countries? If not, what are the constraints?

13.2.8 What obstacles have there been to the success of local production initiatives? Do larger competitors dominate the market? Does the MOH fail to purchase locally produced goods?

13.3 Recommendations

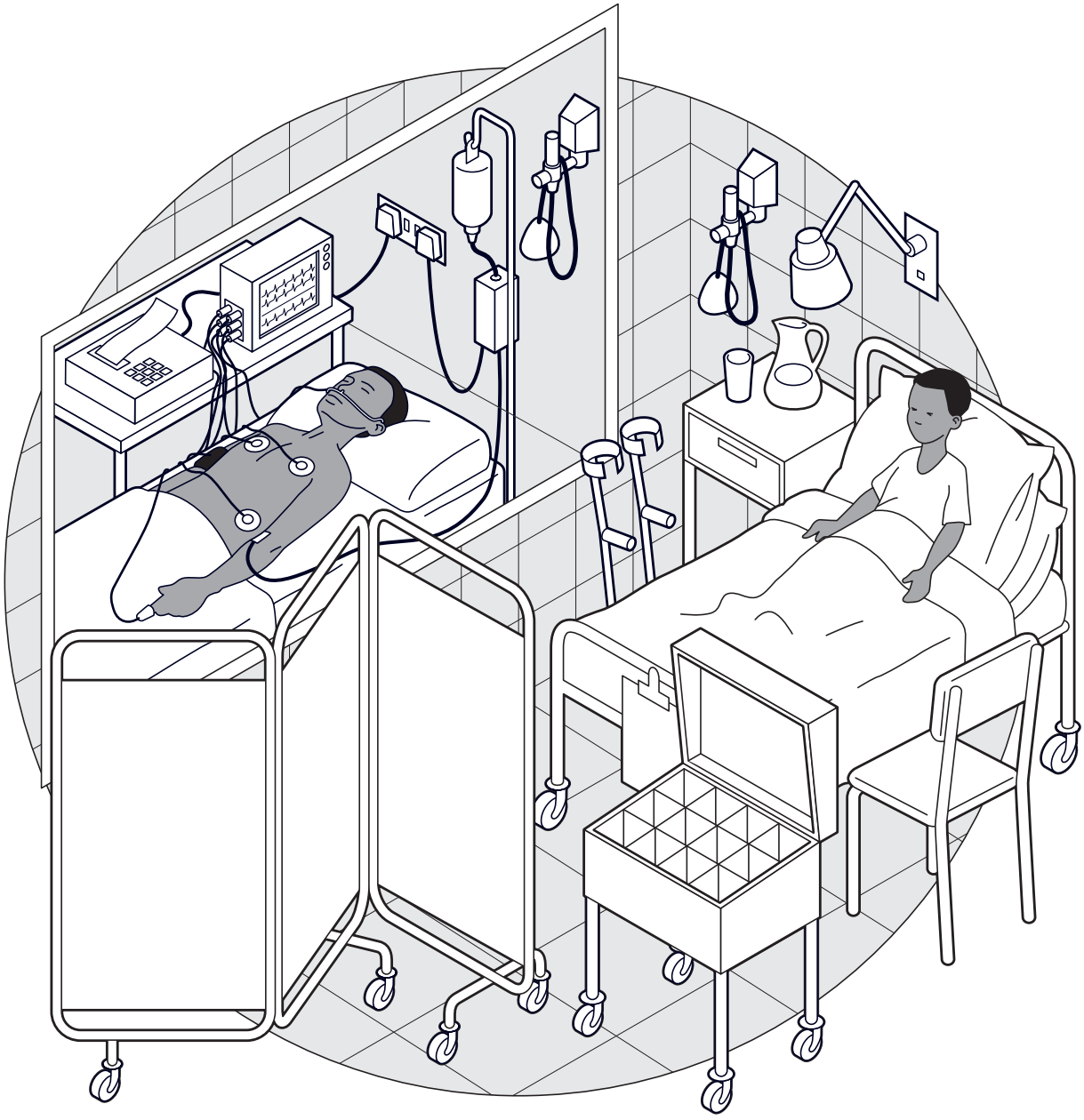
Consider here any functional alternatives for the problems/constraints identified in the situation analysis. Any ideas will be used in the workshop (see Step 4) which will produce recommendations for future action.

STEP 4

Run a National Workshop to Identify Recommendations for Change

This Step looks at:-

Action 1: Preparation
Action 2: Running the Workshop
Action 3: The Follow-Up



STEP 4 – Run a National Workshop to Identify Recommendations for Change

Instructions

Only once the constraints have been identified, is it possible to move forward and develop an appropriate policy based on a full understanding of the real technology management issues. Thus the "Situation Analysis and Problems" identified by the Task Force (see Step 3) must be written up and presented to a wider audience of the many people and institutions involved in Health Care Technology Management.

A National Workshop is a suitable forum for such a presentation, and the attendees should come from various backgrounds with differing involvement in technology management, such as: users, maintainers, managers, and suppliers of health care technology, etc.

A great number of people from different health facilities, different sections of government, and different levels of administration, make decisions every day which affect the life of health care technology. Most of these people work in isolation from the technology itself, and have no idea of the implications of their decisions. Those who do work directly with health care technology equally have little understanding of the other administrative constraints which affect them. This can lead to lack of collaboration between the different sections to reach the most appropriate and workable solutions.

Many participants will not realise the range of problems found in the health care technology sector and experienced by the Ministry. They will be interested in the issues and will contribute enthusiastically in working groups and throughout the proceedings, thereby ensuring a productive Workshop.

The **AIM** of holding a Workshop is to:-

- bring together as many different cadres as possible for "ownership" of the process;
- promote understanding of the different needs and constraints through the presentation of the Situation Analysis findings;
- allow for additional inputs by providing the opportunity for discussion and the airing of other viewpoints;
- facilitate discussion, debate, and brainstorming in order to arrive at mutually acceptable solutions;
- develop recommendations for change to address the constraints identified under each component of the Health Care Technology Package (Step 3);
- extract the major common needs and develop more detailed solutions for these 'key issues';
- produce "functional alternatives" to the problems, that will improve the situation for the future.

In order to successfully run a National Workshop, various Actions are required. This section gives some guidance on:-

Action 1: Preparation
Action 2: Running the Workshop
Action 3: The Follow-Up.

Action By The main motivators will be the *Task Force members* with assistance from additional Workshop Facilitators if required. The main contributors will be the *Workshop Attendees*.

What To Do For each Action, consider the issues presented, make decisions, and undertake the tasks required.

Action 1: Preparation

1.1 Requirements and Tasks to Complete

a. Draft the Situation Analysis document, and send copies to the main collaborators (key people involved in the situation analysis process at central, regional, and facility level).

b. Plan when to have the workshop, for how long (see Action 2), who will be invited (see 1.2 below), where it will be held, etc.

c. Calculate the cost of the venue, food, accommodation, travel, subsistence, materials, facilitators, etc; and seek funding.

d. Book the Workshop venue and accommodation for participants.

e. Send out invitations.

f. Organise transport to the venue for participants (where necessary).

g. Organise food requirements for the Workshop.

h. Identify additional Workshop Facilitators if necessary, either local or foreign consultants (see suggestions in Step 1).

i. Prepare agenda (see Action 2).

j. Organise secretarial support.

k. Organise the provision of visual aids, such as: flipcharts and stands, markers, paper, pads, pens, overheads and projectors, etc.

l. Prepare handouts (overheads, posters, etc) for the participants as follows:-
   i) a statement explaining the Aims of the Workshop and the role they will be expected to play;
   ii) the Agenda, and travel/accommodation arrangements;
   iii) the Guiding Principles of Procedure Studies 3–13 (see Step 3);
   iv) the Situation Analysis data.

   Due to the danger of swamping the participants with the volume of data that will be available, it has proved useful to supply participants with i), ii), & iii) in advance of the Workshop, and iv) only on arrival at the Workshop; this must be balanced against the time the participants will require to digest all the data. The senior management staff will most likely need to see iv) in advance.

m. Plan the Working Group Sessions (see Action 2).

1.2 Who to Invite

Representatives are required from different organisations:-
- Ministry of Health central office *and* regional offices;
- Health facilities at different levels of the health service;
- Ministries or bodies responsible for the maintenance of buildings, services, plant, etc;
- Other health care providers;
- Equipment supplier companies and maintenance providers;
- External support agencies which assist the health care technology sector, etc.

There should be a good mix of personnel from different backgrounds including:-

Technical Services	Clinical Services
Supplies	Administration
Finance	Planning
Human Resources	Training, etc.

It will not be possible to ask representatives from all these backgrounds from every organisation listed. So try to mix and match cadres from different organisations until a good cross-section is obtained of approximately 40–50 people (including the Task Force members) depending on the budget available. People are required who have something to say, but the Workshop will also be a good learning experience for some more junior, less experienced staff. Senior decision-makers are required both for their authorization, but also so that they can hear about problems firsthand and obtain the regional and peripheral viewpoints.

1.3 Additional Strategies

It may be beneficial to:-

a. have the workshop opened by the Minister of Health or the Permanent Secretary in order to generate ownership at the highest level and demonstrate political will;

b. try to obtain funding for part of the workshop (eg for a specific meal, or for certain stationery, etc) from some of the suppliers in order to also generate ownership of the

process outside the MOH.

ACTION 2: RUNNING THE WORKSHOP

2.1. What to Cover – the Agenda

Day 1

a. The Task Force members and facilitators will provide a *background briefing talk* for the participants on:-
   - the typical problems with the health care technology sector;
   - why the workshop is taking place and how the workshop fits into the policy development process.

b. The Task Force members should share responsibility for providing feedback presentations on the outcome of the Situation Analysis by presenting the findings of Studies 1–13. The participants should be given handouts summarising the findings. These will provide a good grounding on which to base the days' deliberations.

c. The facilitators will chair a plenary discussion of the Situation Analysis findings, in order to clarify them or add regional perspectives.

Day 2

d. Once the background has been made clear in Day 1, the Task Force members and facilitators should divide the workshop delegates into working groups to discuss one or more areas covered by the situation analysis. Working Groups are not required for Studies 1 & 2 as they contain the background structure; it is better to concentrate on Studies 3–13 which cover procedures (see Step 3, Part B)).

   For example, depending on the number of participants, consider whether:-
   - one group could study: selection, and technology assessment and R&D;
   - another group: procurement, and getting technology ready for use;
   - another group: maintenance, and local production;
   - another group: management, and financial planning;
   - and so on.

   Then spread different types of cadres, and representatives of the different organisations, between the various subject areas.

e. Then each Group should:-
   i. choose a secretary/note-taker;
   ii. gain an understanding of the "ideal situation" by reading the Introductory Notes for their set areas (provided in advance);
   iii. read the detailed Situation Analysis for their set areas (provided as handouts) in order to understand the real situation as it is, and the constraints identified (care must be taken not to waste time debating the constraints already identified by the Task Force);
   iv. spend most of their time brainstorming to come up with functional alternatives as solutions;
   v. write down these functional alternatives on flipcharts;
   vi. choose a rapporteur/spokesperson;
   vii. prepare to present the Group findings to the rest of the Workshop.

f. The plenary session reconvenes, and the Working Groups should present their findings for review, discussion and revision. Many recommendations will be obtained from each Group.

g. During a lunch or tea break, the Task Force/facilitators should draw out any major themes that crop up from the recommendations of the Working Groups.

For example consider:-
Were specific points identified as key issues across all the presentations? Can common trends be seen?

Often many recommendations relate to:-
- financial/budgetary problems;
- personnel and training issues;
- the role of the body responsible for the maintenance of buildings and plant;
- the need for a national health care technical service;
- the need for a technology advisory/selection committee;
- the role of external support agencies;
- constraints within the procurement and supply system.

Choose a selection of the most burning common factors for which change is required to benefit health care technology management as a whole, and which can be taken forward for further discussion and development.

The Task Force/facilitators should divide the Workshop participants into new Working Groups – a smaller number with more people in each. Decide which of the key issues each Group will develop further (1 or possibly 2 areas is sufficient). Mix up the participants so that different people work together and a different combination of viewpoints is obtained. Cadres with specific backgrounds may be allocated to Working Groups so that their expertise in that area can be used.

Day 3

h. The new Working Groups should:-
   i. choose a secretary/note-taker;
   ii. review the recommendations for change made under their key issues areas (*for example, all the recommendations regarding the need for a health care technical service*);
   iii. spend most of their time brainstorming to refine and expand the recommendations given, and come up with practical solutions to the problems (*for example, decide what the structure of a new health care technical service would be, what staff could be supported at which level, who they would report to, what their mandate/responsibility would be, etc*);
   iv. develop realistic work plans for the implementation of the changes proposed (ie. what action should be taken, by whom, by when);
   v. write down these detailed proposals for change on flipcharts;
   vi. choose a rapporteur/spokesperson;
   vii. prepare to present the Group findings to the rest of the Workshop.

i. The plenary session reconvenes, and the new Working Groups should present their proposals for review, discussion, and revision. Agreement should be reached on the proposed way forward which will be presented in the policy document.

j. The Chair of the Task Force should close the Workshop by detailing the plans that exist for taking the Workshop findings forward, and how the policy-writing process will progress.

2.2 Facilitators

The facilitators (Task Force Members, and additional consultants if required) should share the

task of acting as Rapporteurs for the plenary sessions. They should also be spread amongst the Working Groups to help to: clarify issues, encourage debate, keep Groups on track, and ensure the practicality of recommendations.

2.3. Secretarial Support

During each day of the Workshop, secretarial support should provide a written record by typing up:-

- the notes from the plenary sessions provided by the rapporteurs;
- the presentations of the Working Groups, from their flipcharts and any relevant associated notes.

Action 3: The Follow-Up

3.1 Requirements and Tasks to Complete

The Task Force and other facilitators will have to:-

a. Pursue Working Group rapporteurs for clarifications, final submissions, background details.

b. Further develop and write up the specific proposals from the second Working Groups as Annexes for the Situation Analysis document.

c. Revise and adapt the draft Situation Analysis document.

d. Distribute the document to workshop attendees and the main collaborators for comments.

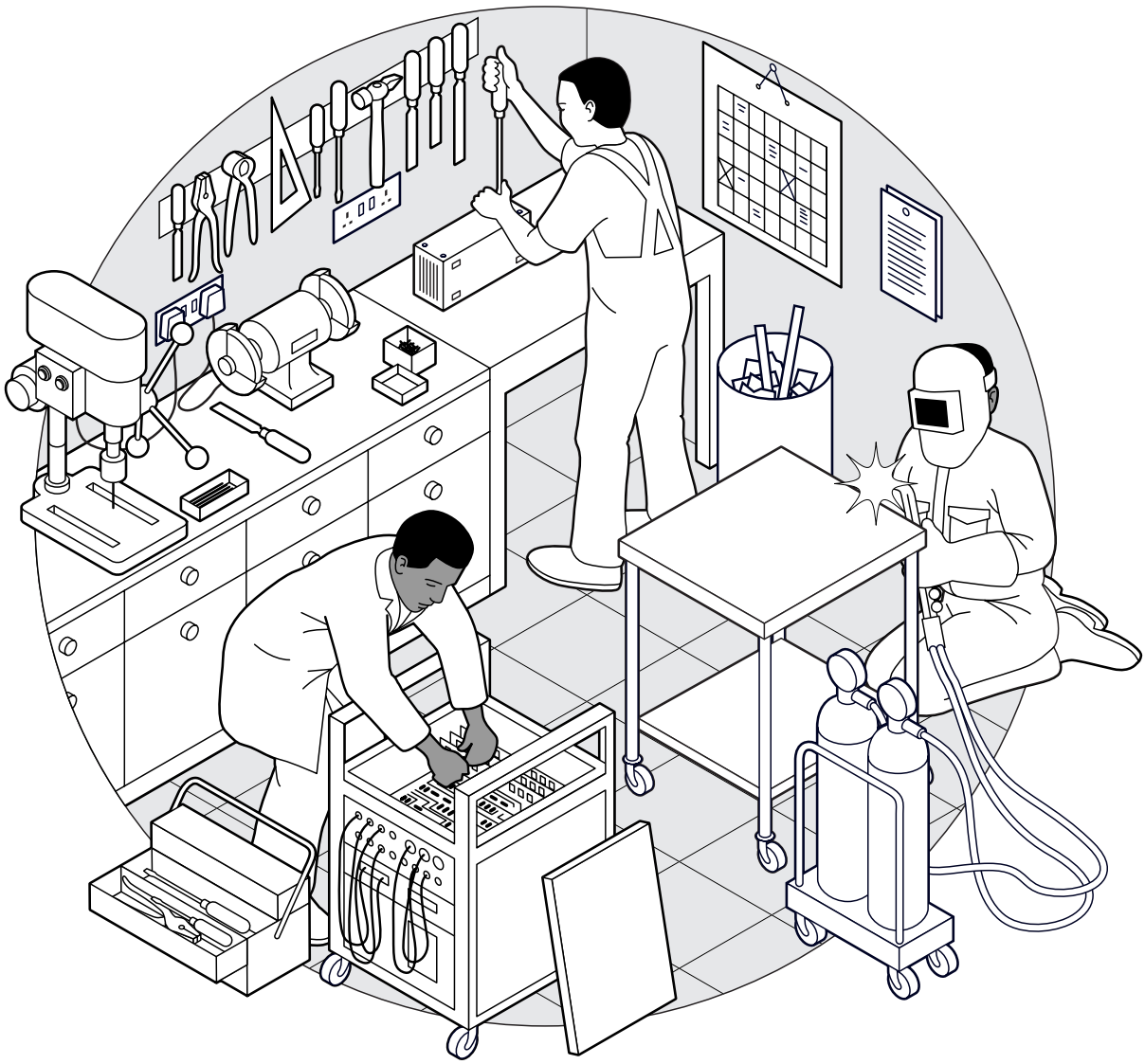
e. Finalize the Situation Analysis document.

f. Submit the document to senior MOH officials.

STEP 5
Formulate National Health Care Technology Policy

This Step looks at:-

Action 1: Structure of the Policy Document
Action 2: Statements of Intent
Action 3: Distribution and Review of the Draft Policy
Action 4: Implications and Costings
Action 5: Revision of the Policy Document



STEP 5 – Formulate National Health Care Technology Policy

Instructions

The Situation Analysis and National Workshop have provided an understanding of: the resources available to the health care technology sector; the people involved; the factors which influence the effective use of technology; the constraints within the current situation; as well as recommendations for the resolution of the problems. Now from this informed position, the Ministry of Health can take the ideas and plans for change which were produced, and feed them directly into the development of a realistic health care technology policy.

Any health care technology policy is likely to contain a minimum of typical policy components which can be derived from the findings of the situation analysis. Thus the Policy Document will be structured around the Situation Analysis format, using the 'signposts' provided (see Step 3) to enable consideration of all the issues to be addressed.

If health care technology is to be managed effectively, several major policy issues will have to be addressed. There will be common factors on which liaison is required with other ministries and bodies, such as adequate funding, responsibility for maintenance, establishment posts and training plans, standardisation of technology, and negotiations with donors, etc.

A process is required to further develop any ideas and their implications; relate them to overall plans and strategies in the MOH; negotiate with other ministries; obtain pre-approval of key policy issues; and draft, review, and finalize a policy document. This process is structured around the framework provided here.

The framework consists of 5 Actions:-

Action 1: Structure of the Policy Document
Action 2: Statements of Intent
Action 3: Distribution and Review of the Draft Policy
Action 4: Implications and Costings
Action 5: Revision of the Policy Document.

Action By The *Task Force*, with co-opted members as necessary for different areas of policy, and with guidance from the *Steering Committee* and the ministerial *Policy-Formulating Authority*.

What To Do
- Consider the issues as described.
- Plan and hold a series of meetings for writing Policy.
- For Actions 1, 2, & 4, consider the issues presented, make decisions, and answer the questions in *italics*.
- Visit, meet, and discuss the issues with many different parties and seek guidance from senior MOH officials.
- For each Action, undertake the tasks required.

Action 1: Structure of the Policy Document

It is necessary to agree on the structure of your Policy document.

1.1 Overall Layout

It has proved useful to employ the framework format of the Situation Analysis (Step 3) as a layout for the Policy document. This framework provides you with sections and sub-headings under each of the Procedure Study areas 3–13.
First you need to develop the Goal and Guiding Principles for your Policy. Then Objectives can be developed for *each* of the 11 Procedure Study areas, and Strategies developed for *each* of the sub-headings within each Study area.

1.2 The Goal

Develop the Goal of your Policy by considering the following question:-

1.2.1 What is the goal for your national health care technology policy?

Consider the following possible statement:-

> 'To deliver improved health services, by giving health service providers the necessary health care technology resources to enable them to deliver a high quality, safe, and cost-effective service. The National Health Care Technology Policy (NHCTP) is a tool to help the MOH to achieve this goal.'

Can you write a better or more appropriate one?

1.3 The Aims

Develop the Aims of your Policy by considering the following question:-

1.3.1 What are the guiding principles behind your Policy?

Consider the following possible statements:-

> 'to ensure that constant availability of safe and appropriate health care technology is maintained in the health facilities of your country'
>
> 'to ensure that equitable access of all citizens to essential health care technology is observed and sustained'
>
> 'to ensure the provision of essential health care technology which is appropriate, and affordable to Government'
>
> 'to promote the safe operation of health care technology through correct use by skilled and knowledgeable staff'
>
> etc.

Can you write better or more appropriate ones?

1.4 The Objectives

It is suggested that areas of Policy are developed for each of the Procedure Study areas 3–11. For each of these Policy areas, you should develop a national objective statement. Consider the following possibilities:-

1.4.1 For Management and Planning, what about the following objective?

> 'to ensure that MOH's stock of health care technology is developed and administered by an appropriate technical body in a rational way according to good technology management practices, based on sufficient information and understanding of the state of the stock at any given time'.

1.4.2 For Allocation of Financial Resources, what about the following objective?

> 'to ensure that sufficient funds are mobilised to sustainably finance national health care technology needs'.

1.4.3 For Selection of Technology, what about the following objective?

> 'to ensure that the essential health care technology incorporated in your country's Standard Equipment Lists is appropriate, affordable, and safe for the delivery of the health care service'.

1.4.4 For Procurement, what about the following objective?

> 'to ensure that health care technology is procured at best cost benefit ratio, in a fast and efficient manner, and is delivered safely to the correct destination'.

1.4.5 For Preparation for Technology Use, what about the following objective?

> 'to ensure new health care technology is prepared and ready for safe operation in an appropriate working environment'.

1.4.6 For Continued Operation, what about the following objective?

> 'to ensure the constant availability of functioning, reliable health care technology safely operated and cared for, and effectively disposed of and replaced at the end of its life'.

1.4.7 For Maintenance and Repair, what about the following objective?

> 'to ensure health care technology remains in good working order, and its normal life-span is maximised'.

1.4.8 For Personnel, what about the following objective?

> 'to ensure adequate numbers of suitably qualified cadres to deliver all aspects of the health care technology package effectively'.

1.4.9 For Training, what about the following objective?

> 'to ensure staff are available at all times with the knowledge, skills and attitude to operate, maintain, and manage equipment effectively'.

1.4.10 For Technology Assessment, Research and Development, what about the following objective?

> 'to ensure MOH is up-to-date on changing trends in health care technology, and to identify and support operational research and development activities in the field of health care technology'.

1.4.11 For Local Production, what about the following objective?

> 'to stimulate and promote local production of certain types of health care technology, and gradually decrease reliance on imports'.

Can you write better or more appropriate ones?

1.5 Policy Strategies

Once you have decided what your Objective is for a Study area, you need to develop the *Strategies* that will lead to the achievement of that Objective. It has proved useful to develop the Strategies required by considering every sub-heading for each Procedure Study area (see Step 3, Part B & your Situation Analysis document). Make sure you have a list of all these sub-headings under each Objective in preparation for brainstorming.

The Strategies to be developed will be derived from the findings of the Situation Analysis, as well as from the recommendations for change and plans developed at the Workshop.

The process for actually developing these Strategies is to take the issues studied and recommendations made, and translate them into 'Statements of Intent'. The way to undertake this process is described next, in Action 2.

1.6 Implementation

The Policy document will also need a statement describing how the Policy will be implemented. It is helpful to develop a Policy Implementation Plan (see Step 6).

1.7 Annexes

The Policy document will require Annexes where certain Strategies are described in detail. For example, you may need to present:-

- an organogram for your proposed Health Care Technical Service;
- terms of reference for any new bodies or committees proposed;
- job descriptions and areas of responsibility for any new posts proposed;
- etc.

Many of these details will have been developed from the plans generated by the second Working Group session of the National Workshop, and may already appear as Annexes to your final Situation Analysis document.

ACTION 2: STATEMENTS OF INTENT

Under each sub-heading of each Procedure Study area (in Step 3, Part B) consider the issues studied, the good practice found, and the recommendations for change made (in Step 4). Consider what Strategies will be required to achieve your Objective for that Study area. Then translate your wishes into '*Statements of Intent*'. Remember that your statements should not reinforce existing problematic procedures, but should present the new changes required which will improve the current situation. Also, the statements of intent should not detail the actual organizational procedures that will be followed, but simply provide the principles that any procedures will be based on. Some examples are presented here; these are only possibilities, you can develop better/more appropriate ones. Consider the following ideas:-

2.1 Management and Planning

Consider what issues were discovered about management and planning (Study 3), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

Establishment of a Management Structure

2.1.1 Have you found that your health care technical service is inadequately represented at ministry level, and throughout the country? Can you write a Statement of Intent about establishing, for example, a "National Technology Management Division" (NTMD)?

a. Will its head office be in the Ministry?
b. What will it be responsible for?
c. Who will head it?
d. Will there be a national network of maintenance workshops?
e. How will technology management be implemented at all levels of the health service?
f. Will there be technology management units in every health facility, or in every district and region?
g. How will you allocate posts for this service?

(The details can be presented as an Annex to your policy document).

2.1.2 What other management bodies are needed? Do you need a Statement of Intent regarding, for example, a Technology Advisory Committee (TAC)? Will health facilities also have technology committees? What will be their terms of reference? (The details can be placed in an Annex to the Policy document).

Formulation of Plans

2.1.3 What planning 'tools' do you have? Was a recommendation made to develop further 'tools'? Can you write Statements of Intent regarding, for example, the following 'tools' and how they will be used for planning purposes:-

a. a policy implementation plan;
b. standard lists of health care technology for different types of health facility;
c. inventories of health care technology;
d. a Core Technology Expenditure Plan (CTEP);
e. future Development Plans for the NTMD;
f. a comprehensive Training Plan?

Organizational Procedures and Guidelines

2.1.4 What organizational procedures and guidelines do you have? Was a recommendation made to develop them further? Can you write a Statement of Intent regarding the development of, for example, a 'Technology Procedures Manual' (see Step 6) to assist staff

with various aspects of managing equipment? Will there be various versions which present the different procedures to be implemented at different levels of the health service?

2.1.5 What other guides will be developed?

Monitoring, Supervision, and Feedback

2.1.6 What monitoring, supervision, and feedback procedures do you have? Does evidence-based planning take place? Was a recommendation made to develop these areas further? Can you write Statements of Intent regarding, for example:-

a. the use of indicators for overall equipment management and planning purposes;
b. annual reports which include statistics according to those indicators;
c. a system for providing feedback regularly (state how often);
d. whether data on technology will be included in your Health Management Information System;
e. whether national meetings will be held regularly (state how often) to review the overall implementation of the technology programme?

Communication

2.1.7 Was a recommendation made to improve communication with other parties involved in health care technology management? Can you write Statements of Intent regarding, for example, communication with the following bodies and how this will be improved:-

a. Ministry of Finance;
b. Ministry of Works;
c. other health care providers;
d. the Tender Board;
e. health care technology suppliers;
f. technology users?

Legislation

2.1.8 Has consideration been given to the medico-legal implications for using high technology equipment in the public and private sectors? Have the ethical issues, risks, and litigation possibilities been considered? Was a recommendation made to develop this area? Can you write a Statement of Intent regarding this aim and, for example, the associated regulations, quality issues, and co-ordination mechanisms which will need to be put in place?

2.2 Allocation of Financial Resources

Consider whether problems were discovered with the allocation of resources for health care technology (Study 4), whether recommendations were made to improve budgetary issues, and how you will reflect that Strategy.

Planning Expenditure

2.2.1 What will be the basis for planning expenditure? Can you write Statements of Intent regarding, for example, the following issues and how they will be used for planning expenditure:-

a. inventories;
b. a Core Technology Expenditure Plan;
c. the MOH Purchasing Policy (a sample policy statement is provided in Annex 2.1);
d. a wider range of budget lines showing different technology expenditures;
e. maintenance budget allocations;
f. the budget for the NTMD itself?

Budgeting for Depreciation

2.2.2 Have you found that there is a problem with the lack of planning for depreciation of health care technology? Can you write Statements of Intent regarding, for example, the following issues and how they will be used for budgeting for depreciation:-

a. data on technology 'life-times';
b. the international guideline estimate of 10% of stock value required annually;
c. the MOH Replacement Policy (a sample policy statement is provided in Annex 2.2);
d. who will be held responsible for the finances and replacement of items currently managed by others (such as plant or service installations);
e. the Core Technology Expenditure Plan;
f. whether the planning will be undertaken centrally, regionally or at facility level depending on the type of technology?

Budgeting for Maintenance and Repair

2.2.3 Can you write Statements of Intent regarding, for example, the following issues and how they will be used for budgeting for maintenance and repair:-

a. the international guideline estimates of % of stock value required annually depending on the type of technology;
b. who will be held responsible for the finances and maintenance of items currently managed by others (such as plant or service installations);
c. whether the maintenance budget will be split between central, regional, and facility level according to the maintenance functions defined for each level (as detailed in the Technology Procedures Manual for example)?

Life-Time Costs

2.2.4 Can you write Statements of Intent regarding, for example:-

a. how new technology under evaluation in the tender process will have its life-time costs taken into account;
b. whether facilities will gather data showing actual consumable requirements and rates of use, and how this will be used for budgetary purposes?

Links between Capital and Recurrent Expenditure

2.2.5 Can you write Statements of Intent regarding, for example:-

a. how planned increases in capital expenditure on technology under development budgets will have parallel increases reflected in the recurrent budgets;
b. which budget line will sufficiently cater for the routine replacement of existing capital stock (as distinct from project purchases under development plans)?

Control of Finances

2.2.6 Can you write Statements of Intent regarding, for example:-

a. where budgetary control will be held for the various technology expenditures;
b. which priority activities require centralized budgetary control to ensure their continuance when funding is tight (such as PPM)?

Preparation of Annual Action Plans and Budgets

2.2.7 Can you write Statements of Intent regarding, for example:-

a. whether annual plans will conform to the long-term goals of a CTEP only or whether activites will deviate from it?
b. whether the NTMD will make the annual plans for the items to be replaced nationally and communicate them to the regions/facilities, or leave it to the regions/facilities to decide;

c. whether budgets will be compiled annually for maintenance, repairs, and consumables at facility level, or at regional or central levels;
d. whether these budgets must be compiled with advice from the NTMD, or be authorized by them?

Resource Allocation

2.2.8 Has consideration been given to gaining acceptance by the Ministry of Finance for the Core Technology Expenditure Plan? Was a recommendation made to hold discussions with them regarding any of the budgetary changes required? Can you hold discussions with them regarding similar budgetary changes required for other ministries responsible for health care technology? Can you write a Statements of Intent regarding these aims?

Aid Packages

2.2.9 Have you found that external support agencies introduce technology that imposes increased recurrent cost implications onto the MOH? Was a recommendation made to improve negotiations with donors? Can you write a Statement of Intent regarding whether donors will be required to comply with:-
a. MOH specifications;
b. MOH criteria on the 'suitability' of products judged on the recurrent costs, maintenance costs, and availability of after sales support for the technology proposed;
c. MOH criteria on the 'package' of inputs to be supplied during procurement;
d. a requirement to support the increased recurrent cost implications if they fail to comply?

(A sample policy statement is provided in Annex 2.3).

Cost Benefit Analysis

2.2.10 Have you discovered that cost-benefit analysis does not take place? Was a recommendation made to improve this situation? Can you write a Statement of Intent regarding how cost-effectiveness issues will be considered, and by whom?

2.3 Selection of Technology

Consider what issues were discovered about the selection of health care technology (Study 5), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

Appropriate Choice

2.3.1 Can you write Statements of Intent regarding, for example:-
a. the criteria to be used when choosing health care technology and writing specifications (a sample policy statement is provided in Annex 2.4);
b. how equipment performance will be evaluated and by whom (possibly through performance reports, supervisory visits, and the Technology Advisory Committee)?

Personnel Involved

2.3.2 Has consideration been given to the types of people who should be involved in the selection of technology? Was a recommendation made to develop a team approach? Can you write a Statement of Intent regarding this aim? Will 'Technology Advisory Committees' be formed? At which levels of the health service will they be based? How will the MOH collaborate on selection with the other ministries responsible for certain types of health care technology?

The Request Process

2.3.3 How are the views of individual facilities reflected in decisions regarding the purchase of the technology they need? How often can requests for purchases be made and what happens in emergencies? Was a recommendation made to improve the request process? Can you write a Statement of Intent regarding this aim?

Information and Advice Required

2.3.4 Is sufficient information available to staff concerning health care technology products and developments? How is the availability of this information to be sustained? Can you write a Statement of Intent regarding obtaining and providing access to brochures, catalogues, international publications, software, feedback on past performance, and consultancy support?

Health Goals and Standard Lists

2.3.5 Can you write Statements of Intent regarding, for example:-

a. how the technology implications of any changes to the MOH's Health Goals will be taken into account during any health goal modification process;
b. how the Standard Equipment Lists will be modified to reflect any changes in the Health Goals of the health service, and by whom;
c. what level of technological sophistication will be included in the Standard Lists;
d. how annual requests from health facilities will relate to the Standard Lists?

Standardization

2.3.6 Can you write Statements of Intent regarding, for example:-

a. why an element of standardization is to be pursued, and how;
b. in what way this will impact on specifications and tendering?

Generic Specifications

2.3.7 Can you write Statements of Intent regarding, for example:-

a. how specifications will be developed, and by whom;
b. whether all purchasing will be undertaken according to those specifications;
c. who will evaluate any proposals for updating specifications;
d. who will review any technology assessment and research reports for potential amendment of specifications;
e. whether particular international standards must be conformed to?

Donations

2.3.8 Has the MOH produced guidelines for negotiating with donors regarding health care technology? Do donors have to conform to MOH requirements? Was a recommendation made to improve this process? Can you write a Statement of Intent regarding this aim? (A sample policy statement is provided in Annex 2.3)

2.3.9 Has the MOH encountered problems with the supply of second-hand equipment? Was a recommendation made to improve the situation? Can you write a Statement of Intent regarding this aim? (A sample policy statement is provided in Annex 2.5)

2.4 Procurement

Consider whether you found that many aspects of health care technology procurement were not co-ordinated (Study 6), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

People Responsible for Procurement

2.4.1 Can you write Statements of Intent regarding, for example:-

a. whether you want one body in overall charge of co-ordinating procurement of technology, and whether it should be the NTMD;
b. whether the writing of Specifications and Purchase Agreements will be undertaken centrally;
c. the availability of Standard Equipment Lists or illustrated catalogues and their use by different levels of the health service for procurement purposes;
d. the forum to be used for discussing health care technology procurement issues with other health care providers?

Principles of Procurement

2.4.2 Can you write Statements of Intent regarding, for example:-

a. whether MOH will only procure technology in accordance with its Purchasing Policy and Replacement Policy, and in line with its long-term Core Technology Expenditure Plan;
b. whether all technology procured will: conform to Specifications, be in-line with annual Purchase Contracts, and be in accordance with the Standardization principles adopted?

Writing Specifications and Deciding the Contents of Purchase Agreements

2.4.3 Can you write a Statements of Intent regarding, for example:-

a. which additional items MOH will always procure together with the health care technology product itself, ie. the contents of any Purchase Agreement? (A sample policy statement is provided in Annex 2.6).
b. how often Specifications and Purchase Agreements will be updated, on what basis, by whom, and who will approve them;
c. whether any other health facilities supported by MOH, such as mission facilities, will stock and purchase equipment using MOH Specifications, Standard Equipment Lists, and Purchase Agreements;
d. whether a body, like the Technology Advisory Committee, will consider all new donations being offered and reject any that do not conform to MOH Specifications, standards, or guidelines on the contents of Purchase Agreements?

Choosing the Supplier

2.4.4 Can you write Statements of Intent regarding, for example:-

a. how suppliers will be sought (ie. the procurement procedure to follow – eg. through tendering, direct contact, selective bidding, etc);
b. the principles on which adjudication of bids will be based (ie. the criteria for choosing health care technology appropriately – see Annex 2.4), and how they will be adopted by the Tender Board;
c. how the NTMD will judge the capabilities of local suppliers (eg. inspect the maintenance workshop facilities);
d. whether high technology items will always be purchased from and installed by the manufacturer rather than through sub-contractors?

Using Purchase Contracts

2.4.5 Can you write a Statement of Intent regarding, for example, whether successful tenderers are to allowed to supply agreed goods to government over a fixed time span under Purchase Contracts? Should any other health facilities supported by the MOH, such as mission facilities, be required to buy equipment through these same Purchase Contracts?

Safe Delivery, Customs, and Transport

2.4.6 Can you write Statements of Intent regarding, for example:-
- a. whether there will be a difference in approach to delivery for different types of technology (such as low or high technology items);
- b. where suppliers will be requested in the tender documents to deliver their goods to for receipt, checking, and assembly;
- c. whether there will be any penalty clauses for late delivery;
- d. the quality of freight carriers and domestic hauliers to be used;
- e. whether insurance cover will be obtained for delivery?

Storage Warehouses, Stock Control, and Despatch

2.4.7 Can you write Statements of Intent regarding, for example:-
- a. how storage facilities, stock control, and despatch will be improved;
- b. whether communication will be improved between all levels of the supply service in order to advise when equipment has arrived;
- c. the use of the Technology Procedures Manual to detail the working practices for receipt, taking onto stock, certifying invoices, informing the initiator of the order, etc?

Payment

2.4.8 Can you write Statements of Intent regarding, for example:-
- a. how payment procedures will be improved and delays reduced;
- b. whether payment should only be made, for example, after successful commissioning;
- c. what retention terms should be used for staged payments?

2.5 Preparation for Technology Use

Consider what issues were discovered about preparation for technology use (Study 7), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

Site Preparation

2.5.1 Can you write Statements of Intent regarding, for example:-
- a. how MOH will ensure that site preparation takes place on time and in accordance to information provided by the equipment suppliers;
- b. whether use will be made of small local contractors supervised by the NTMD?

Installation

2.5.2 Can you write a Statements of Intent regarding, for example, who will undertake installation of different types of technology and how the work of other agencies will be co-ordinated?

Commissioning

2.5.3 Can you write a Statement of Intent regarding, for example, who will undertake commissioning of different types of technology, according to what procedures, and how the work of other agencies will be co-ordinated?

Accepting Equipment into Service

2.5.4 Can you write Statements of Intent regarding, for example:-
- a. who will accept equipment into service, and which branches of the NTMD will be involved;

b. whether equipment will be issued with ID numbers and equipment service records will be opened at this time?

Initial Calibration

2.5.5 Can you write a Statement of Intent regarding, for example, who will undertake initial calibration for different types of technology, according to what procedures, and how the work of other agencies will be co-ordinated?

Initial Operational Training

2.5.6 Can you write Statements of Intent regarding, for example:-
a. whether users must be trained in the operation, care and cleaning, and safe use of new technology before they will be allowed to use it;
b. who will nominate staff and ensure they are available for training;
c. who will develop the training resources and give the training;
d. who will be responsible for ensuring that staff have the necessary skills and knowledge to train others?

Application Training

2.5.7 Can you write Statements of Intent regarding, for example:-
a. whether users must be trained in the application of the equipment before they are allowed to use it;
b. how this will be organized;
c. *who will be the trainers?*

Hiring Staff

2.5.8 Can you write a Statement of Intent regarding, for example, the commitment to and planning for hiring specialist staff (when necessary) in time for the arrival of new equipment?

2.6 Continued Operation

Consider what issues were discovered about the continued operation of technology throughout its life including its replacement at the end of its life (Study 8), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

Consumables

2.6.1 Can you write Statements of Intent regarding, for example, the following issues:-
a. a commitment to make resources available to ensure that equipment can be used throughout its life;
b. who will undertake the procurement, storage, and supply of equipment consumables;
c. whether an illustrated catalogue will be developed to facilitate the ordering of equipment consumables?

Accessories

2.6.2 Can you write Statements of Intent regarding, for example, the following issues:-
a. a commitment to provide replacement accessories as required throughout the life of a piece of equipment;
b. who will undertake the procurement, storage, and supply of equipment accessories;

c. whether an illustrated catalogue will be developed to facilitate the ordering of equipment accessories?

Spare Parts, Maintenance Materials, Tools, and Test Equipment

2.6.3 Can you write Statements of Intent regarding, for example, the following issues:-
a. a commitment to make resources available to ensure that technology can be maintained and repaired throughout its life;
b. who will undertake the procurement, storage, and supply of spare parts, maintenance materials, tools and test equipment;
c. whether an illustrated catalogue will be developed to facilitate the ordering of equipment spare parts, maintenance materials, tools, and test equipment;
d. whether tools will belong to individual maintainers or to the relevant health facility, and the arrangements for issue, replacement and security?

Manuals

2.6.4 Can you write Statements of Intent regarding, for example, what operation and service manuals will be obtained, what copies will be made, and where they will be kept?

Calibration

2.6.5 Can you write a Statement of Intent regarding, for example, who will undertake calibration for different types of technology, according to what procedures, and how this expertise will be developed?

Care and Cleaning

2.6.6 Can you write Statements of Intent regarding, for example:-
a. the development of expertise amongst users in the proper care and cleaning of equipment;
b. the availability of the correct cleaning materials;
c. whether procedure guides will be attached to machines or displayed in departments;
d. the decontamination policy to be pursued?

Planned Preventive Maintenance (PPM)

2.6.7 Can you write Statements of Intent regarding, for example:-
a. how scheduled maintenance plans for health care technology will be drawn up and budgeted for on an annual basis;
b. the commitment to sufficient resources: material, personnel, financial, travel, etc;
c. who will undertake PPM of the different types of health care technology;
d. the development of PPM schedules for users as well as for maintainers, and the monitoring of work undertaken according to set timetables;
e. whether procedure guides will be attached to machines or displayed in departments?

Storage and Stock Control

2.6.8 Can you write Statements of Intent regarding, for example:-
a. whether facilities will review their store rooms (used for equipment and associated supplies) to ensure they are secure, free from dust and damp, vermin-proof, cool enough, with sufficient shelves and storage spaces;
b. whether stock control procedures and their application will be reviewed;
c. how the inventory will be updated, how often, and by whom

d. what security measures will be put in place to prevent the loss of health care technology or maintenance tools, what penalties will be imposed on staff, and how funds could be recouped?

Safety

2.6.9 Can you write Statements of Intent regarding, for example:-
a. how safety procedures and guidelines will be made available (for example, who will write them, will they be presented in the Technology Procedures Manual);
b. who will be responsible for monitoring that staff conform to safety protocols;
c. which national regulatory bodies' rules will apply, and who will liaise with these bodies?

Refresher Training

2.6.10 Can you write Statements of Intent regarding, for example:-
a. who will assess the refresher training needs of staff;
b. who will develop training resources;
c. who will develop an annual training programme tailormade to the identified needs, as part of the overall Training Plan;
d. who will implement the training programme;
e. what other strategies will be pursued (such as regular staff meetings, updating through access to journals, etc)?

Effective Use of Equipment

2.6.11 Can you write Statements of Intent regarding, for example:-
a. whether only staff who have the necessary skills will be allowed to operate equipment and tools;
b. a process for regular identification of mis-use and under-use;
c. how cases of proven mis-use or under-use will be resolved;
d. who should accept responsibility for equipment and tools and be held accountable;
e. whether success with equipment will be reflected in staff performance appraisals?

Monitoring the State of Equipment

2.6.12 Can you write a Statement of Intent regarding, for example, how the working order and condition of equipment will be checked (possibly through annual inventories)? What statistics will be gathered? What other information will be assessed?

Disposal and Replacement

2.6.13 Can you write Statements of Intent regarding, for example:-
a. who will provide the technical advice on expected life-times and reliability for further use (according to the Replacement Policy) for the different types of health care technology;
b. who will be responsible for condemning equipment;
c. how equipment will be disposed of safely and promptly;
d. whether the disposal of equipment will automatically trigger replacement;
e. whether replacement, and the budgeting for it, will be planned activities (ie. annually);
f. how the MOH will ensure that the other ministries responsible for certain types of health care technology also undertake disposal and replacement promptly?

2.7 Maintenance and Repair

Consider what issues were discovered regarding the maintenance and repair of health care technology (Study 9), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

People Responsible for Maintenance

2.7.1 Can you write Statements of Intent regarding, for example:-

a. whether the NTMD will include a national network of workshops to organize overall maintenance and repair, made up of both fixed and mobile services;
b. whether MOH will take over the maintenance role currently taken by any other bodies;
c. whether the MOH in-house maintenance teams will be multi-disciplinary in nature;
d. what use will be made of private sector support;
e. how health service staff in general will understand the procedures to follow for obtaining maintenance support (possibly through the Technology Procedures Manual);
f. whether the NTMD will have first level bases such as 'technology management units' in every health facility, comprised of 2 or 3 staff (administrator, nurse, etc) responsible for technology issues, and whether any of them will do first-line maintenance?

Maintenance and Repair Work

2.7.2 Can you write Statements of Intent regarding, for example:-

a. who will be responsible for overall organization of corrective repairs and PPM;
b. when in-house units or private sector support will be used, depending on the type of technology;
c. how more emphasis will be given to PPM;
d. what use will be made of contracts for PPM and corrective repairs?

Maintenance Facilities

2.7.3 Can you write Statements of Intent regarding, for example:-

a. the availability of expertise within the MOH to manage all maintenance functions;
b. the provision of properly equipped and secure workshops with the necessary infrastructure, communication facilities, budgets, staff, transport, and resources so that the required maintenance functions can be carried out;
c. the use to be made of national and localized maintenance contracts, advice, and support from other technical bodies;
d. how to improve relationships with and the services received from other ministries, manufacturers, and regional capabilities?

Maintenance Management

2.7.4 Can you write Statements of Intent regarding, for example:-

a. the basis on which maintenance management will be carried out, eg. a computerized record system (a sample policy statement is provided in Annex 2.7);
b. the establishment of an effective system for carrying out maintenance in-house as well as a system for managing maintenance contracts?

Maintenance Budgeting and Accounting

2.7.5 Can you write Statements of Intent regarding, for example:-

a. the priority to be given to maintenance budgets, and what the allocations will be in accordance with;
b. how much of the fund control will be decentralized and how it will be monitored;

c. whether the funding for certain maintenance activities will be ring-fenced in order to ensure that they occur;
d. how maintenance costs will be documented and how the maintenance budgets will be reviewed, how often, and by whom?

2.8 Personnel

Consider what issues were discovered about personnel (Study 10), whether recommendations were made to improve this situation, and how you will reflect that Strategy.

Users

2.8.1 Can you write Statements of Intent regarding, for example:-
a. whether all users will preferably have graduated from basic training courses which included training on the equipment they will encounter during their work, and how this will be realized;
b. whether all users will receive induction training programmes on operation, application, and care of equipment when they commence work, and how this will be implemented?

Maintainers

2.8.2 Can you write Statements of Intent regarding, for example:-
a. how the staff establishment of the NTMD will take into consideration adequate and appropriate skill mixes for technical staff at each level, with suitable career paths and salary scales;
b. which skills should be available within the MOH, and which skills will be sourced elsewhere (such as through other ministries or private sector support)?

Managers

2.8.3 Can you write Statements of Intent regarding, for example:-
a. how health care technology management skills are to be developed;
b. how the general level of management skills within the health service is to be improved?

Other Cadres

2.8.4 Can you write a Statement of Intent regarding, for example, how the complementary staff required to manage health care technology will be put in place?

Working Conditions

2.8.5 Can you write Statements of Intent regarding, for example:-
a. the creation of an establishment structure for the NTMD with sufficient posts correctly classified for technical staff;
b. how the staff establishment of the NTMD will provide the means for adequate promotion of all cadres (for example, through definition of entry level qualifications, salary scales, recognition of training, etc);
c. what initiatives will be used to attract and retain technical staff;
d. whether MOH will ensure the adequate and appropriate working environment for all levels of the NTMD?

Expatriate Staff

2.8.6 Can you write Statements of Intent regarding, for example, whether special skills will be recruited from abroad if they are absent locally? How this recuitment will be facilitated to reduce delays? The mechanism to be used for transferring skills?

Recruitment and Retention

2.8.7 Can you write a Statement of Intent regarding, for example, how the MOH will negotiate with the government body responsible (such as the PSC) concerning the necessary recruitment and retention initiatives required to staff the NTMD?

2.9 Training

Consider what issues were discovered about training (Study 11), whether recommendations were made to improve the situation, and how you will reflect that Strategy.

Training Needs

2.9.1 Can you write Statements of Intent regarding, for example:-

a. how the basic training for nurses and other equipment operators will be modified to cover health care technology use, application, and care;
b. what the initial user training after commissioning should contain;
c. what the initial training after commissioning should contain for maintainers;
d. what guidelines will be provided as an accompaniment to initial user training;
e. what courses technical staff will undergo and at what points in their careers;
f. what training will be provided for other cadres involved with health care technology issues?

A Training Plan

2.9.2 Can you write Statements of Intent regarding, for example:-

a. the development of a comprehensive Training Plan and schedule, and the allocation of sufficient funds to implement it;
b. whether all types of in-service training will be included in the Plan (ie. pre-service, on-the-job, attending external training institutes for long or short periods, refresher courses, and workshops/seminars);
c. the inclusion of the Training Plan for the health care technology sector into the overall HRD plan of the MOH;
d. the pursuit of external agency support funding for technology training and its inclusion into their country programmes?

Training Bodies outside MOH

2.9.3 Can you write Statements of Intent regarding, for example:-

a. what use will be made of national technical training courses and trade testing;
b. what use will be made of international technical training courses;
c. what use will be made of manufacturers' courses?

MOH Training Capacity

2.9.4 Can you write Statements of Intent regarding, for example:-

a. how support will be given to national training organizations to develop courses appropriate to the needs of the health care technology sector;

b. how MOH will develop its own in-service training capacity (ie. through curriculum development, recruitment of trainers, establishment of training facilities, formal certification of graduates; recognition of training linked to career progression)?

Renewal of Skills

2.9.5 Can you write a Statement of Intent regarding, for example, how a rolling programme of in-service training will be put in place, in order to retain staff skills and counteract high staff turnover?

2.10 Technology Assessment, Research and Development

Consider what issues were discovered about technology assessment, research and development (Study 12), whether recommendations were made to improve this situation, and how you will reflect that Strategy.

Technology Assessment

2.10.1 Can you write Statements of Intent regarding, for example:-
a. where the responsibility will lie for technology assessment, what role the NTMD will take, what use will be made of internationally available data, what subscriptions will be taken out, and what budget will be held for this work;
b. how reports of relevance will trigger amendments to technology Specifications;
c. whether MOH will accept demonstration models of health care technology and what the legal implications will be? (A sample policy statement is provided in Annex 2.8).

Research and Development of Equipment

2.10.2 Can you write Statements of Intent regarding, for example, whether MOH will provide feedback to manufacturers on the performance or problems with technology, or will collaborate with manufacturers on the development of suitable technology for your region, or new after sales support initiatives?

Research Topics

2.10.3 Can you write Statements of Intent regarding, for example, how suitable areas of research will be identified, and which areas of research the MOH are willing to pursue?

Research Facilities

2.10.4 Can you write a Statement of Intent regarding, for example, how the work of local technical research bodies, international research bodies, and private sector bodies will be investigated, and disseminated, and how links will be established with the relevant ones?

2.11 Local Production

Consider what issues were discovered about local production (Study 13), whether recommendations were made to improve this situation, and how you will reflect that Strategy.

The Industrial Sector

2.11.1 Can you write a Statement of Intent regarding, for example, whether MOH will liaise with the private sector in order to stimulate the local assembly or production of "appropriate" whole units, spare parts, or consumables for health care technology?

A Stable Market

2.11.2 Can you write a Statement of Intent regarding, for example, the strategies MOH will pursue in order to promote and support local production?

And Finally:-

What other Statements of Intent do you require?

Before finishing, for each Statement of Intent consider the following:-

- Does each Strategy fit into the overall themes and aims already considered?
- Are the Strategies realistic?
- Are they achievable and affordable?
- *Will the cost of fulfilling the Strategy far outweigh the benefits thought to be gained?*

If the answer to these questions is No, then reconsider and rewrite individual Statements of Intent.

Action 3: Distribution and Review of the Draft Policy

a. Distribute the Draft Document

The production of Statements of Intent (Action 2) and the work done under Action 1, means that the Task Force will have developed the major thrust of the draft Policy document.

This draft needs to be distributed for comments to the Steering Committee and as many of the main collaborators as seems appropriate.

Most ministries will have standard channels through which policies must pass – some sort of policy-formulation body and process (*Policy-Formulating Authority*). The Steering Committee should discuss the draft Policy document with this authority at this time, before it is formally submitted for approval (Action 5).

b. Enter into Discussions

If health care technology is to be managed effectively, you will have found that several major policy issues will have to be addressed with other bodies. The Ministry of Health needs to enter into discussions with these bodies regarding any major changes that are proposed. For example, negotiations may be required with the following:-

Ministry of Finance	regarding	• adequate funding and budgetary changes; • depreciation accounting and budgeting for replacement.
Ministry of Works	regarding	• responsibility for financing, replacing, and maintaining some technology (eg. service installations); • development of their own health care technology management skills and national policy; • possible transfer of skills and responsibilities to the MOH.
Public Service Commission	regarding	• establishment posts, salary scales, and recognition of training qualifications for the technical staff of the NTMD.
Tender Board	regarding	• standardisation practices for health care technology; • the consideration, during tender adjudication, of the best cost benefit ratio of any choices.
External Aid	regarding	• negotiations with external support agencies requiring them to conform to MOH plans, specifications, standard equipment lists, standardization practices, purchase agreements, etc;
Trade and Industry	regarding	• the establishment of trade tests specifically for polyvalent (multi-disciplinary) basic level health care technology maintenance staff, so that they can obtain recognized qualifications and career progression.

etc.

Pre-approval of major key issues can only be achieved through high-level inter-ministerial discussions undertaken by senior MOH officials who support the Policy (for example the Permanent Secretary, or Directors of Divisions).

c. Further Development of Policy Implications

If health care technology is to be managed effectively, you will have found that several major policy issues will have staffing, resource, and cost implications. Whilst the draft Policy document is being considered, the Task force should continue to work on the implications of the Policy they have written (see Action 4). Once the implications have been detailed, these can be submitted to the Steering Committee, the Policy-Formulating Authority, and the meetings with other ministries, in order to inform their consideration of the draft Policy.

d. Policy Review Process

Once the relevant parties have had time to consider the draft Policy and associated documents, it is useful to have a formal Policy review process.

A "Review Panel" should be set up comprising, for example:-
- the Steering Committee;
- the Task Force;
- representatives from the Policy-Formulating Authority;
- a selection/mix of other personnel from with the health service, as deemed necessary;
- a selection/mix of personnel outside the MOH who will be affected by the Policy (such as other ministries, the private sector, mission facilities, etc), as deemed necessary.

The aim of the Review Panel is to comment on the Policy and edit it before the final Policy document is submitted for approval.

Many countries will have an approach they commonly take with draft policies, in order to open them up for discussion. The MOH may find it most appropriate to run a Policy Review Seminar as a means of gathering together all the parties on the Review Panel, in order to discuss and modify the draft Policy and associated documents. The seminar should only take 1–2 days, since all the parties should have had the documents to read and comment on prior to attending.

Alternatively, some countries may want to run another national workshop at this stage (see Step 4 for guidance on planning a workshop), however a full national workshop may be better timed after the Policy has been approved in order to cover its dissemination (see Step 6).

Action 4: Implications and Costings

While waiting for responses to the draft Policy document, each point should be investigated in more detail by the Task Force.

a. Staffing Implications

The staffing implications of the Strategies proposed should be calculated as precisely as possible. Consider the following, if applicable:-

- What are the staffing implications of any new structures or bodies proposed?
- What are the establishment posts and recruitment implications?
- If there is a freeze on posts, can staff be re-allocated within the MOH to enable these new requirements to be realized?
- For any new staff proposed, what are the terms of reference, qualifications, entry levels, salaries, outlines of job descriptions, etc. required?
- What are the training scholarship requirements?

etc.

b. Resource Implications

Other resource implications of the Strategies proposed should be considered and detailed, for example:-

- Will vehicles be required for the maintenance service?
- What outstanding requirements are there for spare parts and manuals?
- What additional tools and test equipment are required?
- Are subscriptions required to databases, software packages, and professional bodies?
- Is consultancy support required to assist with the development of any of the Policy areas?

etc.

c. Financial Implications

The financial cost of the Strategies proposed should be calculated as precisely as possible. Consider the following, if applicable:-

- What will be the cost of the additional staff proposed?
- What will be the cost of building or equipping the maintenance facilities proposed?
- What are the new budgets proposed for replacement and maintenance?
- What would be the costs of running a PPM system (vehicles, spare parts, contracts, etc)?
- What would be the cost of undertaking an inventory?
- What would be the cost of training staff?

etc.

The Task Force needs to develop and detail these implications in order to inform the Policy review process. The documents produced will need to be submitted to the Steering Committee, the Policy-Formulating Authority, and the meetings with other ministries (where applicable). These details will inform the Policy review process (see Action 3) and will possibly prompt revisions to the draft Policy document.

Action 5: Revision of the Policy Document

Once comments have been received on the draft Policy, the document needs to be finalized and ratified.

a. Finalization

The Task Force, with advice from the Steering Committee, needs to take the output from the Review Panel seminar and make the following changes to the Policy document:-

- any comments received back from reviewers should be considered and, if appropriate, incorporated into the Policy document;
- the pre-approval discussions with other bodies may have produced proposed changes to key issues and, if MOH agrees with these changes, they should be incorporated into the Policy document;
- the detailed implications and costings produced may have prompted the need for revisions – these should be incorporated into the Policy document;
- any instructions received from the MOH Policy-Formulating Authority for changes to be made should be incorporated into the Policy document.

After such modifications the Policy document will have been finalized.

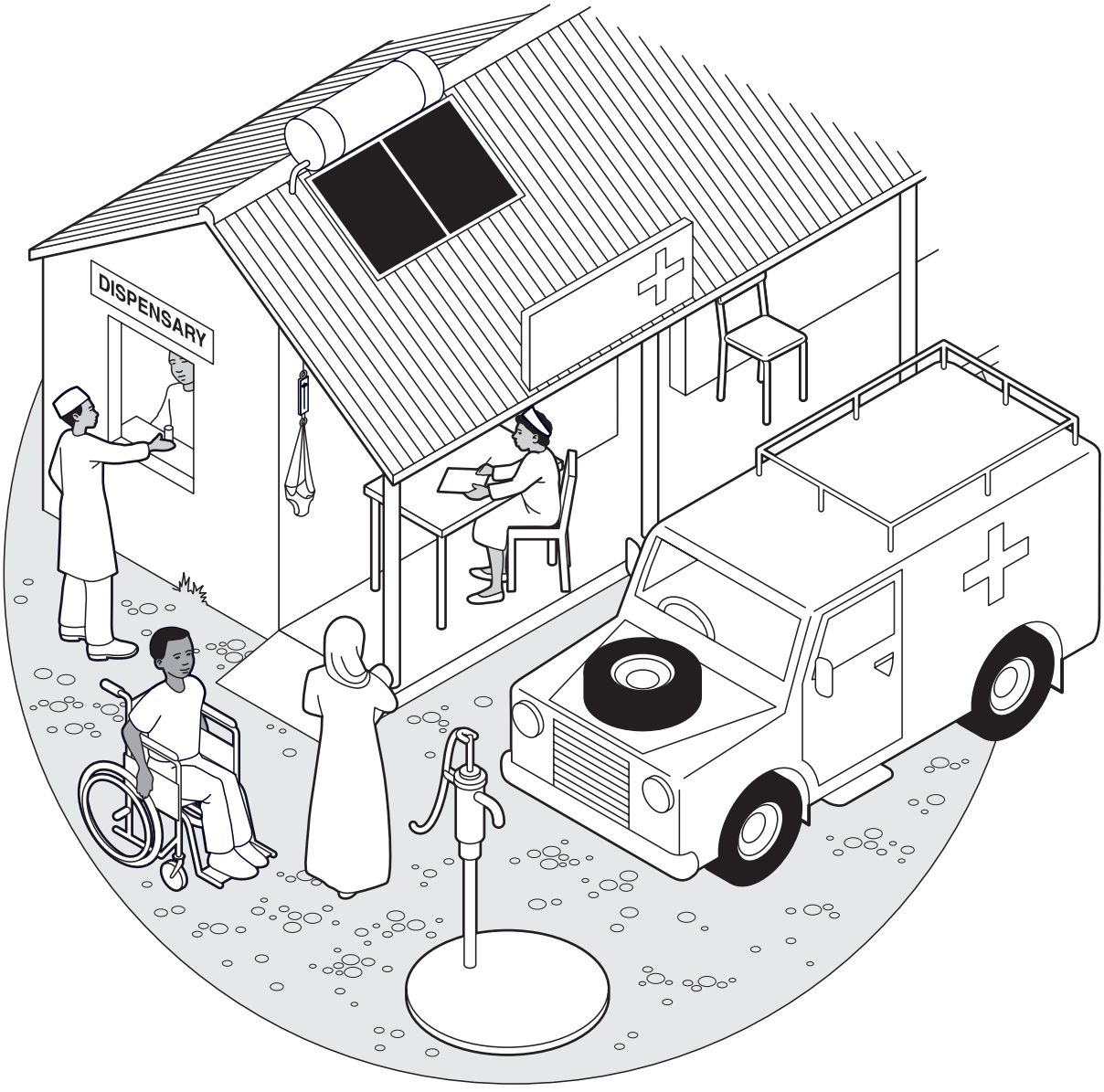
b. Ratification

The finalized Policy document should be re-submitted to the relevant ministerial *Policy-Formulating Authority* for formal ratification.

STEP 6
Ensure Change and Implement the Policy

This Step looks at:-

Action 1: Policy Implementation Plan
Action 2: Technology Procedures Manual
Action 3: Dissemination and Staff Training
Action 4: Evaluation and Monitoring Progress



STEP 6 – Ensure Change and Implement the Policy

Instructions

New Policy is only of any use if it is implemented effectively in good time; the worst thing after all this work is for the Policy document to sit on a shelf and gather dust. A timetable is required to ensure the implementation of the Policy goes ahead according to plan. Procedural guidelines need to be developed so that the strategies in the Policy can be achieved. Also the Policy will only be implemented effectively if it is disseminated widely and staff are trained in the new operational procedures. A valuable part of the process is to monitor and evaluate the Policy in action so that it can be modified or steered, in order to achieve total acceptability and applicability.

Of course, the process of ensuring change and implementing the Policy is a long-term on-going process; it is also an area where the MOH may wish to search for funding from external support agencies.

In order to successfully implement policy, various Actions are required. This section gives some guidance on:-

Action 1: Policy Implementation Plan
Action 2: Technology Procedures Manual
Action 3: Dissemination and Staff Training
Action 4: Evaluation and Monitoring Progress

Action By The *Task Force*, with support of consultants if necessary, and with guidance from the *Steering Committee*.

What To Do
- Consider the issues as described.
- Plan and hold a series of meetings for organizing the implementation of the Policy and writing the necessary documents.
- Consider the issues presented, make decisions, and answer the questions in *italics*.
- For each Action, undertake the tasks required.

Action 1: Policy Implementation Plan

Implementation of the Policy is obviously going to take a number of years, therefore countries should consider the Implementation Plan described here as their Masterplan, their medium-term plan, or their strategic development plan for the health care technology sector.

a. Its Format

The Task Force needs to develop a National Technology Policy Implementation Plan (NTPIP). This should detail the practical aspects of carrying out the changes highlighted in the Policy document, including a timetable of events and the resources (including personnel) required. For example, the following sort of table could be developed using the framework of headings found the Policy document:-

ACTION	BY WHEN	BY WHOM	COMMENTS
1. Establishment of a NTMD a. Create establishment posts b. Create technical teams – Recruit staff – Establish teams, etc c. Develop Facilities – Construct workshops – Equip workshops etc			
2. Planning a. Develop Standard Equipment Lists based on health goals b. Undertake an Inventory c. Develop a Core Technology Expenditure Plan – identify replacement needs – identify shortfall requirements, etc d. Redistribute surplus stock etc			
3. Budgeting			
4. Training and so on.			

The Task Force will have to fill in such a Plan with the details of the activities which have to take place, the timing of each activity, who will be responsible for carrying it out, and any relevant issues such as resources required (see Step 5), discussions to be held, clarifying statements, etc.

The Plan should be approved by the Steering Committee, and be distributed to the relevant people who will be responsible for ensuring that the activities are carried out on time.

b. Additional Strategies

The MOH may wish to use the NTPIP to obtain funding from external support agencies, thus it may be beneficial to present the plan in the form of a logical framework. For this purpose, it will be necessary to detail the resource requirements (as calculated in Step 5), indicators, assumptions, and risks, etc.

Action 2: Technology Procedures Manual

a. Its Purpose

A Manual is required to detail all the organizational procedures that staff will follow in relation to health care technology (ie. technology purchase, use, maintenance, etc), in line with the Strategies as laid out in the Policy document. The strategies provide the principles that procedures are based on; the Manual will provide the actual organizational procedures that staff will have to comply with. Such a 'Technology Procedures Manual' will be a tool for all health service staff and will cover all aspects of the Health Care Technology Package.

b. Its Structure

The first thing you need to describe in your Technology Procedures Manual (TPM) is the organizational bodies involved in health care technology management (ie. committees such as the Technical Advisory Committee, hospital and regional technology management units, the network of maintenance workshops, the NTMD head office, other ministerial departments, and other bodies, etc; as well as their tasks, terms of reference, line functions, job descriptions, etc). This will provide the framework of organizations responsible for ensuring that the necessary management activities are carried out.

Following this, the structure of the TPM should follow the activities in Procedure Study Areas 3–13 in the form of a 'management cycle'. The contents will follow the natural flow of activities as they occur during the management of health care technology, whilst allowing for feedback loops from one activity to another. For example, the activities in the TPM could be detailed in the following order:-

Planning
Financial Management
Selection and Technology Assessment
Procurement
Site Preparation
Installation, Commissioning, and Initial Training
Operation
Maintenance
Disposal and Replacement
Monitoring and Controlling
Human Resource Development …… which then feeds back into Planning again.

Consider: *How do you want to lay out your Technology Procedures Manual?*

Different types of cadre will have a greater interest in certain activities (ie. Supplies staff will be primarily interested in selection, procurement, commissioning, operation, and disposal). Thus consider:-

- *Would it be useful to develop several versions of the TPM with each one being applicable to a different type of staff (supplies officers, maintainers, users, administrators, etc)?*
- *Or would it be more appropriate to have different versions which detail the tasks to be carried out at different levels of the health service (ie. tasks for general staff, for managers at health facility level, for district managers, for regional managers, for head office, etc)?*

Consider: *What terminology should be used for the different versions of the Manual; how can the instructions be simplified to suit the different target readers?*

Consider: *What format should the final printed/published Manual take? Should it be small enough to fit into the pocket of a staff member? Should it be ring-bound so that amendments or additions can be easily incorporated?*

c. Its Development

The development of a Technology Procedures Manual may take several months; the time required will depend on the availability of staff, the writing skills of staff, and whether consultancy support is used.

Compile all the existing procedures relating to health care technology management, and any relevant reference materials (ie. forms used, management 'tools' available, terms of reference of committees, etc).

Hold a series of meetings, using co-opted staff from particular disciplines when necessary, to:-

- work out how the new system will function;
- finalize the decisions regarding the structure of the Manual;
- revise existing procedures;
- write the new Technology Procedures Manual;
- adapt it to produce the several versions required for different types or levels of staff.

Once the Steering Committee has approved the Manual, publish it as an official government publication.

Action 3: Dissemination and Staff Training

a. Dissemination

Once the Policy document is finalized and ratified, it is necessary to make health service staff aware of the new Policy and to distribute copies throughout the health service. It will be necessary to consider the following issues:-

- *How will staff be made aware of the new Policy?*
- *Should a large national workshop be held to present it to staff?*
- *What will be the cost (see Step 4 for guidance on running a workshop)?*
- *Which staff will attend?*
- *How will the remainder of the staff be informed?*
- *Should every staff member receive a copy of the new Policy?*
- *Or would it be better to prepare a summary leaflet outlining the purpose of the Policy, and leave practical details to the Procedures Manual?*

Once the Technology Procedures Manual is ready, it is necessary to distribute it throughout the health service. It will be necessary to consider the following issues:-

- *Will every member of staff receive a copy?*
- *How will this be achieved?*
- *What will it cost?*

It is important to remember that the new working practices will not be implemented unless there is training for staff at all levels.

b. Staff Training

The Task Force, with guidance from the Steering Committee and someone such as the In-Service Training Co-ordinator, needs to develop a programme of training workshops or seminars to cover the new organizational procedures. It will be necessary to consider the following issues:-

- *Will a series of training workshops be run around the country in different geographical areas (by region or district)?*
- *Or will a series of training workshops be run for different types of staff (general staff, district managers, regional managers, etc; or supplies officers, users, maintainers, etc)?*
- *Who will attend, how many, and where will they congregate for the training?*
- *How will the training programme be designed so that in the end all staff understand the new organizational procedures that they must follow?*
- *Who will be the trainers? How much can the Task Force itself do?*
- *How will the training be organized (what will be covered, for how many days, will a lecture format or group practical sessions be used, etc)?*
- *What funding will be required?*

Once the training programme has been designed and planned, the Steering Committee must ensure it takes place. The dissemination and staff training process will of course take some time. However when it has been successfully completed, the newly developed Policy will be implemented as part of the daily work of health service staff, thereby improving the effective use of health care technology throughout its life and the benefits it can offer.

Action 4: Evaluation and Monitoring Progress

It will be necessary to monitor the progress of the Policy, and evaluate it in action in order to see if it is providing the MOH with the results hoped for. It may prove necessary to modify the Policy or steer its application in order to improve its effectiveness. Only through being flexible and agreeing to changes uncovered by evaluation and monitoring, will the MOH achieve total acceptability and applicability of the Policy amongst staff.

As evaluation and monitoring is an on-going long-term requirement, it should most probably become one of the normal responsibilities of the head office of the NTMD. However, the Task Force could be reconvened in order to organize specific large-scale evaluation and monitoring exercises. Any proposed changes to the Policy, which arise from evaluation and monitoring, will have to be presented to and approved by the Policy-Formulating Authority.

In the years immediately following the dissemination of the Policy and its associated Procedures Manual, it will be necessary to define progress indicators and monitor the following:-

- the execution of the activities in the Policy Implementation Plan;
- the progress made with the programme to train staff in the new organizational procedures described in the Technology Procedures Manual;
- the performance of staff in the implementation of the Policy and procedures;
- the way in which the Policy alters the situation for Health Care Technology nationwide.

In the longer-term, possibly after 5 years, a large-scale evaluation needs to be undertaken of the progress made with the Policy and the Health Care Technology sector. The MOH can make use of the Situation Analysis questions (see Step 3) as an evaluation tool. By considering the questions, they will discover whether the constraints originally found have been overcome, whether the planned changes have materialized, and whether the good intentions were realized. In this way it will be possible to identify the additional strategies required, in order to make the National Health Care Technology Policy appropriate and up-to-date for the situation in your country.

To the Readers: Best of Luck!

ANNEXES

This Section looks at:-

Annex 1: References
Annex 2: Sample Policy Statements
Annex 3: Glossary

ANNEX I – REFERENCES

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ANNEX 2 – SAMPLE POLICY STATEMENTS

When working on Action 2 of Step 5, you will be developing *Statements of Intent* for your Policy. Some possible Policy statements are presented here for you to adapt and use:-

2.1 **Purchasing Policy** (refer to Step 5, section 2.2.1c)

The basis of purchasing will be the Inventory. Purchasing will be rational and planned, and the MOH Purchasing Policy will be based on four areas of expenditure in the following order of priority:-

i) replacement of technology (on-going as it reaches the end of its life) in order to ensure the continued provision of existing health services;

ii) procurement of the shortfall of technology to make a basic provision based on the Standard Equipment Lists (calculated by comparing the Inventory with Standard Lists); if there is likely to be a large backlog of needs in this category, purchasing will be staggered according to priorities and criteria to be established;

iii) requirements for any future expansion of the health services to be delivered;

iv) high profile/political projects (unexpected schemes imposed from outside the MOH, which may not be part of their rational and planned goals).

All plans to spend money on health care technology will go through the NTMD. If funds are cut, they will ensure that spending is protected in this same order of priority.

2.2 **Replacement Policy** (refer to Step 5, section 2.2.2c)

The MOH will aim to ensure the continuation of the services it delivers by replacing health care technology when it reaches the end of its natural life, and to budget for this depreciation annually. The MOH will base replacement of health care technology on internationally recognized data on equipment life-times, and together with inventory data will prioritize the timing of replacement of existing stock.
Replacement will be rational and planned, and the MOH Replacement Policy will require that health care technology be replaced only when one or more of the following valid reasons have been fulfilled:-

i) technology has reached the end of its natural life;

ii) it is damaged beyond repair;

iii) spare parts are no longer available;

iv) it is no longer economical to repair;

v) it is technically or clinically obsolete;

vi) it is no longer safe;

Missing negative

vii) utilization statistics are available to show that it is still required.

But health care technology will not be replaced simply because:-

i) it is old;

ii) staff do not like it;

iii) a newer model has arrived on the market.

2.3 Donations of Health Care Technology (refer to Step 5, section 2.2.9 and 2.3.8)

Donations of health care technology will be based on the at least the following principles:-

i) the MOH will always negotiate with external support agencies regarding the health care technology to be supplied;

ii) technical staff will always be involved in the negotiations;

iii) external support agencies will be required to conform to MOH development plans and strategies for health care technology, such as the Core Technology Expenditure Plan and Standard Equipment Lists;

iv) external support agencies will be required to comply with the following MOH guidelines:-
- Specifications;
- details of the 'package' of inputs to be included in Purchase Agreements;
- standardization practices;
- criteria defining the suitability/appropriateness of products.

v) external support agencies will be required to support the increased recurrent cost implications of their donations if they fail to comply with items iii) and iv) above;

vi) the MOH will explore, with external support agencies, the possible alternatives to their supply of equipment hardware only, ie. purchase of equipment could be linked to funds for: strengthening maintenance facilities, training courses, etc;

vii) when donations are part of large external support agency projects within the country, the MOH will negotiate for support for:-
- health care technology maintenance or management programmes;
- training scholarships;
- MOH participation in the procurement process so that external support agency consultants report to the MOH rather than make decisions for them;

viii) if the items offered by the external support agency are not what the MOH requires, they will ask for an alternative, and will ultimately refuse products which are inappropriate.

The MOH will produce guidelines, along these lines, for discussions with external support agencies in order to be in a stronger negotiating position.

2.4 Criteria for Choosing Technology and Writing Specifications (refer to Step 5, section 2.3.1a and 2.4.4b)

When choosing health care technology and writing specifications, the MOH will use the following criteria:-

- safety;
- ease of use;
- appropriateness to priority health problems;
- geographical and climatic conditions;
- quality of materials and the manufacturing process;
- an appropriate level of technological sophistication;
- price and life-time cost;
- local maintenance and repair support;
- availability of spare parts, accessories, and consumables;
- requirements of international standards on safety (such as IEC 601), or on manufacturing practices (such as ISO 9000).

2.5 Second-Hand Health Care Technology (refer to Step 5, section 2.3.9)

When faced with donations of second-hand equipment, the MOH will observe the following principles:-

- Due to the age of second-hand (used) equipment and associated problems, such as its reduced life-time, the increased likelihood of maintenance problems, and the shortage of spare parts, manuals, and after sales support, the MOH will usually refuse to accept it.
- However, exceptions could be made at the discretion of the MOH if the items have been refurbished (restored to their original working condition for the purpose of re-sale) by a reputable company following the Good Manufacturing Practices (GMP) established by their national authorities for the manufacture of health care technology; and the items are supplied together with the necessary manuals, accessories, stocks of consumables, stocks of spare parts, and after sales support.
- When unsolicited donations of second-hand equipment arrive, the MOH will turn the goods back at the port of entry.

A careful study should be made of each case.

2.6 Contents of the Purchase Agreement (refer to Step 5, section 2.4.3a)

The MOH will always procure health care technology together with at least the following items (as applicable), depending on the type of equipment, and they must be detailed in any Specification, Purchase Agreement, or Tender document, for the suppliers to cost:-

i) the necessary accessories (sufficient numbers to cover those in use, those being sterilized, and back-up spares);

ii) a stock of consumables (for example, to last 1 or 2 years);

iii) a stock of recommended spare parts (for example, to last 1 or 2 years) to cover PPM needs and typical repair requirements;

iv) operation and service manuals, in a suitable language;

v) a performance guarantee/warranty for a suitable period after the commissioning date;

vi) information on site preparation details and service supply requirements;

vii) freighting to a given destination (including insurance, if necessary);

viii) a required delivery date;

ix) installation and/or assembly;

x) commissioning;

xi) training of users and maintainers in operation, care and cleaning, safety, PPM, and repair.

In addition, the MOH will require suppliers to conform to at least the following criteria as stated in the Purchase Agreement:-

i) all suppliers must guarantee local service, after sales support, and maintenance;

ii) relevant companies must guarantee the supply of factory tested original goods;

iii) all suppliers must deliver according to a given delivery date dependant on the MOH placing the order in time;

iv) all suppliers will incur a penalty for late delivery of goods (include details of the size of penalty, when it will be incurred, and how it will increase over time) deducted from payment.

The Purchase Agreement will also provide details of at least the following administrative requirements as information for the suppliers:-

i) payment procedures and retention terms;

ii) import regulations and requirements;

iii) details of environmental factors to which the equipment must be suited, such as electricity supply and tolerances, temperature and humidity levels, any other details concerning water quality, dust problems, height above sea level, etc.

2.7 The Basis of Maintenance Management (refer to Step 5, section 2.7.4a)

Maintenance management will be based on a (computerized) record system including at least the following components:-

i) job request forms;

ii) job cards detailing work done and parts used;

iii) job allocation records and staff workloads;

iv) equipment service histories;

v) spare parts stock control;

vi) contract management;

vii) PPM management;

viii) personnel management;

ix) budget management and forward forecasting of expenditure;

x) cost analysis;

xi) statistics and summary reports.

2.8 Research/Demonstration Models of Health Care Technology (refer to Step 5, section 2.10.1c)

The MOH will accept research/demonstration models of health care technology for use in health facilities only under certain strict conditions. The Research and Demonstration Models Policy requires that all of the following criteria be satisfied:-

i) the equipment has been officially released on the market;

ii) that the equipment complies with the international manufacturing safety standards, such as IEC 601 (Parts 1 & 2) for medical electrical equipment, ISO 5358 for anaesthetic equipment, etc, or national equivalents;

iii) the research/demonstration models will remain the property of the supplier;

iv) the supplier will bear the running costs incurred during the research/demonstration period (eg. accessories, consumables);

v) the supplier will be responsible for any subsequent litigation arising from the use of research/demonstration models on patients;

vi) the MOH waivers all responsibility for loss or damage of the research/ demonstration models;

vii) the consent of the patient or patient's relative has been obtained for the use of a research/ demonstration model on the patient.

The MOH will put the necessary legal framework in place for this policy.

ANNEX 3 – GLOSSARY

Acceptance Testing: a process of checking and testing new equipment on its arrival to ensure it is complete, safe, functioning properly, and entered into records, before it is put to use.

Adjudication: the process of evaluating and judging something, ie. tender adjudication is the process of comparing the bids submitted by equipment suppliers, assessing their differences, and contrasting their quality and relative advantages (see definition of Tender).

African Federation for Technology in Healthcare (AFTH): organization offering co-ordination and advice on technical issues for all persons working with health care technology on the African continent.

Annual Action Plan: a plan which describes the activities required to ensure that the necessary procurement and rehabilitation takes place so that the goals of the Core Technology Expenditure Plan are achieved; these annual plans cover the activities for the coming year as part of the overall long-term CTEP.

Application Training: the training of staff in the correct ways of applying equipment so that it can be used to its fullest (clinical) capacity, and providing them with experience in the application of taught procedures, eg. when different features will be employed for different patients or uses, the range of assistance the machine can offer them, how to alter the relationship between the machine and the patient or sample for different purposes, different procedures to pursue for different disorders or uses, etc.

Appropriate Technology: any technology which makes the most economical use of a country's natural resources and its relative proportions of capital, labour, and skills, and that furthers national and social goals; fostering appropriate technology means consciously encouraging the right choice of technology, not simply letting businessmen make the decision for you.

Artisan: a technical person trained, tested and certified in one or more trades (such as plumbing, carpentry, mechanics, electrics, etc.) who can be employed to undertake maintenance tasks.

Best Cost Benefit Ratio: choice of equipment based on the item that will be the most economically advantageous over its life-time and not simply the cheapest at the time of the initial sale; criteria which should be used to judge and compare products at the time of procurement (see definition of Tender).

Calibration: adjustments made to equipment to ensure the result/performance is true and correct, and to counteract the normal alterations in performance which occur due to the effect on technology of climate, time, wear and tear, etc.

Clinical Engineer: a person who has passed an undergraduate degree course in an engineering field and subsequently trained postgraduately to apply their engineering skills to the problems of medical equipment; or has undertaken an undergraduate degree course specifically designed for the engineering aspects of medical equipment.

Clinical Technologist: a person who has passed a higher diploma course specifically designed for the engineering aspects of medical equipment; or has undertaken and ordinary diploma course in an engineering field and subsequently trained at higher diploma level to apply their engineering skills to the problems of medical equipment.

Commissioning: a series of tests performed, after new equipment in installed, to check and ensure that the equipment is functioning correctly at the start of its operational life.

Condemning Committee: a nominated group of staff at facility level who determine whether low technology equipment has reached the end of its life or can no longer be used reliably.

Core Technology Expenditure Plan (CTEP): estimates the amount of money required to ensure that all facilities are provided with functioning equipment at the level defined by the Standard Equipment Lists by the end of a specified period (for example 5-10 years), taking into account purchase, preparation, operation, maintenance, training, and replacement requirements.

Cost Benefit Analysis: a process of comparing the cost-effectiveness of different options or interventions to see which is the most economical route to take (the cost benefit may differ over the short term and the long term).

Depreciation: reduction in value of an asset as it ages.

Donor: see definition of External Support Agency

Essential Service Packages: details of the range of activities which must occur in order to achieve the health goals laid down for each level of the health service (see definition of Health Goals); definitions of the activities for a particular level of health facility which are realistic, appropriate, and affordable, thereby enabling technology needs to be rationally planned.

External Support Agencies: bodies such as an international donors, technical agencies of foreign governments, non-governmental organizations, and financial institutions, who provide financial and material support to the MOH and its programmes; bodies which may run projects in a country to support the development of health care technology.

Freight Forwarder: a company which specializes in the organization of the packing, transport, and delivery of goods internationally across borders.

Generic Specification: a description of a piece of equipment worded in such a way so as not to link it to a particular manufacturer or model; describing an item by type not by name (see definition of Specification).

Health Care Technical Service (HCTS): a national organization and structure which supports the technology used in the delivery of health care (see definition of National Technology Management Division).

Health Care Technology: within health facilities there are many different types of equipment; for the MOH their definition of health care technology may depend on where the responsibility lies for the financing, procurement, and maintenance of the following items:-

Communication equipment :	telephones, two-way radios, nurse-call systems, paging systems; etc
Fire fighting equipment :	fire blankets, buckets, extinguishers, hose and sprinkler systems, etc
Fixtures built into the building :	ceiling-mounted operating theatre lights, scrub-up sinks, fume cupboards; etc
Hospital Furniture :	hospital beds, cots, trolleys, infusion stands, etc;
Medical equipment for clinical use :	x-ray units, diathermy units, suction pumps, foetal dopplers, scales, autoclaves, infant incubators, centrifuges, etc;
Office equipment :	computers, photocopiers, calculators, etc;
Office Furniture :	desks, chairs, filing cabinets, etc;
Plant :	boilers, lifts, air-conditioners, cookers, washing machines, refrigeration units, roller-ironers, water pumps, incinerators, solar panels, etc;
Service Supplies :	electrical installations, water & sewage pipelines, gas supplies; etc;
Training equipment :	overhead & slide projectors, video & tape recorders, etc;
Vehicles :	ambulances, cold-chain motorbikes, mobile workshops, etc;
Walking aids :	wheelchairs, zimmer frames, crutches, etc;
Workshop equipment :	hand tools, bench tools, testing equipment, etc.

Health Care Technology Package (HCTP): the range of inputs which need to be addressed if technology is to be successfully transferred into the health care environment, including: management and planning, allocation of financial resources, selection of technology, procurement, preparation for technology use, continued operation, maintenance and repair, personnel, training, technology assessment and research and development, and local production.

Health Goals: clear policies of the MOH regarding the kind of health service delivery which can be provided at each level of the health service ie. at each type of health facility (referral hospitals, district hospitals, health centres, and clinics); declarations of the care that can be offered at each health service level with the current financial, material and personnel resources available (eg. which facilities can provide Caesarean deliveries, which laboratory tests can be undertaken where, at which level can renal dialysis or ophthalmic surgery be offered, etc).

Health Management Information System (HMIS): computerized data-gathering, collating, and reporting system for management indicators throughout the health service.

Hospital Engineer: a person who has passed an undergraduate degree course in an engineering field and subsequently gained experience of applying their engineering skills to the problems of hospital plant and service installations.

Hospital Furniture: see definition of Health Care Technology

ID Number: means of labelling equipment so that each individual item can be identified as distinct from another similar machine; applied when undertaking an equipment Inventory, and used for filing details of work undertaken on specific machines under their own equipment service histories.

Installation: tasks undertaken to fix equipment into place, and can range from building the equipment into the fabric of the room to simply connecting it to the electrical supply.

International Electro-technical Commission (IEC): international body which defines in detail standards to which equipment must be manufactured if it is to be recognized as safe; IEC 601 (Parts 1 & 2) is their standard concerning the manufacture of medical equipment to which bona fide companies should conform.

International Standards Organization (ISO): international body which defines minimum standards to which factories should conform if they are to show that they commit to quality manufacturing processes.

Inventory: a detailed listing of all the health care technology items that the MOH owns, their location and state of repair; a record which is annually updated.

Level of Technological Sophistication: equipment falls broadly into three categories – high, medium, and low technology reflecting the level of complexity of the internal workings of the machine; this can affect the ability to run, use or maintain the item.

Life-time: all equipment has a normal "life" expectancy dependent on the type of equipment and its technological sophistication (ranging from 5 – 20 years); the life will be shortened if equipment is not cared for (ie. maintained), and at the end of its life equipment must be replaced if the service it provides is to continue.

Life-time Costs: many pieces of equipment use consumable items (x-ray film, laboratory reagents, etc); the cost of providing these inputs must be met throughout the equipment's life if it is to continue to provide a service.

Local Production: the manufacture of products nationally, or regionally in neighbouring countries.

Logical Framework: a device used by external support agencies when designing and evaluating country projects; a table detailing the various activities and outputs which are to be achieved through project interventions in order to reach the goal and purpose of the project, together with details of associated verifiable indicators, assumptions and risks.

Manufacturer's Representative: a private sector company nominated by an equipment manufacturer (producer) to act on the manufacturer's behalf in a particular country or region for the purpose of offering after sales support to their equipment; the level and quality of representation will vary depending on the nature of the contractual agreement between the two parties, ranging from subsidiaries (branches of the parent company providing strong support and access to the manufacturer), and agents (partners under contract who may provide adequate levels of support), to distributors (sales outlets with loose agreements who provide anything from a minimum level of support to no support at all).

Medical Equipment: see definition of Health Care Technology

Mobile Workshop: the tools and test equipment of a maintenance workshop mounted in a vehicle, so that the maintenance staff can travel to facilities and undertake repair work there.

Multi-Disciplinary Maintenance Teams: teams of maintenance staff made up of a variety of people with different skill mixes (electrical, mechanical, plumbing, electronic, carpentry, building, etc) to ensure that maintenance can be carried out in a hospital for all types of equipment (electrical and plumbing installations, buildings, plant, and medical equipment).

National Technology Management Division: the unit within the ministry of health with the structure, capacity and authority to oversee all aspects of health care technology management; the division within the MOH which employs technical staff; a government organization comprising a head office in the ministry of health, as well as a national network of maintenance workshops and technology management units.

Operational Training: the training of staff in the specific operating characteristics and operational procedures of a machine eg. how to switch it on, how to use its various functions, how to make it perform its customary cycles and routines, how to change the bulbs and batteries, etc.

Planned Preventive Maintenance (PPM): a specified schedule of activities carried out according to a timetable on equipment with the aim of preventing breakdowns and ensuring that equipment is operational and safe, thereby diminishing the amount if time equipment is out of service.

Plant: see definition of Health Care Technology

Purchase Agreements: a document describing i) the whole package of inputs that the customer wishes to purchase from the supplier as well as the equipment itself, in order to ensure that the equipment will function over its lifetime, including: performance guarantees, installation and commissioning, local after-sales service, spare parts, consumables, accessories, user and maintenance

training, user and service manuals, maintenance contracts; as well as ii) national requirements including: delivery arrangements, payment terms, import regulations, environmental factors, etc.

Purchase Contracts: after a tendering process, the MOH enters into contracts with various suppliers from whom they will purchase certain types of equipment over a given time period (1 or 2 years) for use throughout the health service.

Purchasing Policy: MOH agreed strategy for rational and planned procurement of equipment in accordance certain prioritized areas of expenditure.

Refresher Training: a rolling programme of in-service training organized on a regular and on-going basis in order to keep staff skills up-to-date, and to cater for staff turnover.

Replacement Policy: MOH agreed strategy for the rational and planned replacement of equipment at the end of its life, and in accordance with certain specified valid reasons which have to be fulfilled.

Research and Development (R&D): process that equipment manufacturers and independent bodies go through to investigate and develop new health care technology products.

Service Supplies: see definition of Health Care Technology

Site Preparation: work required to ensure that the room or space where equipment will be installed is suitable (in terms of size, position, layout, and materials) and the environment is adequate for the particular purpose (eg. air-conditioned, dust-free, away from running water), and can include construction work, and provision of services such as electricity, water, gas and waste pipelines.

Specification: description of equipment in sufficient detail to clearly detail the functions and criteria that the equipment must fulfil; used for procurement purposes to ensure the suppliers can identify exactly what the purchaser requires, and to ensure the purchaser receives the type of equipment they want.

Standard Equipment Lists: lists of the equipment required per room, per department, for different types of health facility (referral hospital, district hospital, health centre, etc), so that the health service planned for that facility can be delivered.

Standardization: limiting the wide range of makes and models of equipment found in the health service; a strategy to ensure users and maintainers are familiar with the types of equipment they come into contact with, and to rationalize the large stocks of consumables and spare parts to be held.

Technician: a person who has passed an ordinary diploma course in a particular trade (such as plumbing, carpentry, mechanics, electrics, etc.) who can be employed to undertake maintenance tasks.

Technology Advisory Committee: a body established to advise senior management on general technology issues (such as selection, evaluation, and performance assessment), and comprised of members from the various disciplines within the health service that play a part in the life of equipment; a committee present at any level (facility, district, regional, and ministerial) to advise the senior management at that level on such technology issues.

Technology Assessment: a process of evaluating the efficiency and efficacy of existing equipment available on the market and the new and ever-evolving technologies arriving on the market.

Technology Management Unit: a team of people established to oversee all aspects of technology management at their level, eg. at facility level a handful of suitable staff chosen to oversee the daily running of technology within the facility, contact point for all equipment and maintenance matters, responsible for finding the correct solution, and may (depending on the size of the facility) undertake the maintenance themselves; at District or Regional level a group of staff from the various disciplines which play a part in the life of equipment chosen to oversee technology issues within their geographical area and responsible for advising the tender committee and senior managers of the MOH on general technology issues.

Technology Procedures Manual (TPM): a document containing the MOH's procedures and guidelines for implementing all aspects of the management of health care technology; a series of complementary manuals to cover the different procedures to be followed at central, regional, district or facility level for the implementation of technology management.

Tender: a formal procurement procedure following strict government procedures and regulations structured in such a way as to obtain responses from as many suppliers as possible, who will submit confidential bids so that the most competitive offer can be identified, by means of a Tender Board adjudication process which should consider the best cost benefit ratio of the choices available

Trade Testing: the formal method for testing and accrediting tradespeople (artisans such as plumbers, mechanics, electricians, etc) through a series of skill levels, governed by a national Trade Test Authority, and enabling tradespeople to be paid according to a set salary scale related to the Trade Test Level passed.

Training Plan: the annually revised strategy for providing equipment operators, maintainers, and associated staff with the required training in various equipment-related skills, through a variety of methods (in-service, academic courses, etc) and a variety of training organizations, together with the training timetable for the implementation of the plan; the Training Plan for the technology sector should be a subset of the overall Human Resource Development plan of the MOH.

Users: people who operate health care technology.

Workhand: a general maintenance worker possibly with some training and skills in basic maintenance in trade areas (plumbing, building, etc), but usually without formal qualifications.

Write-off: the process of condemning equipment which has reached the end of its life or is no longer safe to use, taking it out of service, taking it off the inventory records, and disposing of it.