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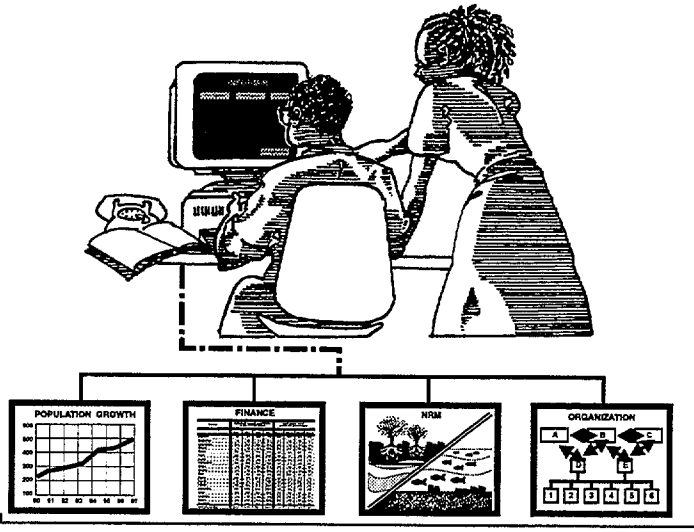

A TRAINING MODULE

Information Management for Research

JULY 1997

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Annex: Overheads

Preface

The International Service for National Agricultural Research (ISNAR) is mandated to assist national agricultural research systems (NARS) in developing countries in strengthening their agricultural research management. Through its training unit and in collaboration with national agricultural research organizations (NAROs) and management development institutes (MDIs), ISNAR produces training modules in agricultural research management. These training modules provide "researchers-trainers" with both a training plan and training materials designed to improve the knowledge, attitudes, and skills needed to manage agricultural research effectively.

The Agricultural Research and Management Training (ARMT) Project aims at institutionalizing agricultural research management training in the Southern African Development Community (SADC) countries as well as improving the management capacity of research leaders. The current phase of the project, sponsored by the United States Agency for International Development (USAID), includes the development of a series of training modules on research management to facilitate the training of national trainers in order to ensure a sustainable capacity for training in the region.

Each training module comprises a curriculum, including learning objectives for each day's activities; descriptions of the training approach, methods, and techniques; and master copies of handouts, worksheets, overhead transparencies, and other training media that can easily be reproduced for distribution among participants in the workshop. In addition, the training modules include evaluation forms and a recommended bibliography for use by the trainers.

Texts and exercises from the region and from other parts of the world were collected to create the training modules. Whenever possible, the training design team has acknowledged original sources. In order to ensure the relevance of the basic materials and cases to the region, this training module was designed in partnership with NARS and tested in a draft version during two-week workshops in the SADC region.

The first week of these workshops brought together SADC trainers from MDIs and universities, and senior researchers from NAROs. ISNAR subject-matter and training specialists led the learning process and collected feedback from the participants to improve the training module. Feedback was incorporated and the module was further tested during the second week. The "new trainers," the main users of this module, led the workshop for national program leaders and senior scientists. The module was further improved by the participants.

This is the resulting version of the module, which was tailored to SADC users through this process. The trainers are expected to use the module to facilitate planning and implementation of training/workshop programs in the region. The researchers are expected to use the module to provide their colleagues with the opportunity to analyze NAROs' approaches and assess ways of improving them within their organizations. In addition, the researchers are expected to assist national trainers in implementing training events in their respective countries.

It is hoped that the trainers and researchers will adapt the module to respond to their specific needs and share the changes with the Eastern and Southern African Management Institute (ESAMI) and ISNAR as a contribution to improving the materials for the benefit of the region.

ESAMI and ISNAR thank all the research management specialists, national trainers, and those who participated in designing, testing, and improving the module for their very valuable contributions.

Dr. Bonard L. Mwape
Director General, ESAMI

Dr. Stein W. Bie
Director General, ISNAR

Acknowledgments

The designing, testing, and producing of the SADC/ESAMI/ISNAR training modules would not have been possible without the active participation and support of the ISNAR management, resource persons and training team, the officers of SADC and the Southern Africa Co-ordinating Committee on Agricultural Research (SACCAR) in Gaborone, Botswana, and ESAMI/ISNAR officers in Arusha, Tanzania.

ESAMI and ISNAR are very thankful to USAID, sponsor of this project. Special thanks go to Louise Setshwaelo, the manager of the ARMT Project based in Arusha, Tanzania.

This training module includes several texts written by H. Shila (ESAMI), Louise Setshwaelo (project manager ESAMI/ISNAR), and A.S. Sithole (ESAMI). This module also includes texts extracted from ISNAR publications written by R. Vernon and E. Brush. Other sources are cited as footnotes in the respective texts.

Special thanks are due to the training team responsible for the initial design of the training module. This team was composed of Lisette Staal, ISNAR/ESAMI consultant and team leader; Robert Obura, Egerton University, Kenya, ISNAR/ESAMI consultant; Mick Mwala, University of Zambia, ISNAR/ESAMI consultant; and members of the ISNAR training team, composed of Zenete Peixoto França, Helen Hambly, Mirela Breedveld-Zoita, Jacobine Verhage, Richard Claase, André Schaareman, Fionnuala Hawes, and Albertine Huybrechts. ISNAR also thanks Robin Baur, who edited this module.

Source of Material

This training module was developed for the SADC/ESAMI/ISNAR ARMT Project. It comprises information from several publications. Other sources are cited as footnotes and listed in the bibliography of this document.

Revision

The sequence of the content for this module was defined by Louise Setshwaelo, who has been co-trainer for the workshops on Database and Information Management in the SADC region during the lifetime of this ARMT project. At ISNAR, R. Vernon has contributed with suggestions, texts, and the INFORM database tool to support specific sessions of this module. The revision includes a new format and introduction, incorporating instructor's notes, and revising and increasing the exercises. The text provided to the trainers as additional reading in the past are included as part of the exercises for analysis by the groups of participants assisted by the resource.

Sponsor

This material was produced for the SADC/ESAMI/ISNAR ARMT Project, funded by USAID.

SADC/ESAMI/ISNAR

Agricultural Research Management Training Project

SADC/ESAMI/ISNAR
Agricultural Research Management Training Project

Introduction

Agriculture continues to play a major role in the economy of the SADC countries (Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe) by providing food, energy, and some income for the majority of the population and raw materials for the growth and development of the manufacturing industries. However, environmental problems such as soil degradation, deforestation, and the severe drought of the recent past remain serious constraints to national development. At the same time, the increased demand for food (due to rapid population growth), raw materials, and improved technologies presents new challenges to agricultural research.

The responsibility for coordinating research and training in agriculture and natural resources in attaining SADC's goal of food security is vested in the Southern Africa Co-ordinating Committee on Agricultural Research (SACCAR). Early in its formation (1984), SACCAR recognized that the national agricultural research systems (NARS) could greatly enhance their efficiency and effectiveness in technology generation and delivery if their management could be improved. In particular, the planning and management of human, financial, physical, and agricultural resources could be improved as could the procedures for prioritizing research programs and linkages with policymakers and external sources of knowledge. The ARMT Project was conceived and developed in 1987 to address these concerns. The evaluation of Phase I in 1990 recommended that one way to make training sustainable was to institutionalize it in the region. The first step in this process was the integration of the project into a regional MDI , which was ESAMI. This was to be followed by institutional capacity building in the region, of which the present exercise of training module development is an integral part.

This project, which covers the period 1992–1996, is a collaborative venture involving three partners: ESAMI, as the main executing agency; ISNAR, as a joint executing agency; and SACCAR, which provides the strategic regional perspective to the project.

The project is based in ESAMI's headquarters in Arusha, Tanzania. It is implemented through a network of SADC MDIs and individual experts from the region. This design aims to ensure adaptation and institutionalization of research management training.

Goal of the Project

The aim of the project is to *strengthen* the capacity of agricultural and natural resource policymakers and research managers in planning, organizing, and managing research systems to increase their efficiency and effectiveness in addressing the region's food problems.

Objectives of the Project

The objectives of the project are the following:

a. to increase understanding among high-level officials on the role of research in promoting and sustaining agricultural development

b. to strengthen the capacity of national research leaders to plan, program, budget, and monitor research programs of relevance to national development goals

c. to foster human resource development in agricultural research management in the member countries

d. to build the skills of middle-level research administrators in the management of agricultural research activities

e. to work towards building a base for a sustained management training capacity for agricultural research within SADC

Phase I laid foundations for building specific skills and provided the knowledge and tools that helped SACCAR move toward achieving its two main goals:

a. increased cooperation in agriculture and natural resource research

b. improvement in the capacities of individual countries to undertake carefully prioritized research and training projects

This in turn enabled SADC countries to make progress toward achieving important goals in:

a. increasing agricultural productivity

b. raising incomes and creating employment in the rural areas

Phase II is concentrating on the institutionalization and sustainability of the ARMT project activities.

Target Audience

The ARMT project aims at training the following persons:

a. **policymakers**: boards of governors, agricultural research council members, planners, executive officers in NARS, permanent or principal secretaries, and others responsible for long-range objectives of NARS

b. **senior research managers**: senior managers and executives of the system, for example, directors general/directors and their assistants, those responsible for overseeing implementation of policies

c. **middle-level research managers**: research coordinators, station heads, and others responsible for supervising research operations at research stations, laboratories, institutes, etc.

The Modules

The ARMT project strives to *institutionalize* and *sustain* management training within the SADC countries. The comprehensive action plan includes several training modules, which are to be used by ESAMI, MDIs and NARS to implement workshops for training their local personnel. This will contribute toward capacity building and, hence, sustainability and institutionalization of management training in the region. The modules aim to help MDIs and NARS develop their own gender-balanced, multidisciplinary, in-service training capacity.

The modules that form the core of the ARMT project include:

1. Priority Setting for Agricultural Research Programs
2. Planning, Monitoring, and Evaluation of Research Projects
3. Information Management for Research
4. Scientific Writing and Presentation
5. Research Program Formulation
6. Financial Management for Research on Agriculture and Natural Resource Management
7. Strategic Planning
8. Gender Analysis for Management of Research in Agriculture and Natural Resources

The Workshops

The modules provide the basis for trainers to prepare and deliver workshops. The majority of the modules are designed to run for five days. However, the training modules on Gender Analysis for Management of Research in Agriculture and Natural Resources and Information Management for Research are designed to run for four days ans 10 days respectively.

Overview of the Module

Information Management for Research

Overview of Module

Information Management for Research

Introduction

Agriculture and environment conservation sectors of government share the responsibility for increased food production while conserving and sustaining the environment. Agricultural research is mandated to conduct applied and adaptive research which provide solutions to the technical and economic problems of producers of food and cash crops, as well as livestock. Among the environmental constraints to increased agricultural production are soil degradation, drought, and deforestation, especially in the marginal areas occupied by smallholder farmers. Sound policies integrating strategies for the generation of agricultural production technologies and environmental management provide the vision for sustained agricultural development.

Among the critical inputs to sound policy formulation and implementation is the management of information on the dynamics of the process of agricultural research and development.

National Agricultural Research Systems (NARS) need to develop adequate management skills and resources to manage their information requirements. Sound information is required at all levels of of NARS, from research scientists to policymakers. Institutions and their managers need effective and efficient systems for collecting, processing, and disseminating critical information. Since technologies for creating such systems are constantly advancing, it is necessary for managers to regularly update and enhance their skills in developing and using them.

Objectives

At the end of the workshop the participants will be able to do the following:

1. Identify techniques for exploiting the potential of information systems and information technologies for the conduct and management in their NARS.
2. Recognize systems and technologies that they could immediately apply to their work situations to enhance the effectiveness of their institutions.
3. Set up Management Information Systems (MIS) within their NARS.

Duration

The workshop will last for ten (10) days.

Topics to be covered

The emphasis of the workshop will be on practical solutions for specific problems in developing information systems for managing research institutions. Emphasis will be on maximizing participants' and facilitators' knowledge and experience, as well as jointly developing practical solutions applicable to the local situation.

Discussion topics and short presentations will be followed by exercises, case studies, group discussions, practical assignments on computers, and participant presentations.

Various aspects of research management, such as information management systems for **planning, programming, budgeting, priority setting, monitoring and evaluation of human resources, financial resources, physical resources, projects** and **operations**, will be discussed within the local context.

Extensive use will be made of computer-based exercises and case studies. The application of information technology to address **management problems, issues, and concerns** will be emphasized. An overview of the capabilities of software application packages will be given with emphasis on the use of **database management systems**. Other software such as **spreadsheets, statistical tools, project management and presentation tools** will also be introduced.

Target Audience for the Information Management for Research Workshop

The workshop is intended for program leaders and scientists. SADC, ESAMI, and ISNAR strongly encourage a balanced selection of participants equally representing males and females. The workshop will benefit those with managerial responsibilities as part of their day-to-day duties. No prior exposure to or experience with information technology is necessary.

Training Approach

This training module provides trainers with information, specific activities, and materials to effectively plan and deliver a training program. Planning by the trainer is critical to the success of any training. Each trainer and each training situation is unique. The module encourages participation and provides problem-solving, hands-on experiences, and exercises.

Applying the Experiential Learning Cycle

This training approach is based on experiential learning theory (Kolb and Fry 1975; McCaffery 1988) and is participatory by design. It is a learner-centered approach involving active experience followed by a process of reviewing, reflecting, and applying what has been learned. Participatory methods keep learners active in the learning process. They are involving and interactive, and they encourage communication and group work. They are action oriented and experience based.

This experiential and participatory approach was chosen to enhance effective skill transfer, to facilitate conceptual and attitudinal development, and to encourage appropriate changes in participants' behavior. The experiential learning cycle is especially useful for skill training because most of its techniques are active and designed to involve the participants in practicing the skill. The

experiential model helps people assume responsibility for their own learning because it asks them to reflect on their experience, draw conclusions, and identify applications. Participants ground the lessons in their actual work environment by considering the question of what can or should be done differently as a result of this training experience.

To be effective, this model must be applied in both the design and delivery stages of training. The sessions, activities, and notes in this module present trainers with guidelines for reaching the training objectives by applying the experiential training methodology. An understanding of the adult learner, the role of the trainer as a facilitator, and the experiential learning cycle is important to this approach.

The Adult Learner

Understanding the adult learner is critical to the success of this training approach. The adult learner has particular needs (Knowles 1978; McCaffery 1986; Zemke and Zemke 1981). Adult learners need continual opportunities to identify their needs and recognize the relevance of their learning in terms of their own lives. Adult learners need self-directed learning opportunities in which they can actively participate. They need to actively think, do, and reflect on experiences, discuss with others, and practice and learn new skills. The adult learner needs interactive communication with both the trainer and fellow learners, which is different from one-way teacher-to-student communication. The learner needs to continually reassess the question, "Where am I now and where do I want to go?"

The Trainer

The role of trainer/facilitator is to manage or guide the training process rather than to manage the content of learning. Adult learners can share the responsibility for their learning with the trainer. The experience of adult learners should be viewed and used as a rich resource in the learning environment and they should be encouraged to contribute to the learning environment whenever possible.

The Experiential Learning Cycle[1]

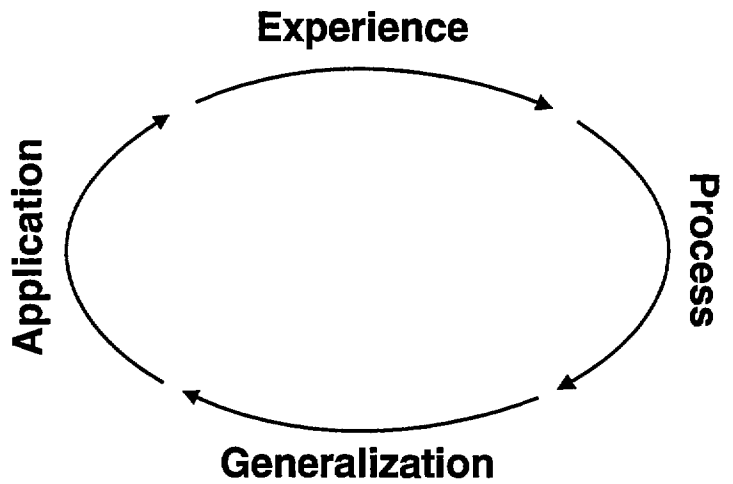
Experiential training or *learning* is a phrase often heard in the educational world. The strength of the approach is in the completeness of its cycle, which consists of four stages, each as important as the preceding or following one. The four stages are (1) experience, (2) process, (3) generalization, and (4) application.

The term "experiential" is often misused in practice. Experiential training seems to mean letting people participate in a presentation, having a question and answer session after a lecture, or a role play or case study without the subsequent steps of the model. The final stages are often left out of

1 The section on the experiential learning cycle is adapted from USDA/OICD/ITD (no date), *Agricultural Trainer Development, Training of Trainers, Instructors Manual,* and McCaffery, J.A., "Interdependent Effectiveness: A Reconsideration of Cross-Cultural Orientation and Training," *International Journal of Intercultural Relations,* 1986.

the design of the program. As a result, the power of experiential learning is significantly diminished or negated altogether. The stages of the experiential learning cycle are outlined below.

Experiential Learning Cycle



Source: McCaffery (1986) and adapted from Kolb and Fry (1975).

Experience. The experience stage is the initial activity and data-producing part of the cycle. This phase is structured to enable participants to "do" something. "Doing" includes a range of activities, such as participating in a case study, role play, simulation, or game, or listening to a lecture, watching a film or slide show, practicing a skill, or completing an exercise.

Process. In this stage, participants reflect on the activity undertaken during the experience stage. They share their reactions in a structured way with other members of the group. They may speak individually, in small groups, or as a full training group. They discuss both their intellectual and attitudinal (cognitive and affective) reactions to the activities in which they have engaged. The trainer helps the participants think critically about the experience and helps them verbalize their feelings and perceptions as well as draws attention to any recurrent themes or patterns that appear in the participants' reactions. The trainer must also help the participants conceptualize their reflections so they can move toward drawing conclusions.

Generalization. In the generalization stage, the participants form conclusions and generalizations that might be derived from, or stimulated by, the first two phases of the cycle. The trainer helps participants think critically in order to draw conclusions that might generally or theoretically apply to "real life." This stage is best symbolized by the following questions: "What did you learn from all this?" and "What more general meaning does this have for you?"

Application. After participants have formed some generalizations, the trainer must guide the participants into the application stage. Drawing upon the insights and conclusions reached during the generalization stage (and previous stages), participants can begin to incorporate what they have learned into their lives by developing plans for more effective behavior in the future. Techniques used to facilitate the application stage can include action plans, reviewing each other's action plans,

formulating ideas for action, sharing action plans with the whole group, and identifying additional learning needs. The trainer assists during this process by helping participants to be as specific as possible.

Participant Action Plan Approach

An integral aspect of the workshop is the ultimate application of the skills by the participants in the work environment. The participant action plan approach (PAPA) was developed by the United States Office of Personnel Management to help participants consider specific applications of lessons learned during training on their job sites. Participants commit themselves to action through a written plan developed at the end of the workshop. PAPA can help participants transfer what they have learned in the workshop to their jobs, thus reaching the application stage of the experiential learning cycle.

At the end of the workshop participants will be required to develop formal individual action plans for implementation upon return to their work situations. Extensive use will be made of computer-based exercises and case studies. The application of information systems and information technology to address **management problems, issues and concerns** will be emphasized.

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The Training Plan

How the Module Is Organized

INTRODUCTION

The module provides the trainer with all the information and materials required for planning and implementing a ten-day workshop. It contains suggested activities that have been field tested, with instructions for trainers. The trainer is encouraged to draw on these ideas to devise tailor-made exercises appropriate for his or her specific training situation. The training plan section is organized in the following way:

1. Pre-workshop instructions
2. Tips for trainers
3. Daily training program. For each day this section provides
   - overview
   - schedule
   - checklist for trainers
   - instructions to trainers
   - summary of overheads
   - participant handouts
4. Overheads and reference materials are organized by day and session. These are located in a section following the daily training program.

MATERIALS

Overview: Includes the day's learning objectives and a list of required participant handouts.

Schedule: Includes suggested times. However, each trainer must consider the time frame, based on the situation and participants, and revise as appropriate.

Trainers' checklist for planning: Helps the trainer collect and compile the materials required for each day.

Instructions to trainers: Provides the trainer with specific information on the flow of the sessions and instructions on how to facilitate activities. A sample format of the "instructions to trainers" appears on the next page.

Participant handouts: Handouts that the trainer distributes to the participants are numbered in order by day and by session. For example *Day 1/Session 1/Handout 1 (1.1.1).*

Overheads: A summary of the overheads used appears in reduced format at the end of each session. Full-size copies of the overheads are organized by day in the annex. Like the handouts, they are numbered *Day 1/Session 1/Overhead 1 (1.1.1)*. Overheads are available in **paper copies**.

Evaluation form (day ten): A diskette with the text of the evaluation form in WordPerfect 5.1 is included and, if necessary, may be adjusted to meet your needs.

A Sample Format
Instructions to Trainers

DAY FOUR	**Session 12** **Management Information Systems (MIS): Data Collection** **Instructions to Trainers**
	11:45 – 13:00 Session 12. Management Information Systems (MIS): Data Collection
OBJECTIVES	By the end of this session, the participants will be able to do the following: • Discuss tools and techniques for data collection. • Define necessary requirements to undertake data collection. • List advantages and disadvantages of each method.
PROCEDURE	Training techniques: presentation and plenary discussion
PRESENTATION	Presentation (15 minutes) 1. (*experience*) Give a brief presentation. You will find the information in the handout 4.12.1 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. After finishing your presentation, distribute the handout. 2. Invite questions from the participants for clarification only.
EXERCISE 12	Exercise 12. Discussing tools and techniques for data collection (60 minutes)
	1. Distribute worksheet 4.12.2, which is a plenary session. 2. (*experience*) Invite participants to jot down key questions related to tools and techniques which they use and/or might use to collect data for MIS in their organization. 3. (*experience and process*) Open the discussion. Take notes on the flipchart, using key words while the participants formulate and respond to questions. 4. (*process*) Facilitate the discussion and keep it alive. 5. Finally, you should provide your views on the results of the exercise. 6. (*process, generalize*) At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

The suggested time and title of each session.

The objectives are stated in terms of participants' abilities by the end of each session.

Various training techniques employed during the session are listed.

Time:
Total time for an activity appears in parentheses.

Each exercise is numbered chronologically. The title for each exercise appears here.

The stage of the experiential learning cycle is identified in italics.

Tips for Trainers

INTRODUCTION

As a trainer, you are responsible for creating the learning environment and maintaining the flow of the workshop. You must be aware of the participants' needs and be sensitive to their concerns. Following are several tips to help you achieve a successful workshop.

TIPS FOR SUCCESS

Ten tips for your success as a trainer:

1. Begin your working day presenting
   - schedule
   - objectives

   Make sure that the trainees are aware of what they are expected to learn each day.
2. Manage time wisely. Time is a motivating factor in training. If you slow down, the participants will lose interest and commitment.
3. Give brief presentations. Encourage your trainees to speak up and participate actively in discussions and exercises.
4. Follow the instructions of the proposed exercises:
   - use different techniques
   - promote active participation
   - increase interest and level of motivation
5. Avoid "short cuts" while working on topics. Keep the same level of interest while making presentations, doing exercises, and listening to reports. Remember that as a trainer you are responsible for the results of the ten-day workshop.
6. Don't let your interest and willingness to teach diminish. Show care for the participants' learning and be patient!
7. Be an attentive and good listener. The participants expect you to value their ideas and look at them while speaking. These positive attitudes increase your credibility among the participants.
8. Praise your trainees for their efforts and good performance. This shows recognition and consequently increases their level of motivation.

9. Make sure that your trainees feel positive and that they are satisfied with the workshop. Ask for their feedback at the end of each day.
10. Be sure of your success as a trainer. Go through the whole plan and be well prepared. Let them see you are competent and self-confident.

MANAGING GROUPS

Many of the exercises require the participants to work together in small groups, and then there must be a way to share the information with the rest of the workshop participants. The most common way is to have group presentations. You are responsible for managing the group activities and ensuring active participation. Some tips will help.

TIPS FOR FACILITATING GROUPS

Seven tips for facilitating group exercises:

1. Be attentive and supportive of the participants' needs in any situation.
2. Help them understand the steps they must take to accomplish all the tasks.
3. Manage time effectively. Be sure to remind participants of time remaining. Be firm! Keep to the schedule.
4. Show interest and be willing to assist them at all times. Circulate from group to group while they are working.
5. Follow the entire process. Remain in the classroom during all activities.
6. Provide the groups with constructive feedback.
7. Always summarize the major points made by the groups and relate them to the objectives of the session and exercise.

Pre-workshop

Pre-workshop

Instructions to Trainer

INTRODUCTION

As a trainer, you are responsible for the preparation and management of the entire program. This often requires pre-workshop actions. You must discuss the pre-workshop responsibilities with the workshop's sponsoring institute. Some things that you must be sure to arrange are included in the following list. There may be several others. Pre-planning is essential to the success of your training workshop.

ACTIONS NEEDED

Actions and planning necessary for implementing systematic activities:

1. In pre-workshop communication, be sure to inform the participants of any information they will require prior to arriving at the workshop. This can be accomplished through a pre-workshop letter. This letter should be comprehensive and data collection forms should be attached, to assist the participants in collecting information from their respective institutes prior to going to the workshop. Note that these questionnaires will be used to accomplish exercises during the workshop. A copy of the letter explaining this requirement and the respective data collection forms are included in the following pages. Remember that these forms must be sent out to the prospective participants of the workshop **two months before** the workshop.
2. Consult with the sponsoring institutions for plans for pre-workshop communication with participants.
3. Contact appropriate officials to welcome the participants.
4. Compile a notebook for each participant. This notebook will be used by the participant to organize the training materials from each session. Before it is distributed at the workshop, each notebook should contain the following items. Samples of these items appear on the following pages.
   - welcome letter and data collection forms
   - prospectus
   - workshop overview
   - tentative schedule (10 days)
   - registration form

5. This module on information management is mainly computer based. Make sure that arrangements to acquire at least five computers are made and install them in advance. Test the computers prior to the beginning of the workshop.

6. This workshop also requires INFORM database diskettes (ISNAR MIS tool) to be used during exercise 22, on day nine. Make sure that you have several copies available for participants to accomplish this exercise.

PLANNING FOR IMPLEMENTING SYSTEMATIC ACTIVITIES

7. Prepare yourself to instruct participants during the opening session on the systematic activities of the workshop.
   - review of daily activities
   - daily PAPA exercise
   - daily brief evaluation

8. At the **end** of **each day's** session, you will need to:
   - Invite a volunteer to prepare and present the following morning a brief report, reviewing the day's activities and summarizing major lessons learned. Provide the volunteer with transparencies of the day's objectives to facilitate his/her presentation which should be delivered in 10 minutes.
   - Distribute the PAPA forms and invite the participants to list major skills from the day's activities which could be applied in their job environment. Request that they keep the PAPA forms in their own notebooks. You will ask them to review these forms during the last day when they fill out the action plan for the follow-up process.
   - Distribute the evaluation form and invite the participants to briefly evaluate the day's activities. Collect the forms and summarize the results to report back to them the following morning. Note that it is necessary to cluster the answers. A guideline (a sample is attached to this session and in daily evaluation forms) facilitates:
     - the participants' evaluation on the diverse features of the day's activities (you should provide the participants with a copy and/or present it in the overhead during the evaluation session)
     - your task of clustering the results of the daily evaluation to report and discuss with the participants in the morning

Dear Participant,

Welcome to the Workshop on Information Management for Research, which has been organized by SADC/ESAMI/ISNAR.

We hope you will enjoy the coming ten days. Our aim is to help you become a skillful information manager for agricultural research. Various subjects will be discussed. First we will consider the theoretical aspects and then you will be given practical work to do using up-to-date training techniques. All of the exercises will be reviewed and discussed by the participants.

We realize that information management for agricultural research is not easy. There are ways to improve your knowledge and skills to facilitate your job performance. This workshop will give you a chance to brush up your skills in information management. You will learn how to implement actions to improve the information management process at your NARS. After all, everyone needs accurate information to manage an organization effectively!

We wish you a pleasant and productive workshop.

Best regards,

SADC/ESAMI/ISNAR Trainers
on Information Management for Research

Dear Participant,

Please find enclosed data collection forms to assist you in collecting information from your institute which will be used for your workshop exercises. You will be expected to bring this data to the workshop to participate in computer exercises and to produce final reports of the working groups. Bring all completed forms to the workshop.

To assist you in collecting the data, please use the following suggestions. If these suggestions prove too difficult or impractical, use whatever means will be easier and convenient for you:

1. **Research programs analysis** – Make as many photocopies as necessary and distribute to your colleagues responsible for individual research projects/programs for them to complete. Make sure you collect all the forms before you come to the workshop.

2. **Human resources** – Distribute photocopies to your colleagues, scientific staff only. Have them complete the forms and collect.

3. **Financial resources** – This is the easiest. Go through your annual budget for this year and extract the information required. Your institute's budget document will provide the necessary information.

4. **Physical resources** – This is the most tricky. Hopefully, with a smile, you can get your stores personnel and the transport manager to help you with their inventory records. Otherwise do the best you can.

Good luck! I hope it's easier for you to "get" information in your institute than it has been for a lot of us !!

Yours sincerely,

Sample Data Capture Form for Human Resources Management Information System

Research institute . . . . . .

1. Biodata

a) personal file number . . . . . .

b) full name . . . . . .

c) date of birth . . . . . .

d) sex . . . . . .

2. Education

	Year	Discipline
a) diploma	. . . . .	. . . . .
b) Bsc	. . . . .	. . . . .
c) Msc	. . . . .	. . . . .
d) PhD	. . . . .	. . . . .

3. Employment

a) date of first appointment . . . . . .

b) current position . . . . . .

c) station . . . . . .

d) basic salary (use average figures for category) . . . . . .

4. % Time on activities

a) research . . . . . .

b) management . . . . . .

c) teaching . . . . . .

Sample Data Capture Form for Financial Resources Management Information System

Research institute . . . . . .

1. Personnel salaries and wages

a) Scientists

Name	Salary
. . . . .	. . . . .

b) Technical support

Name	Salary
. . . . .	. . . . .

c) Administration

Name	Salary
. . . . .	. . . . .

d) Field labor

Name	Salary
. . . . .	. . . . .

2. Station operations

a) Vehicles . . . . . .

b) Subsistence (per diem) . . . . . .

c) Conferences . . . . . .

d) Office supplies . . . . . .

3. Maintenance and repairs

a) Physical plant . . . . . .

b) Buildings . . . . . .

4. Printing and documentation

a) Printing and photocopying . . . . . .

b) Communication . . . . . .

c) Books and journals . . . . . .

5. Utilities

a) Phone . . . . . .

b) Water . . . . . .

c) Electricity . . . . . .

6. Research programs' materials and supplies

. . . . . .

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Sample Data Capture Form for Research Program/Project Management Information System

Research institute . . . . . .

Title of the research program . . . . . .

Title of the project . . . . . .

Beginning date . . . . . .

Expected completion date . . . . . .

Objectives . . . . . .

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Key words

1. . . . . 2. . . . . 3. . . . . .

4. . . . . 5. . . . . 6. . . . . .

7. . . . . 8. . . . . 9. . . . . .

Information on this activity

Province/Region	Location
1.	. . . . .
2.	. . . . .
3.	. . . . .
4.	. . . . .

Researchers implementing this activity

Name	Discipline	Time
Lead other(s)		
1.	. . . . .	. . . . .
2.	. . . . .	. . . . .
3.	. . . . .	. . . . .
4.	. . . . .	. . . . .
5.	. . . . .	. . . . .
6.	. . . . .	. . . . .

Source of funds for this activity

Name	Type*	US$
1.	. . . . .	. . . . .
2.	. . . . .	. . . . .
3.	. . . . .	. . . . .

*Type = donor, government, internal

Annual budget and expenditure for this activity (US$)

	Estimated	Actual			Expenditure	Expenditure to date
		donor	government	internal		
1. Materials and supplies						
2. Transport and travel						
3. Equipment repairs and maintenance						
4. Training						
• Long term						
• Short term						
5. Capital (itemize)						

Sample Data Capture Form for Physical Resources Management Information System

Research institute . . . . . .

One record for each item with the value of more than US$3,000.00. Please use equivalent.

1. Vehicles

year purchased	cost	current condition	equivalent
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .

2. Farm machinery and field equipment

year purchased	cost	current condition	equivalent
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .

3. Office equipment

year purchased	cost	current condition	equivalent
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .

4. Laboratory equipment

year purchased	cost	current condition	equivalent
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .

5. Physical plant

year purchased	cost	current condition	equivalent
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .	. . . . .

6. Land

a) . . . . . .

b) . . . . . .

c) . . . . . .

d) . . . . . .

e) . . . . . .

f) . . . . . .

g) . . . . . .

h) . . . . . .

Information Management for Research Workshop Prospectus

Introduction

Agriculture and environment conservation sectors of government share the responsibility for increased food production while conserving and sustaining the environment. Agricultural research is mandated to conduct applied and adaptive solutions to the technical and economic problems of producers of food and cash crops, as well as livestock. Among the environmental constraints to increased agricultural production are soil degradation, drought, and deforestation, especially in the marginal areas occupied by smallholder farmers. Sound policies integrating strategies for the generation of agricultural production technologies and environmental management provide the vision for sustained agricultural development.

Among the critical inputs to sound policy formulation and implementation is the management of information on the dynamics of the process of agricultural research and development.

National Agricultural Research Systems (NARS) need to develop adequate management skills and resources to manage their information requirements. Sound information is required at all levels of NARS, from research scientists to policymakers. Institutions and their managers need effective and efficient systems for collecting, processing, and disseminating critical information. Since technologies for creating such systems are constantly advancing, it is necessary for managers to regularly update and enhance their skills in developing and using them.

Goal of the Workshop

To provide the ESAMI trainers with an opportunity to conduct a workshop for the research scientist. The aim is to develop basic skills in Information Management for Research.

Workshop Objectives

The workshops will enable participants to identify techniques for exploiting the potential of information systems and information techniques for the conduct and management in their NARS. At the end of the workshop participants will have been exposed to systems and technologies that

they could immediately apply to their work situations to enhance the effectiveness of their institutions.

Duration of the Workshop

The workshop is planned for 10 days.

Workshop Format

The emphasis of the workshop will be on practical solutions for specific problems in developing information systems for managing research work and research institutions. Emphasis will be on maximizing participants' and facilitators' knowledge and experience, as well as jointly developing practical solutions applicable to the local situation.

Discussion topics and short presentations will be followed by case studies, group discussions, practical assignments on computers, and participants presentations.

Various aspects of research management covering such topics as information systems for **planning, programming, budgeting, priority setting, monitoring and evaluation of human resources, finance, projects and operations** will be discussed within the local context.

Extensive use will be made of computer-based exercises and case studies. The application of information systems and information technology to address **management problems, issues and concerns** will be emphasized. An overview of the capabilities of software application packages will be given with emphasis on the use of **database management systems.** Other software such as **spreadsheets, statistical tools, project management and presentation tools** will also be introduced.

Workshop Requirements

No prior exposure to or experience with computers or information technology is required.

Expected Outputs

The expected outputs of the workshop are the following:

1. Improved information management awareness and skills of the trained scientists.

2. Basic computer skills in dBase IV and Lotus 1-2-3.

3. Action plan to apply information management in the participant's own working environment.

4. Improved commitment from agricultural researchers to work as a team toward establishing, within the institute, a critical level of expertise in information management.

5. Increased interest by scientists to serve the SADC-NARS in other duties related to information management for research.

Information Management for Research - Workshop Schedule (Week 1)

Day One	Day Two	Day Three	Day Four	Day Five
08:30 - 09:00 *Welcome* **09:00 - 10:30** *Session 1. Introduction to the workshop*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 5. Information technology: overview.* *Exercise 5*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 8. MIS for financial resources.* *Exercise 8*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 11. Development and management of physical resources.* *Exercise 11*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 14. Establishment and development of an MIS: data analysis.* *Exercise 14*
Tea/coffee break	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**
10:45 - 13:00 *Session 2. Concepts of information and communication.* *Exercise 2*	**10:45 - 11:45** *Session 5. (Continued)* **11:45 - 13:00** *Session 6. Computer basics.* *Exercise 6*	**10:45 - 11:45** *Session 8. (Continued)* **11:45 - 13:00** *Session 9. INFORM: an information system for agr. res. mgt.* *Exercise 9*	**10:45 - 11:45** *Session 11. (Continued)* **11:45 - 13:00** *Session 12. MIS: data collection* *Exercise 12*	**10:45 - 13:00** *Session 14. (Continued)*
		Lunch		
14:00 - 15:30 *Session 3. Database management: fundamentals of database systems.* *Exercise 3*	**14:00 - 14:45** *Session 6. (Continued)* **14:45 - 15:30** *Session 7. MIS for research program analysis.* *Exercise 7.*	**14:00 - 14:45** *Session 9. (Continued)* **14:45 - 15:30** *Session 10. Planning and development of MIS: an overview.* *Exercise 10*	**14:00 - 15:30** *Session 13. Management information systems for human resources.* *Exercise 13.*	**14:00 - 15:30** *Session 14. (Continued)*
Tea/coffee break	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**
15:45 - 17:00 *Session 4. The role of MIS in agriculture and natural resources research.* *Exercise 4* **17:00 - 17:30** *Feedback on the day's activities and PAPA*	**15:45 - 17:00** *Session 7. (Continued)* **17:00 - 17:30** *Feedback on the day's activities and PAPA*	**15:45 - 17:00** *Session 10. (Continued)* **17:00 - 17:30** *Feedback on the day's activities and PAPA*	**15:45 - 17:00** *Session 13. (Continued)* **17:00 - 17:30** *Feedback on the day's activities and PAPA*	**15:45 - 17:00** *Session 14. (Continued)* **17:00 - 17:30** *Feedback on the day's activities and PAPA*

Information Management for Research - Workshop Schedule (Week 2)

Day Six	Day Seven	Day Eight	Day Nine	Day Ten
08:30 - 09:00 *Opening of the day's activities* **09:00 - 10:30** *Session 15. Designing a database structure.* *Exercise 15*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 18. Database queries design.* *Exercise 18*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 20. Database management: security, recovery, and integrity.* *Exercise 20*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 22. INFORM-R computer demonstration.* *Exercise 22*	**08:30 - 09:00** *Opening of the day's activities* **09:00 - 10:30** *Session 23. (Continued)*
Tea/coffee break	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**
10:45 - 13:00 *Session 15. (Continued)*	**10:45 - 13:00** *Session 18. (Continued)*	**10:45 - 11:00** *Session 20. (Continued)* **11:00 - 13:00** *Session 21. Introduction to Lotus 1-2-3.* *Exercise 21*	**10:45 - 13:00** *Session 23. Database development, management, report production, and analysis.* *Exercise 23*	**10:45 - 13:00** *Session 23. (Continued)*
		Lunch		
14:00 - 15:30 *Session 16. Forms design.* *Exercise 16*	**14:00 - 15:30** *Session 19. Database reports design.* *Exercise 19*	**14:00 - 15:30** *Session 21. (Continued)*	**14:00 - 17:00** *Session 24. Field Trip.*	**14:00 - 15:30** *Session 25. Participant action plan approach (PAPA) and workshop evaluation*
Tea/coffee break	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**	**Tea/coffee break**
15:45 - 17:00 *Session 17. MIS: Project initiation.* *Exercise 17* **17:00 - 17:30** *Feedback on the day's activities and PAPA*	**15:45 - 17:00** *Session 19. (Continued)* **17:00 - 17:30** *Feedback on the day's activities and PAPA*	**15:45 - 17:00** *Session 21. (Continued)* **17:00 - 17:30** *Feedback on the day's activities and PAPA*		**15:45 - 16:30** *Final remarks and closing*

SADC/ESAMI/ISNAR Workshop on Information Management for Research
Registration form

Instructions: We would like your help in making this activity as beneficial to you as possible. In order to do this we request that you provide us with some information. Below you will find a number of questions relating to your background and expectations for the workshop. Most questions can be answered simply by placing a check in the appropriate space. Where a written answer is required, please print your reply clearly in the space provided. Please consider your responses carefully and answer truthfully. Everything you say will be held in strictest confidence. The information will be used only to help us make our activities more responsive to your needs.

Last name		First name	

Function in this meeting	❒ Participant ❒ Facilitator/presenter ❒ Organizer ❒ Observer ❒ Other _____

Title	❒ Dr. ❒ Mr. ❒ Mrs. ❒ Ms. ❒ Ing. ❒ Other _____

Gender	❒ M ❒ F

Date of birth	m d y / /19

Degree		Year
	❒ Diploma	19....
	❒ B.Sc.	19....
	❒ M.Sc.	19....
	❒ Ph.D.	19....

Other degree	
Year of other degree	19....

Position (type)	❒ Policymaker ❒ Senior manager ❒ Middle manager ❒ Researcher ❒ Information specialist ❒ Technician ❒ Other _____

Position (type)	
Department	

Institute	
Name of your immediate supervisor	
Your institute's address	

Telephone no.		Telex no./ Fax no.	

Expectations	

What particular topics would you like emphasized in this workshop?	

What other management topics would you like to see covered in future events?	

DAY ONE

Information Management for Research

DAY ONE — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the background, rationale, objectives, and schedule for the 10-day workshop.
2. Explain the use of the participant action plan approach (PAPA).
3. Identify the trainers and trainees.
4. Discuss basic concepts of data processing systems.
5. Discuss conceptual and practical issues of information.
6. Discuss database management.
7. Define management information systems (MIS).
8. Discuss database systems.
9. Discuss the role of management information systems in agriculture and natural resources.
10. Discuss and identify some characteristics of information needs for research planning.
11. Discuss and exercise the use of INFORM in PM&E.

Participant Materials

Workshop notebook (includes welcome letter, workshop prospectus, and tentative 10-day schedule.

Handouts

1.1.1 Overview
1.1.2 Tentative Schedule
1.1.3 Participant Action Plan Approach (PAPA)
1.1.4 Exercise 1. Interactive Exercise (seven sheets to be cut into 21 forms)
1.1.5 Exercise 1. Exercise Sheet (list of questions)
1.2.1 Introduction to Computers: Basic Concepts of Data-Processing Systems (text)
1.2.2 Some Conceptual and Practical Issues of Information (text)
1.2.3 Exercise 2. Basic Ways of Using Information
1.2.4 Exercise 2. Worksheet
1.3.1 Database Management. Fundamentals of Database Systems (text)
1.3.2 Exercise 3. Database Systems
1.3.3 Exercise 3. Worksheet
1.4.1 The Role of Management Information Systems in Agriculture and Natural Resources Research (text)
1.4.2 The Use of INFORM in Planning, Monitoring & Evaluation (text)
1.4.3 The Case of the Livestock Research in Makanda (case study)
1.4.4 Exercise 4. The Case of the Livestock Research in Makanda

1.4.5 Exercise 4. Worksheet
1.4.6 Strengths and Weaknesses
1.4.7 Guidelines to Provide Feedback on the Workshop
1.4.8 PAPA Form — First Stage

Information Management for Research

DAY ONE — Tentative Schedule

08:30 – 09:00	**Welcome**
09:00 – 10:30	**Session 1. Introduction to the Workshop** - Workshop introduction, objectives, and schedule - Overview of day one - Introduction of PAPA - Interactive exercise (1)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 2. Concepts of Information and Communication** (Presentation and exercise 2)

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 3. Database Management: Fundamentals of Database Systems** (Presentation and exercise 3)
15:30 – 15:45	Tea/Coffee Break
15:45 – 17:00	**Session 4. The Role of Management Information Systems (MIS) in Agriculture and Natural Resources Research** (Presentation and exercise 4)
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY ONE — Checklist for Trainers

Pre-workshop preparation

Compile a notebook for each participant. The participant will use the notebook throughout the workshop to organize the training materials. Before they are distributed, each notebook should include the following: welcome letter, workshop prospectus, and tentative 10-day schedule.

Handouts to be distributed

		Yes ✓	No ✓
1.1.1	Overview	❐	❐
1.1.2	Tentative Schedule	❐	❐
1.1.3	Participant Action Plan Approach (PAPA)	❐	❐
1.1.4	Exercise 1. Interactive Exercise (seven sheets to be cut into 21 forms)	❐	❐
1.1.5	Exercise 1. Exercise Sheet (list of questions)	❐	❐
1.2.1	Introduction to Computers: Basic Concepts of Data-Processing Systems (text)	❐	❐
1.2.2	Some Conceptual and Practical Issues of Information (text)	❐	❐
1.2.3	Exercise 2. Basic Ways of Using Information	❐	❐
1.2.4	Exercise 2. Worksheet	❐	❐
1.3.1	Database Management. Fundamentals of Database Systems (text)	❐	❐
1.3.2	Exercise 3. Database Systems	❐	❐
1.3.3	Exercise 3. Worksheet	❐	❐
1.4.1	The Role of Management Information Systems in Agriculture and Natural Resources Research (text)	❐	❐
1.4.2	The Use of INFORM in Planning, Monitoring & Evaluation (text)	❐	❐
1.4.3	The Case of the Livestock Research in Makanda (case study)	❐	❐
1.4.4	Exercise 4. The Case of the Livestock Research in Makanda	❐	❐
1.4.5	Exercise 4. Worksheet	❐	❐
1.4.6	Strengths and Weaknesses	❐	❐
1.4.7	Guidelines to Provide Feedback on the Workshop	❐	❐
1.4.8	PAPA — First Stage	❐	❐

Overheads

1.1.0	Information Management for Research	❐	❐
1.1.1	Workshop Goal	❐	❐
1.1.2	Major Objectives	❐	❐

		Yes ✓	No ✓
1.1.3	Expected Outputs	☐	☐
1.1.4.	Workshop Duration	☐	☐
1.1.5	Objectives of Day One	☐	☐
1.1.6	Schedule of Day One	☐	☐
1.1.7	Participant Action Plan Approach	☐	☐
1.1.8	Why PAPA?	☐	☐
1.1.9	Uses of PAPA	☐	☐
1.1.10	Steps in PAPA	☐	☐
1.1.11	Step 2: In-course Activities – Stage 1	☐	☐
1.1.12	Step 2: In-course Activities – Stage 2	☐	☐
1.1.13	Step 3: Follow-up Activities	☐	☐
1.1.14	PAPA Questionnaire, First Stage – Ideas for Action Items	☐	☐
1.2.1	Objectives of Session 2. Concepts of Information and Communication	☐	☐
1.2.2	Basic Concepts of Data Processing Systems	☐	☐
1.2.3	Information System	☐	☐
1.2.4	Data and Information	☐	☐
1.2.5	Data and Information (continued)	☐	☐
1.2.6	Data Processing System	☐	☐
1.2.7	Information Processing System	☐	☐
1.2.8	Scientific and Business Data Processing	☐	☐
1.2.9	DP Methods and Computers	☐	☐
1.2.10	Qualities of Information	☐	☐
1.2.11	Information and Management	☐	☐
1.2.12	Pressures for Information	☐	☐
1.2.13	Functions of Information	☐	☐
1.2.14	Levels of Organization Decisionmaking	☐	☐
1.2.15	Information Technology (IT)	☐	☐
1.2.16	The Intel Processors	☐	☐
1.3.1	Objectives of Session 3. Database Management: Fundamentals of Database Systems	☐	☐
1.3.2	Database Management	☐	☐
1.3.3	Management Information System	☐	☐
1.3.4	Integrated System	☐	☐
1.3.5	Advantages of Databases	☐	☐
1.3.6	File Processing Systems	☐	☐
1.3.7	Limitations of File Processing Systems	☐	☐
1.3.8	Objectives of Database Management	☐	☐
1.3.9	What Is a Database?	☐	☐
1.3.10	Main Components of Database Technology	☐	☐
1.3.11	What Is a Database Application?	☐	☐
1.3.12	Database Application System Components	☐	☐

		Yes ✓	No ✓
1.3.13	Different Types of Data	❐	❐
1.3.14	People	❐	❐
1.3.15	Different Mechanisms in Database Application	❐	❐
1.3.16	The Role of a Corporate Database	❐	❐
1.3.17	Advantages of Corporate Databases	❐	❐
1.3.18	Data Analysis Methodology	❐	❐
1.3.19	Data Analysis Methodology (continued)	❐	❐
1.3.20	Database Management System	❐	❐
1.4.1	Objectives of Session 4. The Role of MIS in Agriculture and Natural Resources Research	❐	❐
1.4.2	The Role of MIS in Agriculture and Natural Resources Research	❐	❐
1.4.3	Why Management Information?	❐	❐
1.4.4	Functions of a Research Oganization	❐	❐
1.4.5	A Systems Approach	❐	❐
1.4.6	Table 1. Inter-relationships of Functional Areas	❐	❐
1.4.7	Information Needs for Various Levels of Management	❐	❐
1.4.8	Information Needs at the Policy Level	❐	❐
1.4.9	Sources of Information	❐	❐
1.4.10	Information Needs at the Institutional Level	❐	❐
1.4.11	Sources of Information	❐	❐
1.4.12	Information Needs at the Station Level	❐	❐
1.4.13	Sources of Information	❐	❐
1.4.14	Monitoring, Information Field and Problem Identification	❐	❐
1.4.15	Tasks for Monitoring and Evaluation	❐	❐
1.4.16	Relationship of Monitoring and Evaluation to MIS	❐	❐
1.4.17	The Use of INFORM in PM&E	❐	❐

Materials

•	Personal Computers	❐	❐
•	Printers	❐	❐
•	Spare ink or toner for printers	❐	❐
•	Diskettes	❐	❐
•	Overhead projector	❐	❐
•	Spare bulbs for overhead projector	❐	❐
•	Projector screen	❐	❐
•	Extension cords	❐	❐
•	Flipchart stands (minimum 2)	❐	❐
•	Flipchart paper/pads (about 10 per day)	❐	❐
•	Markers for writing on transparencies	❐	❐
•	Blank transparencies	❐	❐
•	Stapler	❐	❐

- Tape (strong masking tape and regular tape) ❒ ❒
- Push pins ❒ ❒
- Glue ❒ ❒
- Pencils/notepads/pens ❒ ❒
- Pencil sharpeners ❒ ❒
- Certificates ❒ ❒
- Photocopying facilities ❒ ❒
- Extra notepads and pens ❒ ❒
- Scissors ❒ ❒

DAY ONE

Welcome and Session 1 Introduction to the Workshop

Instructions to Trainers

PRE-SESSION

Distribute notebooks to participants. Make sure the cards are ready for exercise 1.

08:30 – 09:00 Welcome

SESSION 1

09:00 – 10:30 Session 1. Introduction to the Workshop

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss background and rationale for the workshop: goals, general objectives, and expected outputs.
- Describe the workshop schedule for the entire ten days.
- List the objectives of day one.
- Explain the use of the participant action plan approach (PAPA).
- Identify trainers and trainees.

PROCEDURE

Training techniques: presentation, PAPA, interactive exercise.

PRESENTATION

(experience) Give a presentation providing background and rationale for the workshop. State the goals, general objectives of the workshop, and expected outputs. Explain the 10-day schedule of activities (a copy of the schedule is available in the participants' notebooks). Five overheads support the presentation: 1.1.0 through 1.1.4. Distribute handouts 1.1.1 and 1.1.2. Use overheads 1.1.5 and 1.1.6. to present the objectives and schedule of day one. Ask if clarification is needed. (15 minutes)

PAPA EXERCISE

Introduction of the Participant Action Plan Approach (PAPA).

PRESENTATION

(experience) Introduce the participant action plan approach (PAPA) to the workshop participants using overheads 1.1.7 through 1.1.14. You will find the key points (listed below) and handout 1.1.3. very useful. Distribute handout 1.1.3. Encourage the participants to begin formulating action ideas as the workshop progresses. (15 minutes)

Five basic steps

PAPA requires that participants develop action plans at the end of the workshop. They will prepare a list of activities that they want to try when they return to their jobs. The plans are based on the workshop activities just experienced. After some time has elapsed (usually six months later), the participants are contacted to evaluate what activities they have actually been able to implement. The five steps involved in carrying out this process are as follows:

Step 1. Planning for PAPA

In this step, the persons conducting the workshop determine the specific activities needed to apply PAPA, considering the available resources and the needs of the organizations involved. The trainers assign and schedule the tasks necessary to carry out the approach.

Step 2. In-course activities

This step consists of two stages. At the beginning of the workshop, trainers introduce participants to the idea of an action plan. They are asked to record, throughout the workshop, new ideas they may want to try when they return to their jobs.

At the end of the workshop, participants are asked to write an action plan. This is an edited list of new, workshop-related activities that they plan to try when they return to their jobs.

Step 3. Follow-up activities

At a planned time after the training (usually six months later), participants are interviewed or contacted by questionnaire. They are asked which of their planned activities they have been able to achieve up to that time, and what other activities they have attempted as a result of the workshop. Participants are also asked what effect their new activities have had on their work environment, and what problems, if any, they encountered in trying them.

Step 4. Analysis and conclusions

In this step, the data collected during the follow-up are categorized and displayed to show the extent and type of change resulting from the implementation of the action plan. The information can be displayed in the form of descriptions of behavior change. It can be summarized numerically (e.g., how many of the participants changed in certain ways). It can also be reported using a combination of narrative experience and numbers.

Step 5. Report

The findings from the analysis, conclusions, and recommendations regarding the workshop are reported in a form that meets the information needs of the organizations involved. The format may be an oral report, but a written document is preferred.

Information that can be collected

PAPA gathers information about participants' behavioral changes on the job due to the workshop. Since the trainer asks questions during the follow-up, data can also be obtained on the following:

reaction—how well participants liked and accepted the workshop (viewed six months after its completion).

learning—the skills, knowledge, attitudes, etc., participants felt they acquired during the workshop.

results—the impact the participants felt that the workshop had on their organization or work environment.

Uses of PAPA

Participants commit themselves to action through a written plan developed at the end of workshop. They leave a copy of the plan with the trainer for follow-up purposes.

Participants know that someone will be asking about efforts they have made to implement the action plan. This can motivate them to actually try new activities on the job. Thus, PAPA can help participants transfer to their jobs what they learned in the workshop—PAPA becomes a part of the workshop itself.

Besides directly helping participants with the transfer of skills and knowledge, the action plan process can play a role in supervisor/subordinate discussions of workshop utilization. In working with employees after the workshop, supervisors can help them implement the action plans and thus encourage and support the transfer of learning to the job.

Resources needed to use PAPA

No complex skills or knowledge are required for using PAPA. It does not require previous evaluation experience. No statistical tests are employed in the analysis. If interviews are used to collect follow-up information, interviewing skills are needed. A general ability to synthesize data and draw logical conclusions is also important.

The major resource required is time, mainly time to collect the data about changed job behavior and time for analysis.

However, the trainer can take shortcuts in using the approach and still produce valuable information about the workshop.

Reference

United States Office of Personnel Management. (no date.) Assessing Changes in Job Behavior Due to Training: A Guide to the Participant Action Plan Approach. Washington, D.C.: Productivity Research and Evaluation Division, United States Office of Personnel Management.

EXERCISE 1

Exercise 1. "Getting to know each other." (55 minutes)

1. *(experience)* Distribute a form to each participant (see handout 1.1.4). Note that each form has a different question. You must cut the forms before the session. Each participant fills out a form. Based on the information on the form, the participants introduce themselves to the group.
2. Ask participants to exchange completed forms with each other at random.
3. Ask participants to read the exchanged forms to the group.
4. *(process)* Ask the participants how they felt doing this exercise. What have they learned about themselves and others?
5. *(generalize)* How will this information/experience be useful during this workshop?
6. *(experience)* Distribute handout 1.1.5 and ask participants to complete the form in their own time. This will help them get to know each other better.

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "How will you apply the lessons learned in this session in your job?"
2. Make a transition to the next session.

10:30 – 10:45 Tea/Coffee Break

DAY ONE

Session 1
Summary of Overheads

Information Management for Research

1.1.0

Workshop Goal

To develop basic skills in information management for research

1.1.1

Major Objectives

By the end of the workshop the participants will be able to do the following:

- Identify techniques for exploiting the potential of MIS and IT for the conduct and management in NARS
- Recognize systems and technologies to enhance the effectiveness of NARS
- Set up MIS in NARS

1.1.2

Expected Outputs

1. Improved information management awareness and skills
2. Basic computer skills in dBase IV and Lotus 1-2-3
3. Action plan to apply information management in your own working environment
4. Improved commitment to work as a team toward establishing a critical level of expertise in information management
5. Increased interest to serve the SADC-NARS in other duties related to information management for research

1.1.3

Workshop Duration – Ten Days

1.1.4

Objectives of Day One

1. Discuss background, rationale, objectives, and schedule for the 10-day workshop
2. Explain the use of the participant action plan approach (PAPA)
3. Identify the trainers and trainees
4. Discuss basic concepts of data processing systems
5. Discuss conceptual and practical issues of information
6. Discuss database management
7. Define MIS
8. Discuss database systems
9. Discuss the role of management information systems in agriculture and natural resources
10. Discuss and identify some characteristics of information needs for research planning
11. Discuss and exercise the use of INFORM in PM&E

1.1.5

Schedule of Day One

08:30 – 09:00	Welcome
09:00 – 10:30	Session 1. Introduction to the Workshop
	Tea/Coffee Break
10:45 – 13:00	Session 2. Concepts of Information and Communication
	Lunch
14:00 – 15:30	Session 3. Database Management: Fundamentals of Database Systems
	Tea/Coffee Break
15:45 – 17:00	Session 4. The Role of Management Information Systems (MIS) in Agriculture and Natural Resources Research
17:00 – 17:30	Feedback on the Day's Activities and PAPA

1.1.6

Participant Action Plan Approach

1.1.7

Why PAPA?

- Systematic and continuous planning of future activities by trainees as training evolves
- Formal link between trainees and trainer for follow-up activities
- Further involvement of trainee in improving the training material after training event

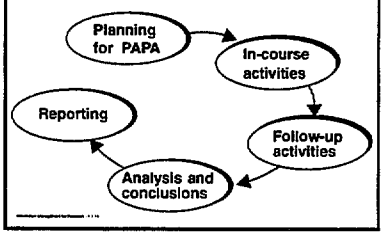
1.1.8

Uses of PAPA

- Assess the transfer of skill to workplace
- Determine the impact of change introduced
- Identify problems of implementation
- Decide how to modify the course
- Evaluate the most useful parts/quality of training

1.1.9

Steps in PAPA



1.1.10

Step 2: In-course Activities

Stage 1

Objectives:
- Introduce PAPA to participants
- Identify possible action ideas to be tried on the job

Procedure:
Jot down action ideas during the training
- use format provided
- do it at end of last session each day
- confer with other participants/trainers periodically

1.1.11

Step 2: In-course Activities

Stage 2

Objectives:

- develop action plan

Procedure:

- prepare preliminary list of action items
- confer with partner
- finalize and prioritize list of action items
- report individual action plans
- make copy and submit to trainer

1.1.12

Step 3: Follow-up Activities

Trainers	Participants
• Formulate and send questionnaire →	• Fill out and return questionnaire
• Analyze and interpret data	
• Prepare report →	• Receive report and send feedback
• Modify course content	

1.1.13

PAPA Questionnaire, First Stage
Ideas for action items

Date :

Workshop title :

Date/Venue :

Name :

Organization :

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop

1.1.14

Special Notes to Trainers

1. Make sure that the notebooks are ready for distribution. Remember the notebooks are comprised of the following:
   - welcome letter
   - workshop prospectus
   - tentative schedule (ten days)
   - registration form
2. Make sure that the cards for the interactive exercise 1 (handout 1.1.4) are cut out.
3. Make sure that you staple all exercise instructions and worksheets together one day before the sessions.
4. Note that a diskette is enclosed in the module with the evaluation forms in Wordperfect 5.1 to use if necessary.

Handout — Overview of Day One

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the background, rationale, objectives, and schedule for the 10-day workshop.
2. Explain the use of the participant action plan approach (PAPA).
3. Identify the trainers and trainees.
4. Discuss basic concepts of data processing systems.
5. Discuss conceptual and practical issues of information.
6. Discuss database management.
7. Define management information systems (MIS).
8. Discuss database systems.
9. Discuss the role of management information systems in agriculture and natural resources.
10. Discuss and identify some characteristics of information needs for research planning.
11. Discuss and exercise the use of INFORM in PM&E.

Participant Materials

Workshop notebook (includes welcome letter, workshop prospectus, and tentative 10-day schedule.

Handouts

1.1.1 Overview
1.1.2 Tentative Schedule
1.1.3 Participant Action Plan Approach (PAPA)
1.1.4 Exercise 1. Interactive Exercise (seven sheets to be cut into 21 forms)
1.1.5 Exercise 1. Exercise Sheet (list of questions)
1.2.1 Introduction to Computers: Basic Concepts of Data-Processing Systems (text)
1.2.2 Some Conceptual and Practical Issues of Information (text)
1.2.3 Exercise 2. Basic Ways of Using Information
1.2.4 Exercise 2. Worksheet
1.3.1 Database Management. Fundamentals of Database Systems (text)
1.3.2 Exercise 3. Database Systems
1.3.3 Exercise 3. Worksheet
1.4.1 The Role of Management Information Systems in Agriculture and Natural Resources Research (text)
1.4.2 The Use of INFORM in Planning, Monitoring & Evaluation (text)
1.4.3 The Case of the Livestock Research in Makanda (case study)

1.4.4 Exercise 4. The Case of the Livestock Research in Makanda
1.4.5 Exercise 4. Worksheet
1.4.6 Strengths and Weaknesses
1.4.7 Guidelines to Provide Feedback on the Workshop
1.4.8 PAPA Form — First Stage

Handout — Tentative Schedule of Day One

Information Management for Research

08:30 – 09:00	**Welcome**
09:00 – 10:30	**Session 1. Introduction to the Workshop** - Workshop introduction, objectives, and schedule - Overview of day one - Introduction of PAPA - Interactive exercise (1)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 2. Concepts of Information and Communication** (Presentation and exercise 2)

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 3. Database Management: Fundamentals of Database Systems** (Presentation and exercise 3)
15:30 – 15:45	Tea/Coffee Break
15:45 – 17:00	**Session 4. The Role of Management Information Systems (MIS) in Agriculture and Natural Resources Research** (Presentation and exercise 4)
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Participant Action Plan Approach (PAPA)

As part of this training, you will do an exercise designed to help you apply what you have learned. You may not find everything taught in the training appropriate to your specific situation. In some cases, you may want to adapt some of the materials to fit your particular job or work setting.

To do this, the participant action plan approach (PAPA) was developed by the United States Office of Personnel Management. PAPA is an easy-to-use method for determining how you changed your job behavior as a result of your attendance at a training course or program. The method generates data that enables the trainers to answer questions such as the following:

1. What happened on the job as a result of the training?
2. Are changes that occurred the ones intended by those providing the training?
3. What may have interfered with participants trying to use on the job what they learned in the training?

With the information from PAPA, trainers (as evaluators) can also decide if the training workshop should be modified, and in what ways. Managers can use the information to determine the worth of the training and make informed decisions about its future.

Workshop Activities

The method consists of two stages. At the beginning of the training you are introduced to the idea of an action plan and are asked to consider throughout the workshop tasks that you might want to do differently when you return to your job as a result of the training. Then, at the end of the training, you are asked to write an action plan. This is a list of new, workshop-related activities that you plan to try when you return to your job.

Follow-up Activities

At a scheduled time after the workshop (usually several months), you will be interviewed or contacted by questionnaire. You will be asked which of your planned activities you have been able to implement up to that time, and what other new activities you have attempted as a result of having attended the training. You will also be asked what effect your new activities have had on your work environment, and what problems, if any, you encountered in trying them.

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title : SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

Guidelines for Writing Action Items

The most important characteristic of an action item is that it is written so you — or someone else — *will know when it occurs*. One way to help achieve this is to use specific *action verbs*. The following is a list of such verbs:

Mental Skills		Physical Skills	Attitude
State	Discriminate	Execute	Choose
Name	Classify	Operate	Volunteer
Describe	Generate (solution)	Repair	Allow
Relate	Apply (a rule)	Adjust	Recommend
Tell	Solve	Manipulate	Defend
Write	Derive	Handle	Endorse
Express	Prove	Manufacture	Cooperate
Recount	Analyze	Calibrate	Accept
	Evaluate	Remove	Decide
		Replace	Agree

As you are working on the action items, ask yourself *Is the behavior described observable? Will it be obvious to me or others when it happens?*

The following are examples of the action items: *As a result of being in this training I plan to:*

1. *Describe* this workshop to my superior within a week of my returning to the job. As a result, my supervisor will know the contents of the training workshop, how I can apply what I learned to the job, and whether or not others in the organization will attend.

2. *Handle* every piece of paper only once to improve the management of my own time. I begin as soon as I am back on the job.

3. *Apply* the principles of performance analysis to the problem of incomplete or tardy case reviews in my research institute and request assistance from the training unit, as needed. As a result I will know whether training is required and/or if some other solution is appropriate. Begin within a month after returning.

4. *Talk* with my employees directly about a problem which arises, rather than avoiding a confrontation; discuss the situation in order to reach mutual understanding.

5. *Within* two weeks after I return, I will implement a _____ research management procedure/process in my research institute.

Implementing the Action Item

As you proceed to develop action items, *be sure to think of yourself in your actual job setting*, implementing the activity you have described.

If you have an idea of *when* you will be able to begin implementing the action items, make a note of it. Three categories can be chosen: 1) as arises (you do not know when the opportunity to try this item will occur, 2) within two months, and 3) after two months.

You may find that you cannot try out your ideas exactly as you envisioned them, or that it is difficult to be specific. That is all right. It is still important to write out your *intent*, as a tentative plan, knowing you may have to modify it once you are back on the job. *Try to develop at least two or three action items*. One may not work, so it is handy to have others.

SECOND STAGE

ACTION PLAN

Date: _____

Workshop Title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Name: _____

Organization: _____

Action Items	Start to implement action plan (check if known)		
I plan to:	Within 2 months	After 2 months	As arises

Questions about Your Action Items

1. *Preliminary nature of plan*

   - Were you specific in writing the action item?
   - What will you need to do when you return to work to find out which actions are possible?

2. *Resources*

   - Who would be carrying out the proposed action, or helping with it (formally or informally)?
   - Are the skills for carrying it out available?
   - How much time would this take?
   - Are there special materials or equipment required?
   - What is involved in obtaining them?
   - Will you be using a tool, system, or aid from this training workshop?
   - If so, how much adaptation is required?
   - Is continual monitoring or follow-through required?
   - If so, who will do it?

3. *Implementation*

   - Do you have the authority to implement the action?
   - If not, who does?
   - How do you think you can go about getting approval?
   - What do you think the degree of support is for your idea?
   - Will you need to sell people on it?
   - If so, who?

4. *Effects*

   - Whom will this action affect?
   - How will it affect them?
   - Will anyone be the worse for the results?
   - Will anyone be improved?
   - What will be affected?

5. *Environment*

   - What factors in the organizational environment might interfere with your doing this?
   - What factors in the organization will support your effort?

Forms for Interactive Exercise

Note to trainer:

Each one of the following forms has a different question for participants. Be sure to photocopy and cut the forms as indicated before session 1 begins.

Name _____

Institution _____

Area of Research _____

I feel motivated when applying information management, if _____

_____

During this workshop I expect _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

When applying information management, I feel disappointed with myself when _____

_____

However, my reaction is _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

As a researcher/information manager, if I were to describe myself in one sentence I would say _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information on the audience

Name _____

Institution _____

Area of Research _____

My best professional quality is _____

_____

This helps me _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

When trying to improve the information system within my organization, I perceive myself as a person who _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

My perception on disseminating my information management results to researchers is that _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Name_____

Institution_____

Area of Research _____

I think that my peers perceive me as_____

_____

because _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name_____

Institution_____

Area of Research _____

When I discuss information management with my peers I_____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name_____

Institution_____

Area of Research _____

People who really get to know me as a researcher/information manager say_____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Name _____

Institution _____

Area of Research _____

I think my information management skills _____

_____

because _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

I perceive that I like making presentations on information management when _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

As a researcher/information manager for research, I like myself when _____

_____

and I dislike myself when _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Name _____

Institution _____

Area of Research _____

When I am making presentations on information management I feel irritated with _____

_____

because _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

While writing a paper on information technology, I prefer to discuss my thoughts and doubts with _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

When I am writing a paper on information technology, I like myself _____

_____

however, _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Name _____

Institution _____

Area of Research _____

When I am among unfamiliar researchers/information managers, I _____

_____

because _____

_____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

When I am participating in a group discussion on scientific/information management issues, I tend to be _____

_____

That is why I expect my team members to be _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

I am sure I could do a better job as a manager on information systems if _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Name _____

Institution _____

Area of Research _____

As a researcher/information manager I dislike being frustrated. That is why I _____

_____

to improve my morale.

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

During this sharing exercise I feel _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Cut here

Name _____

Institution _____

Area of Research _____

While working on information systems, I think of extension workers as _____

_____

because _____

My major expectation for this 10-day workshop is _____

_____

The trainer will ask you to introduce yourself through this information to the audience

Interactive Exercise

Questions

1. I feel motivated when applying information management, if _____

   _____

   During this workshop I expect_____

2. When applying information management, I feel disappointed with myself when _____

   _____

   however, my reaction is_____

3. As a researcher/information manager, if I were to describe myself in one sentence I would say_____

   _____

   because _____

4. My best professional quality is _____

   _____

   This helps me_____

5. When trying to improve the information management system within my organization, I perceive myself as a person who _____

   _____

6. My perception on disseminating my information managament results to researchers is that_____

   because _____

7. I think my peers perceive me as _____

   _____

   because _____

8. When I discuss information management with my peers I_____

_____

because _____

9. People who really get to know me as a researcher/information manager say _____

_____

because _____

10. I think my information management skills _____

_____

because _____

11. I perceive that I like making presentations on information management when _____

_____

because _____

12. As a researcher/information manager, I like myself when _____

_____

and I dislike myself when _____

13. When I am making presentations on information management I feel irritated with _____

_____

because _____

14. While writing a paper on information technology, I prefer to discuss my thoughts and doubts with _____

_____

because _____

15. When I am writing a paper on information technology, I like myself_____

_____

however _____

16. When I am among unfamiliar researchers/information managers, I _____

_____

because _____

17. When I am participating in a group discussion on scientific/information management issues, I tend to be _____

_____

That is why I expect my team members to be _____

18. I am sure I could do a better job as a manager on information systems if_____

_____

because _____

19. As a researcher/information manager research I dislike being frustrated. That is why I__

_____

to improve my morale.

20. During this sharing exercise I feel_____

_____

because _____

21. While working on information systems, I think of extension workers as _____

_____

because _____

DAY ONE

Session 2
Concepts of Information and Communication

Instructions to Trainers

SESSION 2

10:45 – 13:00 Session 2. Concepts of Information and Communication

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss basic concepts of data processing systems.
- Discuss conceptual and practical issues of information.

PROCEDURE

Training techniques: presentation, individual and group work.

PRESENTATION

(experience) Give a brief presentation on concepts of information and communication. You will find the information in handouts 1.2.1 and 1.2.2 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handouts 1.2.1 and 1.2.2 and be sure to ask participants if they have any comments or questions, or if they need clarification. (30 minutes)

EXERCISE 2

Exercise 2. Basic ways of using information. (1 hour 40 minutes)

1. Distribute handouts 1.2.3 and 1.2.4. Handout 1.2.3 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Individual work

2. *(experience)* Individuals work on the questions of Phase 1. (15 minutes)

Phase 2. Group work

3. Divide the participants into four groups and ask each group to elect a rapporteur.
4. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (30 minutes)

Phase 3. Reporting and discussion

5. *(experience, process)* Ask the rapporteurs to present the results of their group's discussion. Five minutes are available for each rapporteur. (25 minutes)

6. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (20 minutes)

7. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the next session.

13:00 – 14:00 Lunch

DAY ONE

Session 2
Summary of Overheads

Objectives of Session 2. Concepts of Information and Communication

4. Discuss basic concepts of data processing systems
5. Discuss conceptual and practical issues of information

1.2.1

Basics Concepts of Data Processing Systems

- Information
- Data
- Communication

1.2.2

Information System

the arterial system of an organization
or
the electric power system supplying power to the city

1.2.3

Data and Information

- DATA are raw materials, while INFORMATION is a finished product
- DATA become INFORMATION when they achieve relevance
- DATA are groups or series of non-random symbols used to represent INFORMATION
- This INFORMATION is usually recorded observations which are not currently affecting behavior
- DATA represent facts about quantities, actions, events, and objects

1.2.4

Data and Information (continued)

- INFORMATION is selected and organized DATA which are processed according to certain decisions
- INFORMATION is DATA processed with respect to user, problem, time, place, and function
- INFORMATION has an assumed utility which can be used for decision-making
- DATA on the other hand do not:
  - necessarily have any apparent utility
  - affect behavior
  - lead to decision-making

1.2.5

Data Processing System

- Wide range of systematic activities which have collection, input, processing, storage, and output in common
- Activities to process transactions for day-to-day operation

1.2.6

Information Processing System

- Wide range of systematic activities which have collection, input, processing, storage, and output in common
- Activities to process transactions for day-to-day operation plus additional functions related to information for management planning

1.2.7

Scientific and Business Data Processing

Scientific — data for engineering and research purposes

Business — data within the business environment, i.e., personnel, accounts, management

1.2.8

DP Methods and Computers

Computers are important in DP methods

- Speed
- Accuracy
- Storage
- Efficiency

1.2.9

Qualities of Information

- Accuracy
- Timeliness
- Conciseness
- Completeness

1.2.10

Information and Management

- Management information
- Information Management

1.2.11

Pressures for information

1. Advances in processing technologies
2. Improved methods of communication
3. Reduced costs of processing
4. Developments in IT: simpler & user-friendly
5. Increased complexity of environment
6. Increased complexity of organizations themselves
7. Improved knowledge, education, and training
8. Greater demands

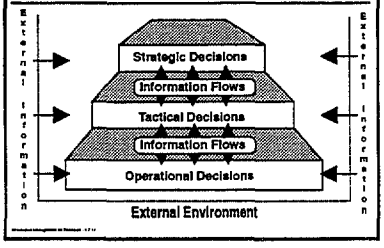
1.2.12

Functions of Information

- Reducing uncertainty in decision-making
- Providing error signals which indicate a deviation from planned performance or operation, thus aiding control activities
- Providing a mechanism for the communication of plans, forecasts, procedures, guidelines, etc.
- Supplying historical evidence of transactions, levels of performance, results of decisions, etc.
- Reducing complexity through enhancement of users' knowledge and understanding of situation

1.2.13

Levels of Organization Decision-making



1.2.14

Information Technology (IT)

- The acquisition, processing, storage, and dissemination of:
  - vocal
  - pictorial
  - textual
  - numeric
- Information by micro-electronics combination of computing and telecommunications

1.2.15

The Intel Processors

Processor	Word Length	Internal Bus Width	External Bus Width
8080	8	8	8
8088	16	16	8
8086	16	16	16
80286	16	16	16
80386	32	32	32
80486	32	32	32
P24T	32	64	32
Pentium	32	64	64

1.2.16

Introduction to Computers

Basic concepts of data processing systems[1]

1. Introduction

The role of information in an organization is analogous to the role of blood in living organisms. The provision of information, in the right form and at the right time, is a vital function in the organization. An information system thus is the arterial system of an organization or equivalent to the electric power system supplying/distributing power to the city. It provides decisionmakers with facts and forecasts and conveys policies and instructions to operating organization levels.

2. Concepts of information & data

We can think of information as "knowledge in motion", i.e., it is knowledge in the process of being carried from one person to another. It is the behavior-initiating stimuli between sender and receiver of information.

A variety of objects can intervene between sender and receiver of information. Familiar objects include books, radio, TV, telephone, computers, etc. Most of these objects attempt to transmit or store the original information.

2.1 Symbols

Before information can be passed from one person to another it must be represented in concrete physical form. These physical things which need to represent information are called **symbols**:

- the 10 digits (0 – 9)
- 26 letters of the alphabet (A – Z)
- special symbols (& : + - % =, etc.)
- electric currents that travel over telephone wires
- the electromagnetic waves our televisions pick up, etc.

In computing, we refer to a series of symbols as **data**.

Data is used to represent information. It may be considered as symbols, usually recorded observations, which are currently not effective behavior.

Data is linked to raw material, information to a finished product, the two being separated by a process.

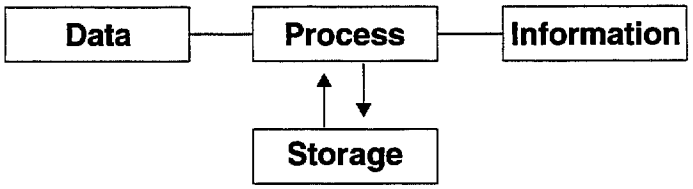
[1] Source: Shila, Howard M. 1995. Eastern and Southern African Management Institute (ESAMI), Arusha, Tanzania.

Data is defined as groups (series) of non-random symbols which represent quantities, actions, things, etc., in other words, facts. The 50 or more characters (numbers, letters, and special symbols) constitute the complete range of "raw material" that goes into any **business**-data processing, and these are the elements which make up the **input** to any system. Data is then organized for processing into data structures.

Information is meaningful combination of data. It is associated with decisionmaking.

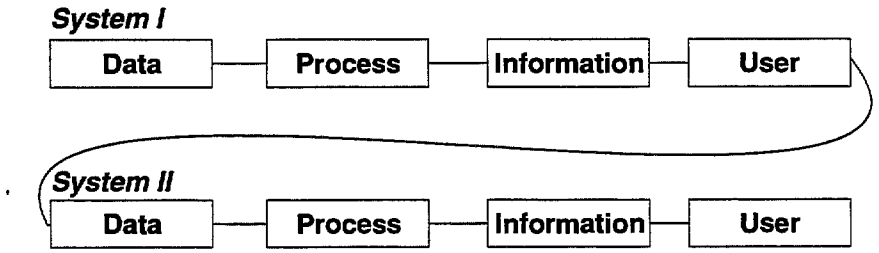
Thus, information consists of selected and organized data with respect to user, problem, time, place, and function. The significant difference between data and information can be described by one word: **utility**. The term information assumes the existence of usefulness (utility) as distinguished from data, which does not necessarily have any apparent usefulness, i.e. does not affect the behavior of men and machine (does not lead to decisionmaking).

Therefore no data can be called information unless it has been viewed and properly organized in a meaningful way and is useful to someone. Thus data becomes information when it achieves relevance.



The analogy of raw material to finished product illustrates the concept that the "finished product" of one process can readily become the "raw material" for another process. Thus information which is the output of one process can often become the data (i.e. raw material) for another process (see fig. above).

Because of this relationship between data and information, the two words are used interchangeably.



3. Data & information processing

The conversion of data to information is the primary function of **data processing**.

Data processing is the term used to describe a wide range of systematic activities which have certain characteristics in common, namely the **collection, input, processing, storage** and **output**

quantities of data relating to the physical events occurring in the business, most of which are performed on a routine basis.

The system which performs the processing of data and produces information is described as a Data Processing (DP) System or an Information Processing System. DP generally refers to a system which is oriented primarily to the processing of transactions for day-to-day operation, whereas information processing systems generally perform substantial additional functions related to information for management planning.

4. Types of data processing systems

These, too, fall into categories, namely, Scientific Data Processing and Business Data Processing.

4.1 Scientific Data Processing

This includes analysis of data required for engineering and research purposes. It is mathematically oriented, usually non-repetitive in nature and file oriented, requiring small amounts of input and output data with many calculations. Areas include weather forecasting, medicine, biosciences, space exploration, etc.

4.2 Business Data Processing

This includes all necessary activities in a business environment, such as payroll, inventory control, accounting, general finance, reservations, hotel management, etc. It is characterized by the processing of many files repeatedly, requiring few calculations but many output reports.

For example, a payroll application would require updated personnel files, payroll reports, checks, deductions, and various internal and external reports. All these would be prepared from the same input.

It should be pointed out that:

- Data processing does not require a computer but it is the power of a computer which makes it feasible.
- Data processing has no meaning without reference to the problem to be solved. The proposed solution is compared against the problem definition.
- The solution technique consists of determining what data to collect to solve the problem and the method of collecting and analyzing the data.
- Data alone are insufficient to solve a problem. Only by organizing and transforming data do we arrive at a solution.
- Data alone have no information content nor problem-solving ability. But when processed to solve a problem, data become information to solve a problem. However, information to solve a problem may be also data to another problem.
- The most powerful data processing tool today is the electronic computer and processing data in this manner is known as electronic data processing.

5. Characteristics and capabilities of computers

Inevitably the computer dominates all discussions of data processing methods because of its **speed, accuracy, storage capacity, and efficiency**.

- Computers operate at speeds which are typically quoted in mill-, micro- or nanoseconds (one-thousandth, one-millionth, or one thousand-millionth of a second) to process or manipulate information.
- Computers are extremely accurate in dealing with large quantities of data. They are also more consistent, i.e. give the same answer every time that a particular process is repeated. They are designed in such a way that many of the inaccuracies which could be caused due to the malfunctioning of the equipment are detected, and their consequences avoided in such a way which is completely transparent to the user. The accuracy of the first generation computers was about 10,000 times greater than an accountant.
- Computers have the ability to store and access large volumes of data required in computation in a small amount of space, thus keeping storage costs down. Furthermore, they have a large internal memory.
- Computers are technically reliable and efficient.

6.The qualities of information

- **Accuracy**. Correct information/total time.
- **Timeliness**. Speed of the response time of the information system.
- **Conciseness**. Just the information needed.
- **Completeness**. Information delivered must be complete.

Some Conceptual and Practical Issues of Information[1]

Definitions

This study inevitably involved many discussions. It became clear that some arguments were based on different understandings of some terms and it was therefore important to clarify these.

Management Information

For managers to manage an enterprise, a regular flow of information from the enterprise is needed. Such information is **management information**. This needs to be somehow obtained from the enterprise. Usually all that is directly available is a large volume of heterogenous information which, in its raw state, is referred to as **data**, and is barely intelligible to those not directly involved with each particular activity of the enterprise. Managers need an abstract of such data, processed in various ways to give a rapid overview of the state of at least their part of the enterprise. The system by which enterprise data is routinely captured and processed into useful information for managers is called a **management information system** or **MIS**.

Information Management

But the various activities of an enterprise inevitably involve many other data which are not generated or processed specifically for the management of the enterprise. Examples are scientific information held in the library in books or on CD-ROM, accounts data in the accounting office, and personnel information. Such information is under the responsibility of the librarian, accountant and personnel officer, who manage it for their own needs; such activity can be collectively described as **information management**.

Over the years, management information systems grew in complexity and in coverage of an enterprise's many departments. They often comprised a number of independent systems. In recent years more flexible, powerful and yet easier to use computer systems have been developed for senior executives. They are able to interrogate and extract information from an organization's basic operational systems. They permit managers to ask their own questions, "drilling down" into the institution's other systems to find the answers. They allow an organization's present position to be compared with historical data to identify trends. This new generation of management tool is commonly called an **executive information system (EIS)**.

Information Needs of Managers

Presented below is a list of generalized information needs for managers based on conclusions reached by a number of studies (see, for example, McNurlin et al. 1989; ARIS 1991). Five such needs are presented along with comments on the degree to which INFORM currently meets these specifications. It suggests that within the implementation process greater attention is needed in project budgeting and the inclusion of technicians and support staff in direct costs.

[1] Extracted from: Vernon, R. May 1994. Evaluation of ISNAR's implementation of INFORM. Discussion Paper No. 94-12. The Hague: ISNAR.

In one of the few published accounts seen on management information systems for agricultural research, Corbett (1989) suggests 11 tasks for such a system:

1. Describe the research in manageable units.
2. Apportion costs of the research.
3. List the principal researchers involved.
4. Report progress in research and in spending.
5. Outline briefly future research intentions.
6. Allow retrieval of all the information aggregated in different fashions.
7. Revise information regularly so that it is current.
8. Permit continuity from year to year.
9. Provide an estimate of benefit, or other reason for doing the research.
10. Provide some measure of output of the research system.
11. Provide the information needed for management purposes with minimum effort for the researchers.

Exercise 2. Basic ways of using information (individual and group work)

"Information may be used to add to knowledge or to make decisions."

Phase 1. Individual work (15 minutes)

1. Define and manage data and information.
2. Describe briefly below a recent personal experience in using information:
   a) to add to your professional knowledge

_____

_____

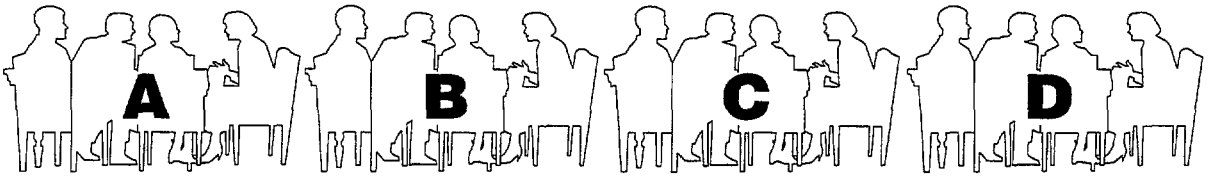
   b) to make a professional or managerial decision

_____

_____

Phase 2. Group work (30 minutes)

3. Form four groups of participants, each electing a rapporteur.



4. Read your answers to Phase 1 aloud to the other group members.
5. The rapporteur summarizes the group's major ideas based on the discussion of the individual experiences, noting similarities and differences and examining reasons for success or failure in using the information for the stated purpose.

Phase 3. Reporting and discussion (50 minutes)

6. The rapporteurs present their group's results.
7. The trainer writes keywords from each presentation on a flipchart to facilitate comparison and open discussion, to stress lessons learned from the exercise.

Exercise 2. Worksheet

DAY ONE

Session 3
Database Management: Fundamentals of Database Systems

Instructions to Trainers

SESSION 3

14:00 – 15:30 Session 3. Database Management: Fundamentals of Database Systems

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss database management.
- Define management information systems (MIS).
- Discuss database systems.

PROCEDURE

Training techniques: presentation and group work.

PRESENTATION

(experience) Give a brief presentation on database management. You will find the information in handout 1.3.1 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 1.3.1 and be sure to ask participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 3

Exercise 3. Database systems. (1 hour 10 minutes)

1. Distribute handouts 1.3.2 and 1.3.3. Handout 1.3.2 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur.
3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (30 minutes)

Phase 2. Reporting and discussion

4. *(experience, process)* Ask each rapporteur to report the results of their group's discussion. Approximately five minutes are available for each rapporteur. (20 minutes)

5. *(process)* Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)

6. *(process, generalize)* Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the next session.

15:30 – 15:45 Tea/coffee break

DAY ONE

Session 3
Summary of Overheads

Objectives of Session 3.
Database Management: Fundamentals of Database Systems

6. Discuss database management
7. Define MIS
8. Discuss database systems

1.3.1

Database Management

1.3.2

Management Information System (MIS)

- an integrated user-machine system
- for providing information
- to support the planning, operations, management, analysis, and decision-making functions in an organization

1.3.3

Integrated System

Information system builds structures from data to reveal patterns, trends, and tendencies that users need to perform their jobs

1.3.4

Advantages of Databases

Databases facilitate the production of information

- may store large volumes of data
- are readily accessible
- can be implemented on computers of all sizes

1.3.5

File Processing Systems

- collect only data necessary for reports
- store data only in pre-report format
- store data in formats efficient for data processing required for reports
- represent all data semantics
- data files and program are interdependent

1.3.6

Limitations of File Processing Systems

- data is separated and isolated
- data is often duplicated among files
- application programs are dependent on file formats
- difficult to represent complex objects from users' environment
- major changes to the system are very time consuming

1.3.7

Objectives of Database Management

- shareability
- availability
- evolvability
- integrity
  - quality
  - privacy

1.3.8

What Is a Database?

A mechanized, shared, formally defined, and centrally controlled collection of data

Three parts of a database:
1. application data
2. data dictionary or meta-data
3. overhead data

1.3.9

Main Components of Database Technology

- database management systems (DBMS)
- database
- computer technology

1.3.10

What Is a Database Application?

A business computer system
that processes a portion
of a database
to meet the information needs
of a specific group

1.3.11

Database Application System Components

- hardware
- programs
- data
- procedures
- people

1.3.12

Different Types of Data

- source data
  facts stored in the database
- overhead data
  describes structures that represent relationships: lists, indexes
- meta-data
  describes the structure of the database
- application meta-data
  describes the constructs of particular applications

1.3.13

People

- Clientele
  for whom the system is developed
- Systems development personnel
  design and implement the database and its applications
- Operations personnel
  run the computer and associated equipment
- Database administration (DAB) personnel
  deal with database security, ownership, backup, and recovery of data

1.3.14

Different Mechanisms in Database Application

- updating data
- displaying data
- controlling data

1.3.15

The Role of a Corporate Database

Allows management to:

- research the past
- organize the present
- plan for the future

1.3.16

Advantages of Corporate Databases

- Redundancy reduced
- Inconsistency reduced
- Data can be shared
- Standards enforced
- Security restrictions
- Integrity
- Conflicting requirements balanced

1.3.17

Data Analysis Methodology

1. Define the major data areas of the organization
2. Define entity types for each of the data areas of the organization
3. Determine relationships existing between entity types
4. Derive an entity model for the area of the organization
5. Determine attributes for the entity types

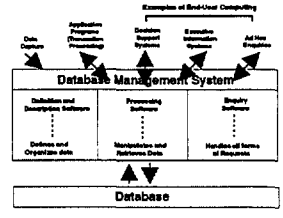
1.3.18

Data Analysis Methodology (continued)

6. Normalize the attributes of the entity types
7. Amalgamate entity models to derive a complete model for the organization
8. Test the adequacy of the entity model against the functions and processes required of it

1.3.19

Database Management System



1.3.20

Eastern and Southern African Management Institute

Database Management

Fundamentals of Database Systems[1]

by
Howard M. Shila

[1]Extract from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual, Arusha, Tanzania: ESAMI.

Abstract

Data management and MIS

More data is not what management needs. They need data which is filtered, massaged, analyzed and compared in ways they cannot predict. As management faces new problems and challenges, information requirements change. Whether managers ask for new information or faster access to existing information, the supporting information system should be able to respond in new and tailored ways.

Essentially managers at all levels require similar data. The operation managers require data which is timely, precise, detailed, internal and historical. Upper level managers need data which is aggregated, external as well as internal, future oriented as well as historical, covering a longer time span. This calls for an effective **management information system** (**MIS**). An effective MIS cannot be built without viable data management tools. An important key to a successful MIS is the effective management of an organization's data resources. This can be achieved by the **database** approach. Creating a centralized corporate database. The data will have to contain all data relating to an organization – its business operations, plans, and its environment including opportunities and changes.

This paper discusses the database approach to the design of an effective MIS. Traditional file processing systems and their disadvantages are presented; the **database systems** and their objectives are discussed together with their main components.

1. Introduction

Information processing is a major organizational activity. A significant part of an individual's working and personal time is spent in recording, searching for, and absorbing information. It is estimated that as much as 80% of a typical executive's time is spent in processing and communicating information.

Computer technology has become an essential part of organizational information processing because of the computing power in terms of speed, accuracy, storage capacity and reliability. The current challenge facing NARS today in information processing is how best can they use the capacities of computers to support knowledge work, including research, managerial activities and decision making functions. They need feasible Management Information Systems – MIS.

1.1 Definition of MIS

A Management Information System is:

- an integrated, user machine system
- for providing information
- to support the planning, operations, management, analysis, and decision making functions in an organization

The system utilizes:

- computer hardware, software, and communications technology

- manual procedures
- models for analysis, planning, control, and decision support systems
- a database

1.2. Computer-based user machine system

This is a concept implying that some tasks are best performed by humans, while others are best done by machine. The computer can be a stand-alone personal computer or a large computer serving a number of users through terminals connected by communication lines.

The user of an MIS is any person responsible for entering input data, instructing the system, or utilizing the information output of the system.

1.3. Integrated system

Management Information Systems typically provide the basis for integration of organizational information processing. Integrating processing enables individual diverse applications to be consistent and compatible and eliminates redundancy. The first step in integration of diverse information system applications is to have an **overall information system plan**. The overall plan determines how applications fit in with other functions.

The word **information** comes from the latin word *informare*, which means "to build from" or "give structure." Information systems build structures from data by processing it to reveal patterns, trends, and tendencies. These patterns, trends, and so forth are the information that users need to perform their jobs. If we did not derive information from the huge volumes of facts we store in our files or computers (**data**), then our users would be overwhelmed with details, floundering about to find the knowledge they need. In fact they would be drowning in a sea of facts. Database technology facilitates the production of information. Today, database processing is fast becoming the rule of development for MIS. There are several reasons for this.

Databases can store large volumes of corporate operational data. Such databases become the heart of many transaction processing applications, such as order entry, inventory control, and management of human, physical and natural resources.

Databases can be queried on an ad hoc basis, making them the foundation for decision-support systems (**DSS**). Data stored in a database can be readily accessed and processed.

Databases can be implemented on computers of all sizes, making them feasible for almost any business or organization.

The fundamental purpose of all information systems is to reduce uncertainty. Database management encompasses the control and use of data resources in an organization.

Control involves maintaining the existence and quality of a database and restricting its use to authorized people. Control seeks to maintain data integrity.

Use of data resources leads to the objective of **availability**, which includes sharing present data resources and enhancing future availability.

2. Traditional File Processing Systems

The earliest computer systems were used to process business records and produce information. They were generally faster and more accurate than the equivalent manual systems. These systems stored records in separate files, and so they were called **file processing systems.** Essentially they were program centered. Systems are created of programs that read and update data records, sort, and then print. Often there are hundreds of steps in these large systems of programs.

Fundamentally, these systems are created on the basis of report needs. The first question asked by the systems designers is "**What do you want out?**" Once the output is finalized, input specifications are nailed down, and once that is done, the programs are written to transform input to output.

2.1 Characteristics of a processing system

The main characteristics of such a file processing system are:

- The system collects only the data necessary for reports.
- It stores data only in pre-report format.
- It extracts data from its natural environment and stores it in formats efficient for the data processing required for reports.
- It represents all data semantics — rules for meaning, validity, and usage — through program logic.
- Its data files and programs are definitely inter-dependent as each is merely an extension of the other.

2.2 Changing a file processing system

Whenever someone wants to change something major, everyone goes into a tailspin because:

- All the file formats have to change.
- A majority of the report programs have to change.
- A majority of the input programs have to change.
- A majority of the translation programs have to change.

In short, the entire system has to change. And since often there is not enough time, the programmer comes to the rescue and creates crafty solutions.

2.3 Problems of file processing systems

Although file processing systems are a great improvement over manual systems, they do have the following limitations:

- Data is separated and isolated, therefore it is difficult to integrate the corporate data resources.
- Data is often duplicated among files, leading to data integrity problems.
- Application programs are dependent on file formats and other physical descriptions inviting maintenance problems when such formats change.
- It is difficult to represent complex objects from the user's environment using file processing systems.
- Whenever major changes are required, everyone goes into a tailspin.

These limitations are a very serious setback in managing data resources.

2.4 Managing data resources: the database technology approach

Database technology was developed to overcome the limitations of file processing systems. Automating important business functions in an organization may save labor, time, and money. By their nature, however, these transactions arise from daily performance of the organization's activities. They report what has been done, but they are of little help to top management in **planning** successful actions for future, or making the decisions required to **control and monitor** the major affairs of the organization. Therefore one of the challenging questions which persists, even though computers are used all over the organization, is the **effective management** of the corporate data resources to facilitate the provision of the right information to the right management at the right time and in the right form required for decision making.

To become more useful in these vital areas, the computer must be integrated into a **system** complete with people and procedures, and organized to provide the entire community with information for decision making, analysis, strategic planning, forecasting, projections, and control functions in the organization.

Such a system – an MIS – must be effective. It should be functionally appropriate, i.e. delivering the correct amount of sufficiently accurate and concise information with the required timeliness. Such a system must have a **database** – the **corporate database** – consisting of all databases in the organization containing data relating to the organization, its operations, plans and its environment, together with tools to collect and manage the data, a responsible and cooperative attitude among users and a **database administrator**.

2.5 Objectives of database management

The database approach is rooted in an attitude of sharing valued data resources, releasing control of these resources to a common responsible authority and cooperating in the maintenance of those shared data resources. Consequently the objectives of database management are:

2.5.1 Share ability

Different people and different processes using the same data at virtually the same time. A shared database environment requires central control to coordinate the collection and use of data to integrate the storage of data. This can result in increased consistency, reduced redundancy, and reduced effort in the capture and maintenance of corporate data resources.

2.5.2 Availability

Bringing the data of an organization to the users of that data, i.e. making it available **when** and **where** it is needed, and in the **manner** and **form** in which it is needed.

2.5.3 Evolvability

This is the gradual unfolding, development, and growth of a system to better meet the needs of the using environment. The ability of a database management system to change in response to growing user needs and advancing technology. It covers expansion or contraction, both of which may occur as the system changes to fit the ever-changing needs and desires of the user environment. It should not be confused with **expandability** – extending or adding to the system which then grows ever larger.

2.5.4 Database integrity: the quality or state of being complete

Protecting the existence of the database from threats, such as:

- natural threats such as fire, flood, earthquake, and lightning
- deliberate human acts such as vandalism, theft, and popular errors
- hardware and software failures, power failure, etc.

Maintaining the quality of the database. Database quality can be threatened by erroneous input or improper update actions. When the database existence has been protected, it is now necessary to maintain the quality of the stored data by:

- ensuring that it always conforms to its definition
- validating the stored data and input data
- controlling the execution of update processes ensuring proper authorization, controlling concurrent update, and synchronizing update and multiple copies.

Ensuring the privacy of the database. Privacy is the right of individuals to be left alone, to keep their affairs confidential, and to choose what information about themselves to share with others. Data privacy requires the protection of personal data from inadvertent or unauthorized disclosure to unauthorized persons or for unauthorized purposes. This requires both legal and technical solutions. The technical solutions include **access control, encryption, and monitoring**. The legal solutions include **policies** and **penalties**.

2.6 What is a database?

A database is a mechanized, shared, formally defined, and centrally controlled collection of data. It consists of integrated records describing entities from one or more entry classes within the total collection of organizational data resources. It includes a description of itself in a **data dictionary** (its own structure) sometimes called **meta-data** (data about data) and a description of relationships among the records in the files. The relationships are often stored in overhead data. Thus, there are three fundamental parts of a database:

- application data
- data dictionary – or database schema or structure
- overhead data consisting of linked lists, indexes, and similar data.

2.7 The database as a model of an organization

A database represents the automation of the knowledge component of a business, which is manifested through the business's quality operation, planning and management. It contains representations of facts about an organization that can be manipulated to produce information. The degree of detail incorporated in the data model depends on the user's need to derive. Transaction processing keeps the database current so that the database is always an accurate model of the organization.

Essentially the data to be maintained in the database will include current data needed for operations, historical data useful for managerial planning, control, and projections as well as formulating business objectives, strategies, policies, and marketing strategies.

In specific terms, for the training database, the following data will have to be captured and maintained in a corporate database: the annual training program schedule comprising training

programs per directorate/sector with their institutions/colleges, facilitators, venues, dates, duration, code numbers, target groups and financing plans if any.

2.8 The role of the corporate database

With a successful database, management can research the past, organize the present, and plan for the future.

Organizations need effective MIS, which are arterial systems supplying information to all levels, analogous to the blood vessels in living organisms. Such information systems need information building blocks – databases.

Conceptually, these information systems can exist without computers and databases. But it is the power of the computer technology which makes them feasible, i.e. technically reliable and cost effective, and the database which will make data available to users by storing diverse data, in an environment of diverse users, operating in diverse modes of operations, using diverse languages, satisfying diverse patterns of use. The users include managers, programmers, research scientists, general problem solvers, governments, donor agencies, and other international agencies.

In brief, the database will provide the effective control and use of the corporate data resources for decision making, training, research, consultancy, strategic planning, control, forecasting, and development. It will also ensure high data integrity and evolvability.

The decisions and actions of the training management will be based upon the image contained in the corporate training database. Managerial decisions originating from the consultative meetings such as management team meetings, management development committees, etc., will direct the actions at the operational level and produce business plans and expectations (annual training program plans, expenditures plans) which should be formally captured and stored in the training database.

Transactions will record actual results of programs attended/conducted, costs and number of participants, postponed and rescheduled programs, and venues to update the database to maintain a current image of the training function.

The operation managers will query the database for information to conduct the daily operations. Senior and middle managers will receive reports on training activities comparing actual results to previously recorded plans and expectations. The corporate database will also provide data for forecasting, projections, training needs assessment, modeling and design which support management needs. The corporate database will support all levels of the corporation and will be vital for the decision making and management process.

2.9 The main components of the database technology

2.9.1 The database management system (DBMS)

The set of programs acting as an interface between the application programs and the database. It allows stored data to be integrated, reduces data duplication, ensures data integrity, eliminates program dependency on file formats, and allows even complicated objects to be easily represented and retrieved. In short, a DBMS is the program that processes the database.

2.9.2 The database

A mechanized, formally defined, and centrally coordinated collection of data.

2.9.3 The computer technology

The CPU, input/output devices, printers and telecommunication devices.

2.10 Database applications

A database application is a business computer system that processes a portion of a database in order to meet the information needs of a business group, department, or functional area. In a sense, an application provides a window into the database for a particular user group. Database processing is divided into applications to conform to the functional areas of the business, to control access to the data, and to limit development to a series of small projects rather than one large one.

2.11 Database application system components

A database application is a business computer system. As such, it has five system components.

2.11.1 Hardware

Computer **hardware** is required to run the DBMS application and other programs. Database systems can be installed on computers of all sizes, from microcomputers to very large mainframes.

2.11.2 Programs

A variety of **programs** is needed to support database applications. At the very least, an application requires a DBMS and an operating system. In a network environment where the database is shared concurrently, a communications control program (CCP) is needed. However, on local area networks and minicomputers the CCP is built into the operating system.

There are two major types of application programs. Applications written in standard programming languages such as C, PASCAL and COBOL access the DBMS through subroutine calls. A second type of application program consists of programs that are written in the DBMS product's own language. This is very common on microcomputers. They include the common DBMS such as **DBASE IV**, **CLIPPER**, etc.

2.11.3 Data

The data component of a database application is the database itself. It contains **source data**, **meta-data** in the data dictionary, and **overhead data**.

Source data are the facts stored in the database, such as students' registration numbers, names, year of study, course, department, and faculty. The meta-data describes the structure of the database. Overhead data is used for lists, indexes, and other data structures that represent record relationships.

The structure of the entire database is called the **schema**, or the **conceptual view**. That portion of the database structure that is processed by a particular application is a **sub-schema** or **application view**. A sub-schema is also called the **logical view**. Application programs are aware only of the data that is in their view.

Some DBMS products store a fourth type of data in the database. **Application meta-data** is data about constructs (such as reports and screens) used by particular applications. Some DBMS products include a report generation subsystem used to define report formats. Oracle and DBase are some of the products with report generation capabilities. The report formats include the report name, names of column headings, names of data items that appear in the report, control breaks, page layouts, and so forth. Once the report format is defined and stored, it can be referenced by an application. Such an application is called application data because it pertains to a particular application, not to the database as a whole.

2.11.4 Procedures

Both users and the operations staff need documented procedures describing how to run the system. Users need to know how to sign on to the system, how to enter data and commands, how to operate the computer or terminal, and how to employ the system to perform the tasks they need to accomplish.

Note that **programs** and **procedures** are different ways of doing something. We can get something done by having a person do it (procedure) or by having a computer do it (program). It should be pointed out that many procedures can be programmed into application programs. Alternatively, procedures can be documented and manually implemented.

Other important procedures needed are procedures for backup and recovery operations. In the event that the database system fails or crashes, both users and operational personnel need procedures describing what to do. Users also need to know manual procedures to follow during the failure, what data to save, and what to do with business transactions that cannot be processed during the failure. When the system is returned to operation, users need to know what to do to resume processing. How much work needs to be redone? How much of the data gathered manually during the failure needs to be considered in developing user recovery procedures.

Similar procedures are required for computer operations. When the database system fails, operations personnel need to know what to do. What actions should be taken to identify the source of the problem and to correct it? What must be done to minimize damage to the database? Who should be called? Once the problem is corrected, how should the database be restored? These actions need to be carefully thought out and documented during the design and implementation of the system.

Just One Reminder!

Business is a dynamic activity, and business needs will change. For a database system, however, changes must be made very carefully. A change made to benefit one user may be detrimental to users in seemingly unrelated departments. Consequently, changes to a database need to be made with a community-wide view. Procedures must be defined and documented to control changes to the database.

2.11.5 People

Clientele are the people for whom the system is developed. These do not usually have an active role in the database system development or use. **Users** employ the system to satisfy a business need.

Systems development personnel design and implement the database and its applications. They determine the requirements, specify alternatives, design the five components of the system and implement the system. The systems development personnel include the following: systems

analysts and application programmers (those people who support and maintain the operating system, the CPC, the DBMS, and other similar system support programs).

Operations personnel run the computer and associated equipment. These are the computer operators, data control personnel, and data entry people.

Database administration (DAB) personnel. The functions of the DAB staff are to protect the database and to resolve conflict among users. The DAB should be a representative of the community as a whole, not of any particular group of users. Some of the DAB responsibilities include the following:

- Management of database activity – provide database standards, guidelines, and control procedures
- Management of database structure – configuration control, plan and implement necessary changes to the schemes and documentation
- Management of the DBMS software – generate database system performance reports/statistics, investigate user performance complaints, evaluate and implement new features, modify database structure, tune the system to the communication software and operating system, and tuning the database system
- Control of concurrent processing – establish data ownership, access rights, modification rights
- Database backup and recovery – develop recovery techniques and procedures
- Database security

2.12 Database application functional components

- Mechanisms for updating data
  - Entering, deleting, and editing
  - By means of forms, supplied tabular form, query/update language, e.g. SQL, mass data input via command sometimes called import. By means of programming: form generated and processed by application program, or application program updating database directly
- Mechanisms for displaying data
  - Reports by default, generated by utility report generator, or application generator
  - Query made by a database query language such as SQL
  - Export: generating a file for another system
- Mechanisms for control
  - Limit database views to required data
  - Limit access to application via passwords and account numbers
  - Teach applications to users only as they are needed
  - Restrict processing via menus
  - Limit processing through design of application program
  - Restrict allowable command set

2.13 Database modeling tools and techniques

Data Analysis. A technique primarily concerned with determining the logical structure of data, its properties and processes needed to make use of it. Its objective is to produce a model which represents the information system or subsystem and should be understandable by users as well as analysts, in order to provide a basis for discussion and agreement.

The main tool used within data analysis is the Entity-Relationship Model (ERM) which classifies information into:

- entities
- attributes
- relationships

Entities are objects or things which are of interest or relevance to organization, for example: *Supplier, Customer, Stock, Item,* etc.

Attributes contribute those properties of an entity which are identified as being of interest to users. Attributes may be equated with fields in a conventional record.

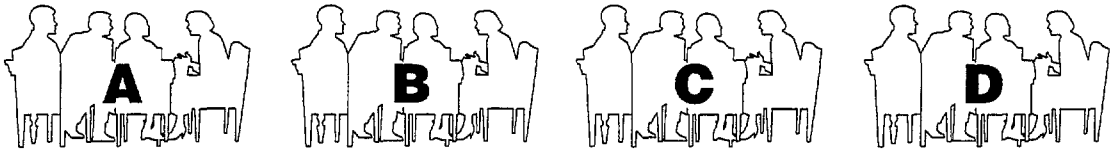
Relationships exist between entities. The degree of a relation may be:

- one to one,
- one to many,
- many to many.

Exercise 3. Database systems (group work)

Phase 1. Group work (30 minutes)

1. Form four groups of participants, each electing a rapporteur.



2. Discuss and agree on the following items.
   a. In what sense does the database constitute the image of an organization?
   b. Describe the role of a database system in supporting the three levels of management in agriculture, natural resources, and extension.
   c. Identify three characteristics of management which make MIS a rich and challenging context within which to study database management.

Phase 2. Reporting and discussion (30 minutes)

3. The rapporteurs present and discuss the summary of the groups' work to the audience. Use a flipchart or overhead to facilitate the presentation.

Exercise 3. Worksheet

DAY ONE

Session 4
The Role of Management Information Systems (MIS) in Agriculture and Natural Resources Research

Instructions to Trainers

SESSION 4

15:45 – 17:00 Session 4. The Role of Management Information Systems (MIS) in Agriculture and Natural Resources Research

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss the role of management information systems in agriculture and natural resources.
- Discuss and identify some characteristics of information needs for research planning.
- Discuss and exercise the use of INFORM in PM&E.

PROCEDURE

Training techniques: presentation, individual and group work.

PRESENTATION

(experience) Give a brief presentation on the role of MIS in agriculture and natural resources research. You will find the information in handouts 1.4.1 and 1.4.2 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handouts 1.4.1 and 1.4.2 and be sure to ask participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 4

Exercise 4. The case of the livestock research in Makanda. (55 minutes)

1. Distribute handouts 1.4.3, 1.4.4, and 1.4.5. Handout 1.4.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur.
3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (30 minutes)

Phase 2. Reporting and Discussion

4. Ask the rapporteurs to present the results of their group's work. Approximately five minutes are available for each rapporteur. (20 minutes)
5. Open the discussion to the audience. Finally, provide your views on the results of the exercise.
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 1.4.6 and use handout 1.4.7 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 1.4.8. (15 minutes)

DAY ONE

Session 4
Summary of Overheads

Objectives of Session 4.
The Role of MIS in Agriculture and Natural Resources Research

9. Discuss the role of MIS in agriculture and natural resources
10. Discuss and identify characteristics of information needs for research planning
11. Discuss and exercise the use of INFORM in PM&E

1.4.1

The role of MIS in Agriculture and Natural Resources Research

1.4.2

Why Management Information?

1. Need for information to plan and program research activities
2. Research activities, in turn, generate a vast amount of information
3. Tremendous increase in the total volume of operations and resources directly under research institutions' control

1.4.3

Functions of a Research Organization

- Developing research programs
- Mobilizing and effectively utilizing financial resources
- Developing and maintaining a physical infrastructure
- Developing and maintaining a critical mass of well-qualified staff

1.4.4

A Systems Approach

Portrays the processes and relationships between functional areas, work areas, and management information.

1.4.5

Table 1. Inter-relationships of Functional Areas, Work Areas, and Management Information of a Research Institution

Functional areas	Work areas	Management information
Human Resources Management	Recruitment Training and development Performance appraisal Salaries and wages	Workforce – size, composition & deployment Management accounts
Financial Resources Management	Budgeting Mobilization Accounting	Management accounts Donor and funding agencies
Physical Resources Management	Procurement Utilization Control Maintenance	Management accounts Project data Inventory
Programs Management	Priority setting Program formulation Budgeting & resource allocation Implementation M/E	Projects data Management accounts Personnel information

1.4.6

Information Needs for Various Levels of Management

- Policy level
- Institutional level
- Station level

1.4.7

Information Needs at the Policy Level

Decision-making areas:

- set broad priorities and allocate resources at national level
- formulate research policies
- analyze alternatives and mobilize resources
- provide overall monitoring and evaluation
- provide leadership

1.4.8

Sources of Information

- Socioeconomic survey
- Technical review
- Diagnostic studies

1.4.9

Information Needs at the Institutional Level

Decision-making areas:

- develop long-term and strategic research plans
- provide leadership and direct supervision of programs
- monitor programs
- provide overall management of station

1.4.10

Sources of Information

- Physical/financial organization
- Quarterly progress, annual and final reports
- Annual review
- Final report

1.4.11

Information Needs at the Station Level

Decision-making areas:

- short-term planning
- project planning and budgeting
- implementation of projects
- monitoring of projects

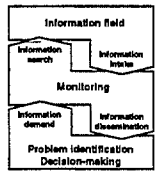
1.4.12

Sources of Information

- Technical and socioeconomic analysis
- Annual research reports
- Technical review
- Personnel evaluation
- Physical/financial organization

1.4.13

Monitoring, Information Field and Problem Identification



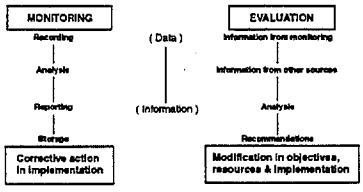
1.4.14

Tasks for Monitoring and Evaluation

- sensing
- screening
- structuring
- storing
- retrieval and communication

1.4.15

Relationship of Monitoring and Evaluation to MIS



1.4.16

The Use of INFORM in Planning, Monitoring, and Evaluation

1.4.17

The Role of Management Information Systems in Agriculture and Natural Resources Research[1]

1. Introduction

All organizations or institutions, irrespective of size, engaged in any type of research are usually associated with the need for information to plan and program their research activities and, in turn, they generate a vast amount of information from these activities. This information is even most critical in agriculture and natural resources institutions, because of the wide scope of work that has to be undertaken, in order to address the needs and concerns of the diverse clientele that utilize the technology generated from the research. In addition, over the past two decades, research institutions in the developing countries have witnessed a tremendous increase in the total volume of their operations and, in absolute terms, the amount of resources directly under their control, thus increasing the demands on managers to carefully allocate resources (which are often not sufficient) to meet priority needs for research. In order to minimize the risk of taking wrong decisions in planning, choosing research priorities and allocating resources, careful judgement based on appropriate and sufficient information is necessary. The managers therefore need to be well informed in order to take informed management decisions, being fully aware of the environment both within and outside the institution that influence the direction of the research activities. A systematic and comprehensive information system is therefore necessary to provide analytical support to research managers for them to rationalize complex choices and decisions.

Information has proven to be a source of power and its control is key to the ability of the research manager, to influence policy directions and mobilize resources for research activities. Consequently, the paramount challenge to all managers of research is to keep oneself well informed.

2. Systems Approach and Management Information System

Some key functions of a research organization are (adapted from D. McLean 1988):

- developing research programs which address constraints to national development
- mobilizing and effectively utilizing financial resources
- developing and maintaining a physical infrastructure which adequately covers major agroecological zones
- developing and maintaining a critical mass of well-qualified scientific and support personnel

The above functions determine the work areas of a research organization as shown in Table 1. These work areas are closely inter-related and together they connect and contribute to the Management Information System (MIS). For example, information on research programs comprises components from human resources, financial resources and physical resources databases. A systems approach would help to portray the processes and relationships between all management functional areas, work areas and management information for the institution. Hence, an efficient MIS will integrate and provide adequate information about the activities of

[1] Source: Setshwaelo, L.L. 1994. The role of management information systems in agriculture and natural resources research. Arusha, Tanzania: ESAMI.

the NARS that can be used for various purposes (formulating policies, planning, programming, etc.), at different times by managers at various levels.

Table 1. Inter-relationships of functional areas, work areas and management information of a research institution

Functional areas	Work areas	Management information
Human Resources Management	Recruitment Training & development Performance appraisal Salaries and wages	Workforce – size, composition & deployment Management accounts
Financial Resources Management	Budgeting Mobilization Accounting	Management accounts Donor and funding agencies
Physical Resources Management	Procurement Utilization Control Maintenance	Management accounts Project data Inventory
Programs Management	Priority setting Program formulation Budgeting & resources allocation Implementation M/E	Projects data Management accounts Personnel information

3. Information Needs for Various Levels of Management

Information needs of senior, middle, and lower level managers as well as professional and technical staff depends on the type of activities and decisions made at each level. Illustrated in Table 2 are the information requirements and use by different management levels for research.

Table 2. Information and use by different levels of management

Level of Management	Source	Use
1. Cabinet	Socioeconomic Survey	Guide investment level
2. National agricultural ministries	Socioeconomic survey Technical Review	Guide balance of investment in research/development institutions
3. National agricultural research (council)	Technical and socioeconomic analysis Technical review Diagnostic studies	Determine potential impact of research initiatives Guide allocations to research institutions
4. Research institutions	Technical and socioeconomic analysis Physical/financial organization; beneficiary contact Annual research reports Technical review Personnel evaluation	Determine potential impact of research initiatives; justify/allocate resources to divisions/programs Improve efficiency of management of research institution Improve research implementation and planning Balance of programs justification of resources Assessment/assignment of personnel
5. Research stations	Physical/financial organization Annual review and reports Personnel evaluation	Improve station management Short-term planning (Annual) program planning Personnel management
6. Programs	Quarterly progress, annual and final reports Annual review	Improve program planning and management
7. Projects	Quarterly progress reports Annual report Annual review Final report	Guide to modify projects Guide for future projects
8. Researcher	Quarterly progress reports Annual reports Annual review Personnel evaluation	Guide research execution and planning Assessment of performance

Although most of the information required may be related and can be sourced within the institution, it is not uncommon to find individual users maintaining only that part which relates directly to their activities and decisionmaking process, without any formal linkage to other sources and users. Such information is, most often, not easily accessible to other users who do not have direct control over it.

3.1. Information needs at policy level

This category includes the Cabinet, National Research Council, Ministerial Policy Committee, etc. and constitutes the uppermost echelon of the decisionmaking process. Their area of emphasis is in the following areas:

a) Setting broad priorities and allocating resources at national level

b) Formulating research policy

c) Analyzing alternatives and mobilizing resources

d) Overall monitoring and evaluation

e) Providing leadership

The type of information required by this group is mostly strategic and therefore relates to political, economic, social and scientific factors. Such information includes the scope and key characteristics of the research institution, farming population size, national agricultural production statistics, natural resources base, etc. The information therefore should:

- facilitate decisions in regard to strategic long-term planning, therefore it is likely to include projections and forecasts;
- relate to the objectives of the ministry as a whole.

3.2. Information needs at institutional level

These are institutional technical committees or structures which act as an advisory instrument to the institution's chief executive. Their main areas of emphasis in the decisionmaking process fall on the following:

a) Developing long-term and strategic research plans

b) Leadership and direct supervision of programs

c) Formulation, budgeting and review of programs

d) Monitoring of programs

e) Overall management of station/divisional activities

The information required by this group would normally arise from current activities of the institution and includes the research environment, the institution's capabilities, constraints, and scientific and technical possibilities. Some of the strategic information is also useful at this decisionmaking level.

The information should:

- facilitate short-term planning for the division or station (budgeting, program planning and monitoring, etc.);
- facilitate program planning, implementation and monitoring.

3.3. Information needs at station level

This group consists of station managers, program leaders, and individual scientists and technicians of support services. These groups may work independently or as groups. Most of the duties performed may not be managerial in the traditional sense but require information to support their tasks. The areas of emphasis in decisionmaking is on:

a) Short-term planning

b) Project planning and budgeting

c) Implementation of projects

d) Monitoring of projects

Information required would normally be operational and have the following characteristics:

- Usually raw unsummarized data generated from projects which require some analysis
- May be used to conceptualize, plan and implement projects

4. Information Use for Planning and Policy Formulation

Planning activities are intended to establish a map that enables the institution to achieve its objectives. Planning concerns the future, therefore, the institution's past activities are useful in developing strategies that will determine the institution's particular actions to achieve its goal. Two major types of planning are usually undertaken by organizations or institutions: i) long-term planning which establishes a longer period plan, for five or more years; ii) a short-term or strategic plan, shorter but done within the framework of a long-range plan. Planning is a process involving several steps, and each of the steps requires information, most of which can be obtained from within the institution.

4.1 Research planning at national level

At this level, planning is concerned mostly with translating the national agricultural development policy and goals into research goals that will facilitate achievement of the overall mission for the agricultural sector, and using the research goals and objectives to set the strategy and priorities for the whole research system. To achieve this task, information is required on the current status of the overall research system, the resources available and the environment within which the system operates, with regard to the political, economic and social factors. Information on the status of the research system can thus be derived from the operations of the research institutions and this requires an evaluation or diagnosis of the whole system. Some of the information therefore arises from, among other places, the routine data processed within the different institutions. However, such information about the institution's operations is seldom in the form ready for use in the planning process. A conscious effort then has to be made to reprocess the

information for it to be more useful. Strategic information about the external environment influencing the activities of the research system can be derived both informally and formally through a system organized to gather such information and from published national surveys and statistics. All the information referred to above is therefore an input into the planning process and serves to provide an insight to the feasibility and desirability of various plans and strategies.

4.2 Research planning at institutional level

The goal and mission (already defined at national level) and the present status of the institution (in terms of the resources available and the scientific capabilities and potential) become the context for the planning activities at the institutional level. Organization of research programs and the resources development plan (financial, human and physical) both require, as an input, information on resources availability and forecasting of requirements for individual programs. Such information is largely available from the institution's own data bank and can also be matched with experience from previous activities to act as a guide in allocating resources. It is therefore important to develop procedures to sense and scan such information from the different sources within the institution in order to ensure that relevant information is available for the decisionmaking process.

In general, information required for long-term planning should focus on the following issues:

- Identification of key factors that affect or impact the direction of variables in the research system
- Identification of minimal conditions necessary for the research system to operate efficiently

Policy-making is normally regarded as a type of planning; this activity therefore also involves a series of steps or stages which all require data and information. Formulation of research policy will require understanding of the social organization of agriculture within the country and strategic information at the national level which includes the scope and characteristics of the agricultural sector. During this process of decisionmaking, lack of political insight and insufficient empirical data and information may lead to adoption of policies which have less efficient solutions in addressing the key problems of the agricultural sector. Most information required for this process would however be available from sources outside the research institution. Nonetheless, some information concerning technology generation and research capabilities would also be required; this would be provided by the research institutions.

5. Implications for Monitoring and Information Systems

The processes of monitoring and evaluation are basically means of collecting and analyzing information on utilization of resources, the quality of the research and timing. This allows management decisions to be made to adjust the project plan where necessary, during the implementation period. Information on progress, use of resources and identification of possible deviations from the project plan would usually be collected as part of the project records and documents, analyzed, organized and disseminated to the appropriate users. All the tasks involved such as: sensing, screening, structuring, storing and retrieval and communication of the monitoring information, are similar to those associated with any information system. Routine monitoring of programs and projects can therefore be seen as part of the overall MIS since it

provides management with information on which to base decisions concerning implementation. Presented below in Figure 1 is the relationship between monitoring, information field and information use by managers. Management requires information of project implementation; this activates the monitoring process to search for relevant information and disseminate it to management for decisionmaking.

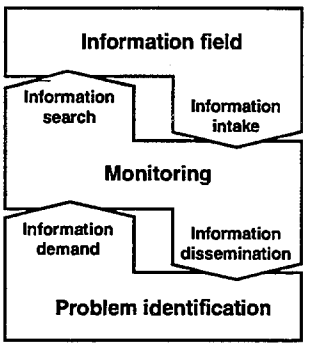
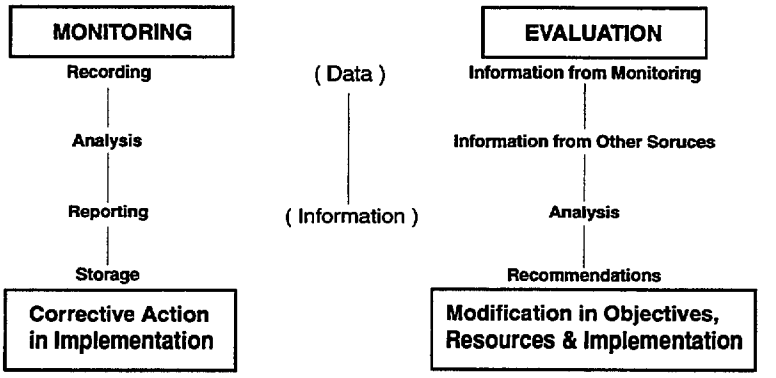


Figure 1. Relationship between monitoring, information field and problem identification. Source: Haynes 1974.

One of the most important issues is the selection and screening of information during the monitoring process. It is important to filter out an abundance of irrelevant information which would typically be collected through monitoring. Consequently, in order to facilitate the collection, analysis and utilization of information collected through monitoring of projects, the key indicators or variables need to be identified at the planning stage. One way of identifying these key indicators is by developing a Logical Framework. The Logframe provides a structure to specify the components of activities and a way to link inputs to outputs. Thus the Logframe serves as a guide to provide specific information. Most of the information collected through monitoring is also used together with information from other sources for evaluating the appropriateness of the project plan. The relationship of monitoring and evaluation as they relate to the MIS is depicted in Figure 2.



The Use of INFORM in Planning, Monitoring & Evaluation[1]

There were a number of requests to develop INFORM to serve more explicitly the planning, monitoring and evaluation of research. ISNAR has considerable experience with methodologies in these areas. More work is needed to clarify their information needs and the minimum data collection needed to meet these needs.

Information Needs

An analysis of the information needs of managers identified a number of specific elements viz. provision of a set of baseline data or norms against which performance can be measured, estimates of research benefits, outline of proposed future research, time series information, a physical resources module and selected external data.

Ex ante and ex post views of the research program have their own data capture needs. Data collection effort needs to be kept to a minimum due not only to the practitioner's time used, but also the time and goodwill of the scientists, who are the source for much of the data. It is probably easier to make the first collection an ex post view of the current research program, namely the experiments currently in hand. If national priorities are available they can then be compared with this view. If national priorities are not available the existing resource allocation shown by INFORM can be a useful foil against which to develop them. The next step may be to plan a revised research program closer in line with national priorities: this then leads to the ex ante view for the next planting season by having researchers provide data on their intended work.

There is then a need to capture ex post and ex ante data each year, or twice a year in a 2 cropping season environment.

The need to handle the many further data items will affect INFORM's file structures. To incorporate them in the current two database files (experiments and researchers) would make these, and processing with them, somewhat more complicated. One advantage of relational database software is that it breaks the mass of data down into individual tables, one for each data entity or object and its attributes. ISNAR is working on a relational model of INFORM.

Different planning and M & E methodologies, and different countries, will have different information needs. A generalized model of indicators for monitoring and evaluation is offered below. Any agreed version will then need to be tested in the field. A refined model will then be offered in the next INFORM Guideline for guidance of users. When introducing the system to a NARO it will be important to make clear its general nature and the need for the NARO itself to be selective in the indicators it perceives important at that time.

These can then be entered into the MIS as a template against which experiment/study results can be entered as records. This will allow a range of issues to be readily explored with comparatively little effort, at individual experiment level or across different levels of aggregation: project, program, and national, for example.

[1] Extract from: Vernon, R. May 1994. Evaluation of ISNAR's implementation of INFORM. Discussion Paper No. 94-12. The Hague: ISNAR.

To be effective such indicators should be few in number and feasible to collect in a consistent manner across time and across projects. The following subsections follow the steps in the life cycle of the experiment or study.

Reviewing the Research Proposal

A suggested checklist of indicators follows, against which proposed research can be matched. Some are comparable with those used in ex post evaluation and impact assessment including both within an INFORM system would facilitate comparison between initial goals and post research realization. There are of course different examples of research protocols. A sample data capture form is given at the end of this section.

At individual project level[2]

Checked by: *Researcher (name):_____ *date checked:__/__/__

*Reviewer (name):_____ *date checked:__/__/__

*Project/Experiment protocol submitted? yes☐ no☐

Towards confirming **relevance:**

*National literature search completed? yes☐ no☐

*Number of related national references cited: _____

*International literature search completed? yes☐ no☐

*Number of relevant international references cited: _____

These four items address the concern that research is often initiated without checking **what has been done before** on the same issue, or **is being done elsewhere.**

*Experiment objectives:

Compatible with project/program objectives? yes☐ no☐

*Expected outputs (list): _____

Are they measurable? yes☐ no☐

If so, list measurable parameters: _____

*Expected main beneficiary: _____

These questions are important because most annual research program reviews rarely question the adequacy or responsiveness of the research to specific societal interests or needs. However, the historical evidence is clear: linkages to client groups are an essential and vital feature of effective agricultural research (in Vernon, 1994).

[2] In this section an asterisk indicates a data item: either on a form and/or a field in a database.

Towards assuring **quality**:

*Good science yes☐ no☐

The object here is to focus the mind, firstly of the researcher and then of the reviewer, on this point. It is argued that most experienced researchers would be able to offer judgement on this issue.

*Peer review held ? yes☐ no☐

If yes, date: __/__/__

Result: 1. approved

2. approved with modifications

3. withdrawn

*Design approved by biometrician ? yes☐ no☐

Towards assuring **benefit:**

*Reasonable chance of achieving the objectives, within the proposed time (4-point scale):

1. Excellent 3. Moderate

2. Good 4. Small _____

*Estimated value of success:

productivity gain per ha x applicable crop area

x estimated adoption rate = $ _____

Towards evaluating **cost**:

*Estimated time to achieve objectives (years) _____

*Estimated scientist time needed (person years) _____

*Estimated cost of experiment: $ _____

(INFORM's method of attributing cost to an experiment:

scientist years to be spent on this experiment

x annual cost of scientist

/ proportion of total scientists' cost to total research budget)

*Resources needed specified? yes☐ no☐

*Resources needed approved? yes☐ no☐

At program level, across all projects in a program

*Compare estimated resource needs aggregated across all projects by **discipline**, with planned, or previous years', allocation of resources. This would be feasible only with a computerized system.

At NARO level, across all programs

*Compare estimated resource needs with planned or previous years' allocation of resources, across **commodities;**

*Compare planned, or previous years' allocation of resources across commodities with current proportions of commodities' contribution to agricultural GDP.

Monitoring: Standard Reports Needed

A draft set of suggested monitoring indicators follows, to assist in making a selection for a National Agricultural Research Organization (NARO) standard report. A test for the usefulness of INFORM outputs is to ask what conclusion can be drawn from it and/or what potential does it have to prompt some management action. In the list below an asterisk (*) indicates those core outputs which may be produced in a first round pending decisions on those appropriate for any particular circumstance.

Many may first be prepared at research station level. Some can then be aggregated at institute and national levels.

A problem in some NARS is the contradiction between the great importance of annual reports of work done, and the delay and poor quality of reports prepared. In part this is due to institutional and management issues but in part also to the sheer difficulty and labor of assembling such reports. An MIS has a great deal to offer here: if well maintained it can greatly ease the burden and enhance the value of the annual research report at each level, research program, station, institute and country. Many of the outputs listed here in this sub-section can be designed to feed directly into the annual report with minimal modification.

Proposed INFORM Module to Record Review of Research Protocol

Checked by:

* Researcher (name): _____ * date checked:__/__/__

* Reviewer (name): _____ * date checked:__/__/__

* Experiment Protocol Submitted? yes☐ no☐

Towards confirming relevance: These four items address the concern that research is often initiated without checking **what has been done before** on the same issue, or **is being done elsewhere.**

*National literature search completed? yes☐ no☐

*Number of related national references cited _____

*International literature search completed? yes☐ no☐

*Number of relevant international references cited _____

Linkages to client groups are an essential and vital feature of effective agricultural research. Research program reviews need to question the responsiveness of the research to specific societal interests:

*Experiment objectives:

Compatible with project & program objectives? yes☐ no☐

*Expected outputs (list): _____

Are they measurable? yes☐ no☐

If so, list measurable indicators: _____

*Expected main beneficiary: _____

Towards assuring quality: The object here is to focus the mind, firstly of the researcher and then of the reviewer, on whether the underlying science (the treatments, and the measurable parameters) deployed in the study, and its structural design, are likely to yield the stated objectives.

*Good science? yes☐ no☐

*Peer review held? yes☐ no☐

If yes, date: __/__/__

Result: 1. approved

2. approved with modifications

3. withdrawn _____

*Design approved by biometrician? yes☐ no☐

Towards assuring benefit:

*Reasonable chance of achieving objectives, within the proposed time (4-point scale):

1. Excellent 3. Moderate

2. Good 4. Small _____

*Value of success:

Productivity gain per ha

x applicable crop area

x estimated adoption rate = $ _____

Towards evaluating cost:

*Estimated time to achieve objectives (years) _____

*Estimated scientist time needed (person years) _____

*Cost: years x annual research cost $ _____

*Resources needed specified in protocol? yes☐ no☐

*Resources needed approved? yes☐ no☐

The Case of the Livestock Research in Makanda[1] (case study)

Goal: To understand some characteristics of information needs for research planning.

Dr. James Tobolo is the Director of the Department of Agricultural Research in the Ministry of Agriculture in the small Republic of Makanda. The department runs a limited research program on livestock. However, due to the economic problems facing the country, the Ministry of Agriculture has been requested to reduce the livestock research (among others) to a size that can be maintained at half its current budget. Dr. Tobolo as the director of the department has been charged with this responsibility.

Features of the livestock sector

The basic features of the livestock sector in this small country are as follows:

- There is a population of 2 million dual-purpose cattle and 1 million sheep and goats, mainly on small farms.
- The annual offtake rate for beef is 12.5% (i.e. 250,000 head), with an average carcass value of US$ 350 (total beef production, US$ 87.5 million). The offtake rate for sheep and goats is 50%, with an average carcass value of US$ 20 (total mutton products, US$ 10 million).
- Of the cattle herd, 50% are adult cows with a 24-month calving interval, average lactation of 600 kg, and milk sold off the farm at US$ 0.20 per liter (total milk production, US$ 60 million).
- Hides and skins realize US$ 5 million annually. Thus, the total gross output from the livestock sector was about US$ 160 million. If we assume modest inputs are equivalent to 40% of output, then the net output produced by the section will be US$ 96 million.
- Non-ruminants are of limited importance, little locally grown feedstuffs are available for them and the use of imported feed is seldom economic.

Features of the livestock research

The basic features of the livestock research are as follows:

- There is one central research station and three regional substations located in a total of two agroecological zones. The stations maintain a herd of 950 head of cattle for breeding and nutritional research.
- There are two main research programs, one to increase the efficiency of meat and milk production from dual-purpose cattle, the other to increase the productivity of small ruminants.
- Both research programs are multidisciplinary with an on-farm, farming systems approach. There is a strong focus on technology adaptation rather than generation. Technical progress reports on the research programs are published by the department

[1] Source: Setshwaelo, L.L. 1994. The case of the livestock research in Makanda. Arusha, Tanzania: ESAMI.

even though they are three years behind. These reports are available from the research library on request, some copies are sent to the ministry headquarters.

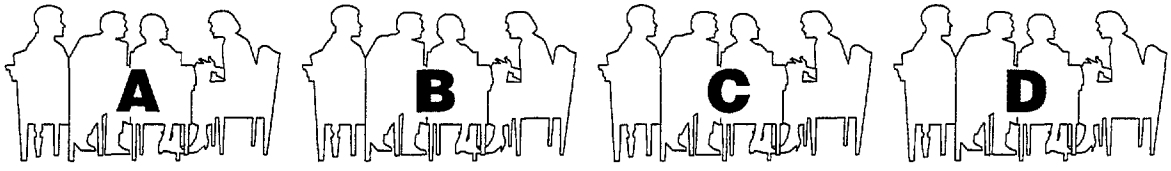
- As in many small countries and those with limited research budgets, the research strategy is based on applied and adaptive research and relies on support from other sources including collaboration with international agricultural research centers (IARCs) and donor-country institutions, and through networking projects with other countries in the region. At the national level, they involve cooperative activities with the local university and, in some cases perhaps, with the private sector.

Exercise 4.
The case of the livestock research in Makanda
(group work)

The goal of this exercise is to identify some characteristics of information needs for research planning.

Phase 1. Group work (30 minutes)

1. Form four groups of participants, each electing a rapporteur.



2. Each group will work on **only** one issue as assigned below. (30 minutes)

Group A

Identify the key information needs and sources that would be required by the management to make informed decisions to reduce the size of the livestock research from US$ 900,000 to US$ 450,000.

Group B

Dr. Tobolo feels that the livestock research in its current status is already small. He wants to convince the policymakers that for the program to be effective, government should actually put in more resources. Identify the key information needs and sources that would be required by Dr. Tobolo to develop his case to present to the Minister of Agriculture.

Group C

What key information do you think could have been used by the policymakers as the basis in deciding that the livestock research should be reduced? The only explanation given to Dr. Tobolo was that cuts have to be made.

Group D

The timing of Dr. Tobolo to make a case for the livestock research and request more funds seems rather awkward. What do you think could have contributed to this serious delay and how can this be corrected?

3. Each group reads and discusses the case study, **stressing** the information responding to the specific item assigned to the group.

4. The rapporteur summarizes the results of the group's discussion to present (in 5 minutes) to the audience.

Phase 2. Reporting and discussion

5. The rapporteurs present and discuss the summary of the groups' work to the audience. Use a flipchart or overhead to facilitate the presentation.

Exercise 4. Worksheet

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day one**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day one**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

   - physical (training facilities, training material, hotel facilities in general)
   - psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
   - social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

   - personal and professional assessment
   - recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title : SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY TWO

Information Management for Research

DAY TWO — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss information technology and its importance.
2. Assess information technology use and organization.
3. List computer hardware and software composition.
4. Discuss computer keyboard and mouse usages.
5. Practice basic commands for computer skills development.
6. Practice dBase IV: database management system.
7. Discuss management information systems for research program analysis.
8. Discuss information requirements for planning.

Handouts

2.5.1 Overview
2.5.2 Tentative Schedule
2.5.3 Information Technology: Overview (text)
2.5.4 Exercise 5. Analyzing Technology Information in Research Organizations
2.5.5 Exercise 5. Worksheet
2.6.1 Computer Basics (text)
2.6.2 dBase IV: Database Management System (text)
2.6.3 Exercise 6. Developing Basic Computer Skills
2.6.4 Exercise 6. Worksheet
2.7.1 Management Information Systems for Research Program Analysis (text)
2.7.2 Exercise 7. Developing a Database Structure for Research Program Analysis
2.7.3 Exercise 7. Worksheet
2.7.4 Strengths and Weaknesses
2.7.5 Guidelines to Provide Feedback on the Workshop
2.7.6 PAPA Form - First Stage

Information Management for Research

DAY TWO — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 5. Information Technology: Overview** (Presentation and exercise 5)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:45	**Session 5. (Continued)**
11:45 – 13:00	**Session 6. Computer Basics** (Presentation and exercise 6)

13:00 – 14:00 Lunch

14:00 – 14:45	**Session 6. (Continued)**
14:45 – 15:30	**Session 7. Management Information Systems for Research Program Analysis** (Presentation and exercise 7)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 7. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY TWO — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
2.5.1	Overview	❒	❒
2.5.2	Tentative Schedule	❒	❒
2.5.3	Information Technology: Overview (text)	❒	❒
2.5.4	Exercise 5. Analyzing Technology Information in Research Organizations	❒	❒
2.5.5	Exercise 5. Worksheet	❒	❒
2.6.1	Computer Basics (text)	❒	❒
2.6.2	dBase IV: Database Management System (text)	❒	❒
2.6.3	Exercise 6. Developing Basic Computer Skills	❒	❒
2.6.4	Exercise 6. Worksheet	❒	❒
2.7.1	Management Information Systems for Research Program Analysis (text)	❒	❒
2.7.2	Exercise 7. Developing a Database Structure for Research Program Analysis	❒	❒
2.7.3	Exercise 7. Worksheet	❒	❒
2.7.4	Strengths and Weaknesses	❒	❒
2.7.5	Guidelines to Provide Feedback on the Workshop	❒	❒
2.7.6	PAPA Form - First Stage	❒	❒

Overheads

2.5.1	Objectives of Day Two	❒	❒
2.5.2	Schedule of Day Two	❒	❒
2.5.3	Objectives of Session 5. Information Technology: Overview	❒	❒
2.5.4	Information Technology: Overview	❒	❒
2.5.5	Computer Hardware	❒	❒
2.5.6	Computer Software	❒	❒
2.5.7	Two Main Types of Networks	❒	❒
2.5.8	Examples of Network Patterns	❒	❒
2.5.9	Examples of Network Patterns (continued)	❒	❒
2.5.10	Operating Systems	❒	❒
2.5.11	Basic Structure of Computer Software	❒	❒
2.6.1	Objectives of Session 6. Computer Basics	❒	❒
2.6.2	Computer Basics	❒	❒
2.6.3	Keyboard and Mouse	❒	❒
2.7.1	Objectives of Session 7. MIS for Research Program Analysis	❒	❒

		Yes ✓	No ✓
2.7.2	MIS for Research Program Analysis	❐	❐
2.7.3	Questions Answered by Information on Research Programs	❐	❐
2.7.4	Uses of Information on Research Programs	❐	❐
2.7.5	Program Planning and Formulation	❐	❐
2.7.6	Steps of Program Planning and Formulation	❐	❐
2.7.7	Information Required for Program Planning and Formulation	❐	❐
2.7.8	Budgeting and Resource Allocation	❐	❐
2.7.9	Table 1. Information Requirements and Possible Sources for Program Planning and Formulation	❐	❐
2.7.10	Reports Generated for Budgeting and Resource Allocation	❐	❐
2.7.11	Financial Resources	❐	❐
2.7.12	Human Resources	❐	❐
2.7.13	Physical Resources	❐	❐
2.7.14	Projects	❐	❐
2.7.15	Issues on Data Collection	❐	❐

Materials

● Personal Computers	❐	❐
● Printers	❐	❐
● Diskettes	❐	❐
● Spare ink or toner for printers	❐	❐
● Overhead projector	❐	❐
● Spare bulbs for overhead projector	❐	❐
● Extension cords	❐	❐
● Projector screen	❐	❐
● Flipchart stands (minimum 2)	❐	❐
● Flipchart paper/pads (about 10 per day)	❐	❐
● Markers for writing on newsprint	❐	❐
● Markers for writing on transparencies	❐	❐
● Blank transparencies	❐	❐
● Stapler	❐	❐
● Tape (strong masking tape and regular tape)	❐	❐
● Push pins	❐	❐
● Glue	❐	❐
● Pencils/notepads/pens	❐	❐
● Pencil sharpeners	❐	❐
● Certificates	❐	❐
● Photocopying facilities	❐	❐
● Extra notepads and pens	❐	❐
● Scissors	❐	❐

DAY TWO

Session 5
Information Technology: Overview

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

– Review of the previous day's activities.

– Summary of the evaluation of the previous day.

– Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day two (handouts 2.5.1 and 2.5.2) to the participants. Use overheads 2.5.1 and 2.5.2 to review the objectives and schedule. Ask if clarifications are needed. (10 minutes)

SESSION 5

09:00 – 10:30 Session 5. Information Technology: Overview

10:30 – 10:45 Tea/Coffee Break

10:45 – 12:00 Session 5. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss information technology and its importance.
- Assess information technology use and organization.
- List computer hardware and software composition.

PROCEDURE

Training techniques: presentation, video presentation, individual and group work.

PRESENTATION

(experience) Give a brief presentation on information technology. You will find the information in handout 2.5.3 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 2.5.3 and be sure to ask

participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 5

Exercise 5. Analyzing technology information in research organizations. (2 hours 10 minutes)

Note: *Make sure you have prepared a* ***video*** *to present during exercise 5. For example, some parts of the video "Competing through IT" would be recommended. However, you can select any video related to this content to provide the participants with the opportunity to analyze information technology.*

1. Distribute handouts 2.5.4 and 2.5.5. Handout 2.5.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Video presentation

2. Show the video on information technology. After the video presentation, invite the participants to list three major lessons learned as well as three strengths of the video. (60 minutes)

Phase 2. Group work

3. Divide the participants into four groups and ask each group to elect a rapporteur.
4. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (20 minutes)

Phase 3. Reporting and discussion

5. Ask the rapporteurs to present the results of their group's work. Use the worksheet (handout 2.5.5) to document key lessons learned by the group. Five minutes are available for each presentation. (20 minutes)
6. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
7. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

DAY TWO

Session 5
Summary of Overheads

Objectives of Day Two

1. Discuss information technology and its importance
2. Assess information technology use and organization
3. List computer hardware and software composition
4. Discuss computer keyboard and mouse usages
5. Practice basic commands for computer skills development
6. Practice dBase IV: database management system
7. Discuss MIS for research program analysis
8. Discuss information requirements for planning

2.5.1

Schedule of Day Two

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 5. Information Technology: Overview
Tea/Coffee Break	
10:45 – 12.00	Session 5. (Continued)
12:00 – 13:00	Session 6. Computer Basics
Lunch	
14:00 – 14:45	Session 6. (Continued)
14:45 – 15:30	Session 7. Management Information Systems for Research Program Analysis
Tea/Coffee Break	
15:45 – 17:00	Session 7. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

2.5.2

Objectives of Session 5. Information Technology: Overview

1. Discuss information technology and its importance
2. Assess information technology use and organization
3. List computer hardware and software composition

2.5.3

Information Technology: Overview

2.5.4

Computer Hardware

Parts of a computer that you can touch

Examples:
- input/output devices
- backing or external storage devices
- central processing unit (CPU)
  - main memory
  - arithmetic and logic unit (ALU)
  - control unit (CU)

2.5.5

Computer Software

Parts of a computer that you cannot touch

Examples:
- programs, data, or information
- operating systems
- procedural language processors
- non-procedural language processors
- utility software
- packaged software

2.5.6

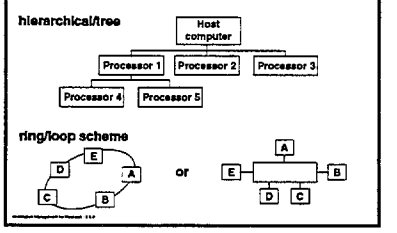
Two Main Types of Networks

Local area network (LAN)
Technology to support transmission of data between computer systems that are located in the same premises or that can be physically interconnected

Wide area network (WAN)
Technology to support transmission of data between computer systems that are too far apart to be interconnected

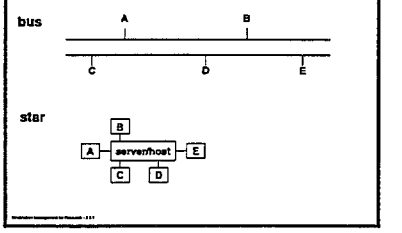
2.5.7

Examples of Network Patterns



2.5.8

Examples of Network Patterns (continued)



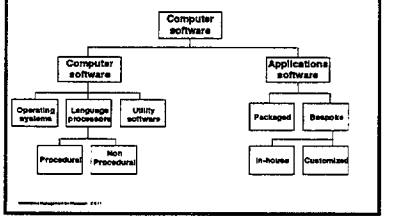
2.5.9

Operating Systems

- Monitor and ensure effective and efficient use of all resources of the computer
- Interpret and execute commands entered by the user or coming from the different user interfaces
- Software is responsible for the management of computing resources
- Common examples of software are UNIX, SCO-UNIX, OS/2, AIX, VMS, WINDOWS, etc.

2.5.10

Basic Structure of Computer Software



2.5.11

Handout — Overview of Day Two

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss information technology and its importance.
2. Assess information technology use and organization.
3. List computer hardware and software composition.
4. Discuss computer keyboard and mouse usages.
5. Practice basic commands for computer skills development.
6. Practice dBase IV: database management system.
7. Discuss management information systems for research program analysis
8. Discuss information requirements for planning.

Handouts

2.5.1 Overview
2.5.2 Tentative Schedule
2.5.3 Information Technology: Overview (text)
2.5.4 Exercise 5. Analyzing Technology Information in Research Organizations
2.5.5 Exercise 5. Worksheet
2.6.1 Computer Basics (text)
2.6.2 dBase IV: Database Management System (text)
2.6.3 Exercise 6. Developing Basic Computer Skills
2.6.4 Exercise 6. Worksheet
2.7.1 Management Information Systems for Research Program Analysis (text)
2.7.2 Exercise 7. Developing a Database Structure for Research Program Analysis
2.7.3 Exercise 7. Worksheet
2.7.4 Strengths and Weaknesses
2.7.5 Guidelines to Provide Feedback on the Workshop
2.7.6 PAPA Form - First Stage

Handout — Tentative Schedule of Day Two

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 5. Information Technology: Overview** (Presentation and exercise 5)
10:30 – 10:45	Tea/Coffee Break
10:45 – 12:00	**Session 5. (Continued)**
12:00 – 13:00	**Session 6. Computer Basics** (Presentation and exercise 6)

13:00 – 14:00 Lunch

14:00 – 14:45	**Session 6. (Continued)**
14:45 – 15:30	**Session 7. Management Information Systems for Research Program Analysis** (Presentation and exercise 7)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 7. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Eastern and Southern African Management Institute

INFORMATION TECHNOLOGY[1]:

Overview

by

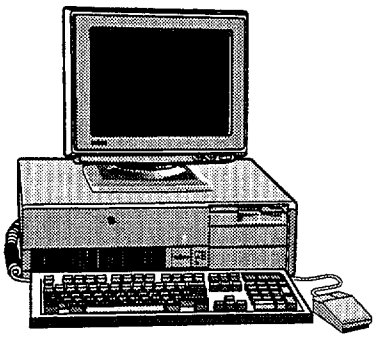
A.S. Sithole

[1] Source: Sithole, A.S. 1995. Information Technology: Overview. Arusha, Tanzania: ESAMI:

Information Technology

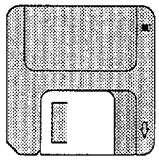
The technology used in the creation, collection, storage, searching and retrieval, manipulation, dissemination and disposal of **data** or **information**.

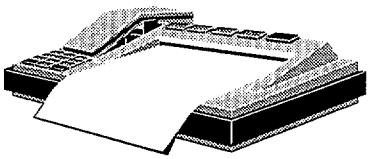
Composition



Computer hardware

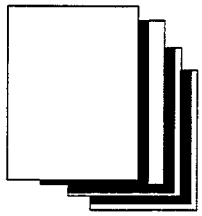
Computer software

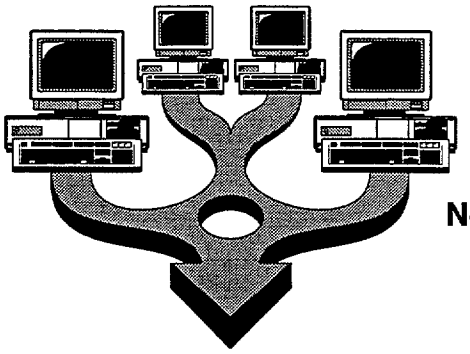




Facsimile

Paper



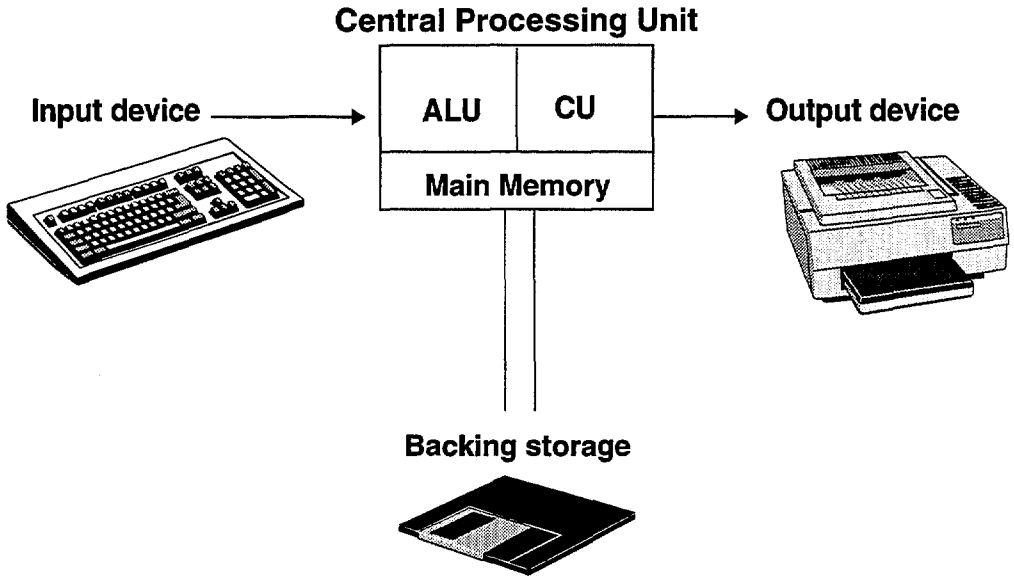


Networks

Computer Hardware

That which you can touch about the computer, i.e. the physical objects. It is composed of four main functional units: input devices, output devices, backing or external storage devices and finally the central processing unit (CPU), which is subdivided into main memory, arithmetic and logic unit (ALU) and the control unit (CU).

Basic structure of computer hardware:



Data preparation and input devices

Accept data or information to be processed. Examples of commonly used input devices are keyboards, card readers, optical mark readers, magnetic ink character readers, paper tape readers, point of sale machines, code readers, etc. On IBM compatibles the device name for the keyboard is "COM:".

Output devices

Supply results from the processing done to information or data. Examples of the most commonly used output devices are printers (matrix, band, line, laser, jet) visual display units, etc. On IBM compatible device name for a printer is "PRN:" or "LPT?", where "?" denotes number of printer.

Backing storage devices

Store data or information permanently for future use. Examples of such devices include paper tape, magnetic tape, magnetic discs, laser discs, magnetic drums, diskettes (floppies and stiffies), etc. On IBM compatibles the standard device names for a hard disc, i.e. one non-exchangeable is "C:" and for diskettes is "A:" or "B:". Up to 63 drive names can be defined.

Main memory

Data or information can only be processed if they are resident in main memory.

Arithmetic and logic unit (ALU)

The unit performs all arithmetic (+,-,*,/) and logical (=,<>,>,<,=>,<=) operations. This is made possible through use of registers in the circuitry.

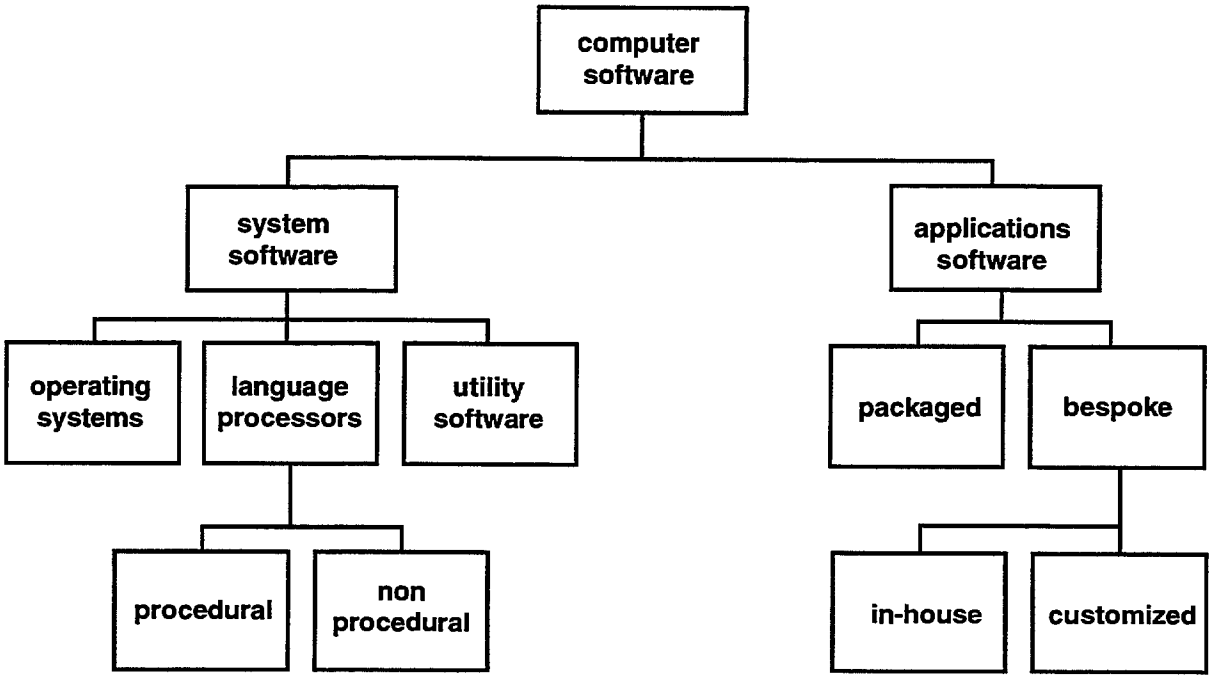
Control unit (CU)

The unit controls the flow of data/information into and out of main memory as well as regulation of the input and output devices.

Computer Software

These are programs and data or information. That which you cannot touch about a computer. A program is a sequence of instructions to do a particular job.

Basic structure of computer software:



Operating systems

Monitor and ensure effective and efficient use of all resources of the computer. Interpret and execute commands entered by the user or coming from the different user interfaces. In summary, the software is responsible for the management of computing resources. Common examples of software are UNIX, SCO-UNIX, XENIX, OS/2, AIX, VMS, WINDOWS, etc.

Procedural language processors

Refers to the interpreters and compilers for up to third generation languages such as COBOL, BASIC, PASCAL, ALGOL, ASSEMBLER, FORTRAN and others. These are responsible for the translation into machine code which can be understood by the computer hardware. With the 3 GL environment, a programmer is required to specify not only "WHAT" but also "HOW" to solve a problem in an algorithm.

Non-procedural language processors

Provide for what is known as a 4 GL (fourth generation environment) whereby a user specifies "WHAT" is required and leaves the "HOW" to the environment. A 4 GL environment comprises data dictionaries, screen painters, report generators, query language processors, dialogue specifiers, code generators, application generators, spreadsheets, report writers, graphics, automatic documenting tools, project management software, etc., all centered around a database.

Utility software

This is like an appendage of the operating systems although it does not have to reside in main memory. Utility software is used mainly for general housekeeping, i.e. copying, sorting, merging, editing, program loading, etc.

Packaged software

These are programs and data developed by computer manufacturers, suppliers, software houses or freelance programmers for public consumption at a price or for free. Although they address the general or common aspects of an application, e.g. financial accounting, some are parameter driven to make the process of adapting to specific users' needs easy, including implementation.

In-house developed software

(Self-explanatory). This would mean organizations having their own resources for development, i.e. manpower, equipment, development tools, and time.

Customized software

This type of software is developed by a third party for a user (sub-contracting) probably because the user might not have the capacity in house.

Networks

There are two main classes of networking technologies available on the market today.

Local area network (LAN)

These technologies support the transmissions of data between computer systems that are located in the same premises or that can be physically interconnected by a cabling system in a campus environment. "Ethernet" and "token ring" have become like an industry standard for LAN's.

Wide area network (WAN)

WANs support the transmission of data between computer systems that are so far removed from each other that they cannot be interconnected by a cabling system. They traditionally use telephone wires but can also use satellite and microwave transmission to move data. Please note requirements for modems.

Examples of networks

- Novel Netware
- Lantastic
- Lanstar
- TCP/IP
- Netcom
- Vines

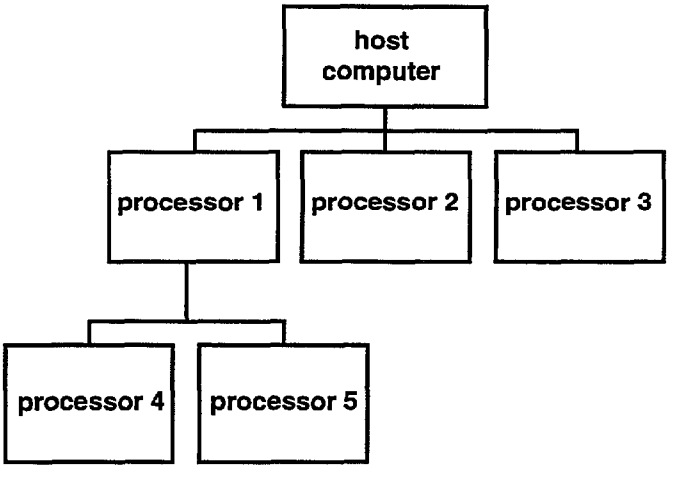
Network patterns

The four schemes available or used on the market today are hierarchical or tree, ring or loop, bus, and star.

Hierarchical/Tree

This scheme is generally slow.

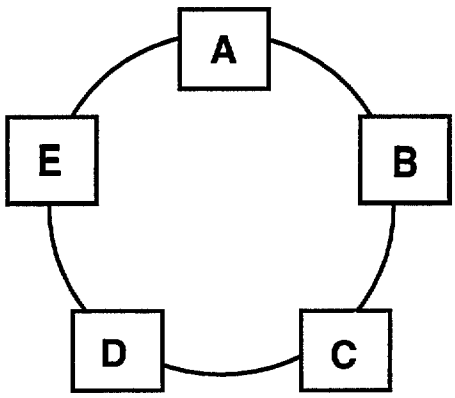
Hierarchical/Tree Network:



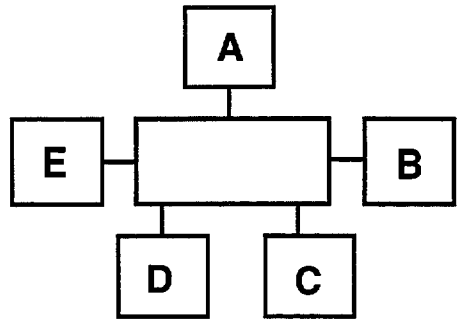
Ring/Loop scheme

One out of the computers A, B, C, D, and E must be the server. Its recommended to have two hosts/servers in case one breaks down. High priority jobs can run on one and low priority ones on the other. All machines must be on at the same time.

Ring/Loop Scheme Network:



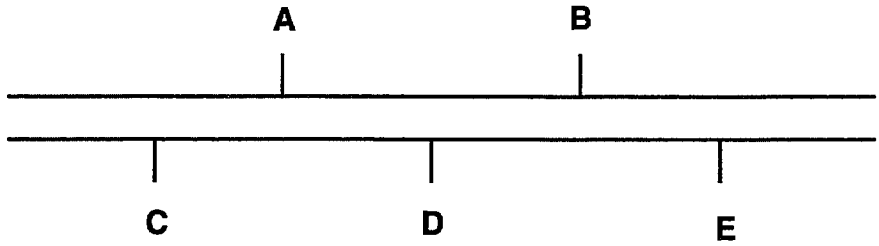
or



Bus

There are problems of collision which could be solved through time slicing or putting on listening devices.

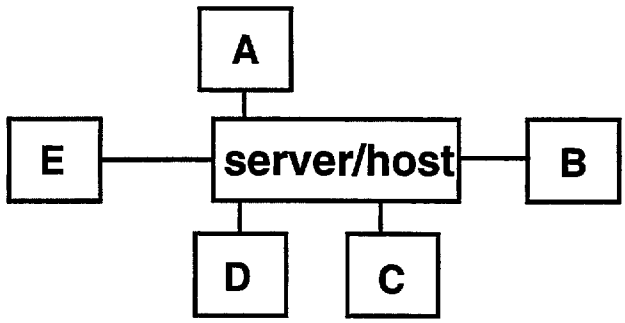
Bus Network:



Star

For A to E to communicate, they must go through the server/host computer. Also if the host breaks down, that is the end of the network.

Star Network:



Factors affecting choice of information technologies

- Processing strategies
  - Transaction
  - Batch
- Distributed versus centralized processing
- Data or information accessibility requirements
  - Number of users
  - Response times
  - Frequency of access, etc.
- File activity
  - Number of transactions processed against master data
- Capacity
  - Data to be available to the central processing unit at any one time
- Data transfer speed requirements
- Output requirements
- Input requirements etc.

Centralized processing architecture

A single processor is required to handle not only all of the computational activity but also all of the input/output (I/O) of data and files between peripherals.

Distributed processing architecture

Separate, intelligent processors are used to handle the I/O, thereby freeing the central processor to specialize in computation and perform more of a coordinating role for I/O. Generally this type of architecture is more efficient in office environments, where there are many users performing a variety of different operations that compete for I/O resources of the computer.

Office automation

This is a new concept involving a number of new technologies including networks that are being introduced into the office to improve office productivity, to facilitate management communications and also to provide more stimulating and intellectually rewarding work for the office worker.

Some of the underlying office technologies include:

- word processing
- electronic mail (e-mail)
- tele- and video conferencing — (CD-ROM)
- micrographics for archiving on microfilm
- telecommunications to include phones, facsimile, telexmachine and intelligent copying machines

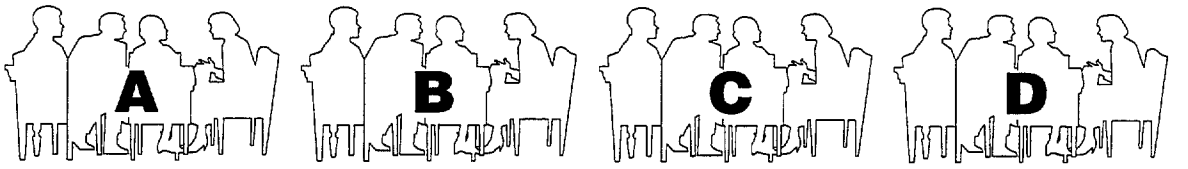
Exercise 5. Analyzing technology information in research organizations (individual and group work)

Phase 1. Video presentation: individual analysis (60 minutes)

1. Watch the video presentation to analyze some aspects of information technology.
2. List three major lessons learned.
3. What are three strengths of the video? List them along with your rationale to consider them as such.

Phase 2. Group analysis of research organization (20 minutes)

4. Form four groups of participants, each electing a rapporteur.



5. Discuss and summarize the group view on the following:
   a) Is there a potential for strategic use of information technology in your organization? If so, in which areas and how?
   b) How effective is your institution or organization in exploiting information technologies? Give examples.

Phase 3. Reporting and discussion (35 minutes)

6. The rapporteur writes the group's results from phase 1 and phase 2 on the flipchart and presents them to the audience. Each rapporteur has 5 minutes to present.

Exercise 5. Worksheet

DAY TWO

Session 6
Computer Basics

Instructions to Trainers

SESSION 6

12:00 – 13:00 Session 6. Computer Basics

13:00 – 14:00 Lunch

14:00 – 14:45 Session 6. (Continued)

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Discuss computer keyboard and mouse usages.
- Practice basic commands for computer skills development.
- Practice dBase IV: database management system.

PROCEDURE

Training techniques: presentation, demonstration, group work.

PRESENTATION

(experience) Give a brief presentation and demonstration on the basics of computers and dBase IV. You will find the information in handouts 2.6.1 and 2.6.2 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handouts 2.6.1 and 2.6.2 and be sure to ask participants if they have any comments or questions, or if they need clarification. (20 minutes)

EXERCISE 6

Exercise 6. Developing basic computer skills.
(1 hour 25 minutes)

1. Distribute handouts 2.6.3 and 2.6.4. Handout 2.6.3 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Computer practice

2. Divide the participants into small groups and assign them to the respective computers in the training room. Ask each group to elect a rapporteur. (5 minutes)
3. *(experience)* Invite participants to read handouts 2.6.1 and 2.6.2. Remind them that they will use these handouts as guidelines to practice. The rapporteurs use the worksheet (handout 2.6.4) to take notes on key issues

raised during this practicing session to report to the audience. (5 minutes)

4. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (30 minutes)

Phase 2. Reporting and discussion

5. Ask the rapporteurs to present their group's lessons learned. State the amount of time (e.g., three or five minutes) you will allow for each presentation. (30 minutes)

6. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (5 minutes)

7. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the next session.

DAY TWO

Session 6
Summary of Overheads

Objectives of Session 6. Computer Basics

4. Discuss computer keyboard and mouse usages
5. Practice basic commands for computer skills development
6. Practice dBase IV: database management system

2.6.1

Computer Basics

2.6.2

Keyboard and Mouse

2.6.3

Computer Basics[1]

1. The Keyboard

Although most of the instructions in this manual assume the use of a mouse, your computer's keyboard is also a necessary and important piece of equipment. There are times when the mouse can't do the job, or when keystrokes are easier and faster. The following provides an overview of the most common keyboard and mouse usages in most applications, so you can be comfortable with both, and decide which to use in a given situation.

This manual uses the enhanced IBM XT/AT/PS2 keyboard. Chances are your computer's keyboard is similar or identical to this standard. If you have another kind of keyboard, such as those supplied with older IBM PCs and XT compatibles, refer to your computer's operations manual for help in locating specific keys. The only real difference between a typewriter and a computer keyboard is the addition of certain specialized keys, each of which has its own purpose.

1.1 The function keys

Across the top or at the far-left of the keyboard are 12 keys labelled F1 to F12. These are called function keys. The effect of pressing a given function key varies, depending on the program you are running (WordPerfect, Lotus 1-2-3, Sidekick, or whatever). One key, however, is common to many programs, including dBase IV. The F1 key usually displays a screen of useful information to help you perform the task at hand. The function keys are used quite a bit with dBase IV.

1.2 The escape key

In the upper-left of most keyboards is the key labelled "Esc", or "Escape". Pressing this key generally lets you back out of, or escape from, a choice you have made. For example, when the screen displays a sub-menu or prompt, pressing Esc returns you to the previous step. We will discuss menus and sub-menus later, but for the time being, you can think of the Esc key as a means of making an escape.

1.3 The control key

The "Ctrl", or "Control" key just below the "Shift" key (or sometimes to the left of the "A" key), is always used in conjunction with another key. With dBase IV, the Ctrl is used mostly for moving the cursor (the blinking pointer) around the screen and for editing (changing) data in your database. The important point to remembers is to press the Ctrl key first and to keep it down as you press the key it modifies. You must also take care not to press the Ctrl key when you meant to press the Shift key. They are close to each other and are easily confused.

1.4 The shift keys

The "Shift" keys work much as they do on a typewriter. They are located at the right and left of the bottom row of letter keys and they are labelled with upward-pointing arrow outlines.

[1] Source: Setshwaelo, L.L. 1995. Management Information Systems for Research Program Analysis. Gaborone, Botswana: CICE.

1.5 The underscore key

dBase IV makes extensive use of the underscore (underline) key. The underscore key is located just above the "P" key. To produce an underscore, you must hold down the Shift key as you press the underscore key.

1.6 The enter key

The enter key, represented in this book by the ¿ symbol. It has several effects, depending on what you are doing. In general, pressing ¿ tells the computer to accept or act on what you have typed and then respond accordingly. You can think of ¿ as the "go ahead" key.

If a menu is displayed, pressing ¿ confirms that you want to select the menu option you have highlighted. If you are entering date into a field, pressing ¿ moves you down to the next field. In some operations, pressing ¿ may move you to the next record. In a few operations ¿ acts like an on/off switch. Pressing it once selects an option and pressing it again deselects the option.

The ¿ key on your keyboard may be labeled "ENTER", "RETURN", or "CR" (carriage return).

1.7 The cursor keys or navigation keys

At the right side of the keyboard is a block of number keys. Notice that the "2", "4", "6" and "8" keys have arrows on them. These keys control the movement of the cursor, letting you move around on your computer's screen to highlight menu options, type commands, or enter data into databases. The enhanced IBM keyboard also has a separate set of arrow keys between the numeric keypad and the rest of the keyboard.

You may use either set of arrow keys when following the exercises in this book. However, to use the arrows on the numbered keypad, you must make sure these keys are not in the "NumLock" mode. If NumLock is on, these keys can only type numbers. Most keyboards have a light in the upper-right corner that indicates whether the NumLock mode is active (usually red or yellow in color). This manual uses the same arrows that appear on the keys ®, ¬, – , and ¯ to represent the cursor movement keys on your keyboard.

1.8 The backspace key

The "Backspace" key is located at the upper right of the main keyboard. This key is often labelled like the ¬ key, but does more than just move the cursor to the left. The Backspace key also erases characters as the cursor moves left, like a self-correcting typewriter.

1.9 The end, home, page up, and page down keys

Notice that the "1", "7", "9", and "3" keys on the numeric keypad say "End", "Home", "PgUp", and "PgDn", respectively. Like ¿, the effect of these keys depends on what you're doing in dBase IV. In general, these keys move the cursor in larger jumps than the arrow keys do, meaning that instead of moving one letter at a time, they may move a whole word or a whole screen at a time. The "Ctrl" key is used with both "Home" and "End" to enter data or to save your work in dBase IV.

1.10 Repeating keys

One final note about the keyboard. Almost all the keys on the keyboard are repeating keys. If you hold down a key more than about one second, it begins to repeat continually. Therefore, when entering data, be careful not to accidentally press down a key for too long. If you do, unpredictable results can occur, such as the name John Doooooooooe showing up in a database.

1.11 The space bar

This is a long bar key used to put a space between words when you are typing or inputting data.

1.12 The caps lock

This is a switch which when turned **on** by pressing it, turns all the alphabet letters to UPPER CASE or CAPITAL LETTERS. You turn it **off** by pressing it once again.

1.13 The insert key

The "Insert" key allows characters to be inserted in between other characters and adjustment on the right done automatically. When switched off to **Typeover** mode, it does not allow insertion of characters, instead typing over deleted the original characters.

1.14 The delete key

The "Delete" or "Del" key deletes one character to the right of the cursor at a time.

1.15 The alt key

Usually pronounced "alter key". This key is close to the "Control" key and is used in Word Perfect to display a **Menu**.

2. The Mouse

Depending on what you're trying to accomplish, the mouse can be a welcome improvement. In other cases, the keyboard may prove more efficient. If you want to use a mouse with dBase, you first need to install it.

Once your mouse is installed and running, Word Perfect or dBase IV displays a small block that moves when you move the mouse. This is the mouse pointer. To perform an operation using the mouse, position the pointer over a screen item (such as a menu option, filename, a choice in a list, or text), and then activate the item by clicking, double-clicking, or dragging it. If your mouse has more than one button, only use the left one.

Click means pressing the left mouse button once and then releasing it.

Double-Click means to press and release the left mouse button twice in quick succession. If it doesn't work as it should, try adjusting the speed of your two clicks.

Drag means pressing the left mouse button and holding it down while you move the mouse pointer to highlight some text or move an object on the screen. To end the drag, simply release the mouse button.

Your mouse may not move as smoothly in dBase as it does in other applications. Before you press the left mouse button, be sure the pointer is correctly positioned. It may cling tenaciously to the current selection, and when you think you've moved it down a line and clicked on a new choice, you may really be selecting the one you thought you'd left behind.

Some conventions of mouse usage within dBase IV will become apparent as you work through the program.

3. Saving Your Work

As is the case with most computer programs, your work in Word Perfect or dBASE IV is usually being done within the computer's Random Access Memory (RAM). RAM processes data much faster than your disk drives, but when you turn your computer off, data stored in RAM is lost.

Your floppy disk drive or hard disk drive can be used to store information that would otherwise be lost when the computer's power is shut off, but this does not happen automatically. It's up to you to remember to save your work on a disk before you turn off your computer.

Word Perfect or dBase IV provides several ways to save your work but the surest one for dBase IV is to select the Quit to DOS option from the Exit menu and answer "yes" to any question that dBase asks about saving chances you may have made. For Word Perfect, the surest way is to Press **F10, then type the file name if you haven't, and press the "ENTER" key. If asked the question Replace Y/N, simply press "Y".** Your file will be saved and you can continue with typing.

You should always quit to DOS before turning off your computer.

dBase IV

Database Management System[1]

[1] Extracted from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

Starting dBase IV

1. **Turn on your computer.** If your system uses a menu, use the arrow key to move to the DBASE IV option and press enter, otherwise when your computer displays the DOS prompt (usually **c:**) follow the steps below:
2. **Type CD\DBASE** (or whatever the name of the directory is) to move to the dBase IV directory. Be sure to use a backslash '\' rather than a forward slash '/'. **Then press the "ENTER" key.**
3. **Type DBASE and press the ENTER key** to load the dBase IV program and bring up the dBase IV main screen, **THE CONTROL CENTER**. See Figure 1.

If instead, you see the message "Bad command or file name", then either dBase is not installed on your computer at all, or dBase is installed in another disk drive or directory. You may need to seek assistance from the person who installed the program.

Wait for a few seconds for the dBase IV program to be loaded in the memory. You will see a blue/green screen — **THE CONTROL CENTER** as shown in Figure 1.

The next section introduces you to the various parts of the Control Center.

Catalog Tools Exit 4:30:15 pm

DBASE IV CONTROL CENTER

CATALOG: C:\DBASE\RESEARCH.CAT

Data	Queries	Forms	Reports	Labels	Applications
<create>	<create>	<create>	<create>	<create>	<create>
HRMIS PROGDB FINADB PHYRDB	PATH OVER55 SAL ENTOM PHD MSC	HRF PRGOF FINF RESF	HR1 HR2 PROG1 PROG2		HRAP1 HRAP2 PROGAP FINAP

File: Newfile
Description: Press ENTER on <create> to create a new file

Help: F1 Use: Data F2 Design: Shift-F2 Quick Report: Shift-F9 Menus: F10

Figure 1.

The dBase IV Control Center

The Control Center is the graphic display from which you select files and initiate database operations. It is the gateway to the **dBase IV Database Management System – DBMS**. It lets you control dBase IV by making choices visually from pulldown menus.

The various parts of the Control Center

The six panels are: The Menu Bar, The Current Catalog, The Work Space consisting of Six Panels, The Current File name and description, The Navigation Line, The Mouse pointer, if any. These parts are described below.

1. The Menu Bar

At the upper left corner of the Control Center is the menu bar. The menu options are **Catalog, Tools and Exit** with their associated pull-down menus or choices. To move the cursor to the menu bar you simply press **F10**. Then use the arrow keys to move the selection bar through the list of menu options or through the various choices on a menu. To select a choice position the selection bar on your choice and press the **ENTER** key.

Note: As you move the selection bar through the various choices on a menu, the bottom line on your screen provides a description of what that choice does. This short line of text is called a **Message Line** and helps you to remember what a given command does.

Just above the message line is the **Navigation Line**. This line tells you what your next step should be, or what your options are to complete the task you are working on. These instructions change according to the particular task on which you and dBase are working.

2. The Current Catalog

Centered beneath the title of the Control Center screen is the name of the current catalog. A catalog is just a tool for organizing related information in a database; it is like a department in a corporation. For example, you might store scientists information in one catalog and physical resources in another. An example of a full specification of the catalog is given below:

C:\DBASE\RESEARCH.CAT

where "C" is the drive name that contains the catalog, "\DBASE\" is the directory name on the hard disk where the catalog is stored, and "RESEARCH" is the name of the catalog. Your screen may show something else, don't worry. You will create your own catalog later on.

3. The Work Space: the Six File Panels

The center of the screen shows the Control Center work space which consists of six file panels. Each panel will hold names of the objects within the current catalog of a given type – **Data, Query, Form, Report, Label, Applications**. When you create a new catalog the panels are usually empty. Each panel includes the option that allows you to create your own file of a given type. The six panels are used as described below:

Table 1. The six file panels of The Work Space

PANEL	FILE TYPE	PURPOSE
Data	Database File (.dbf)	Create a new database file for storing actual data or modify the structure of an existing database file; display and edit file data.
Queries	Query (.qbe)	Create a new query file to display selected (filter) records and fields of a database file which meet a certain criteria; modify an existing query file.
Forms	Form (.scr)	Create a new form for entering or editing data in a database file one record at a time; modify an existing form file.
Reports	Report (.frm)	Create a new report format for displaying and printing the summarized data in a database file; modify the format of a existing report file; use a format to display and print data.
Labels	Label (.lbl)	Create a new label format for printing labels using the data in the database file; modify the format of an existing label file; use a format to display and print labels.
Applications	Design (.app) Program (.prg)	Create application design and program files for performing database management tasks; modify and run an existing program.

4. The Current File name and description

The current name and description section, beneath the work space, displays the name and description of the file that is currently highlighted in the panel. If it is highlighted instead of a file name, this area displays "New file." Press **ENTER** to create a new file.

5. The Navigation Line

The Navigation Line at the bottom of the screen lists some of the special keys that are currently available to you. To get **Help** you press the function key labelled **F1**; to display or browse records you press the function key labelled **F2**; to design or display a database structure you press **Shift+F2**; to generate a Quick report you press **Shift+F9**; and to get to the **menu bar** you press **F10**.

6. The mouse pointer

If you have a mouse and it is properly installed, the mouse pointer appears as a small rectangle that moves in whatever direction you move the mouse. You can move the mouse pointer to just about any option on the screen, then click the left mouse button to choose that option.

Accessing the Dot Prompt

dBase IV offers an optional **command-driven** technique for managing a database, where you type commands rather than selecting options from the pulldown menus. To access the dot prompt, follow the steps below:

1. Press **F10** to access the menu bar
2. Choose **Exit**
3. Select **Exit to Dot Prompt**

The Control Center will disappear, and you will see only a highlighted bar, a period (**dot**), and the blinking cursor.

To return to the Control Center:

1. Type the command **ASSIST**
2. Press **ENTER** key6 and wait a few seconds, the Control Center will appear.

Exiting dBase IV

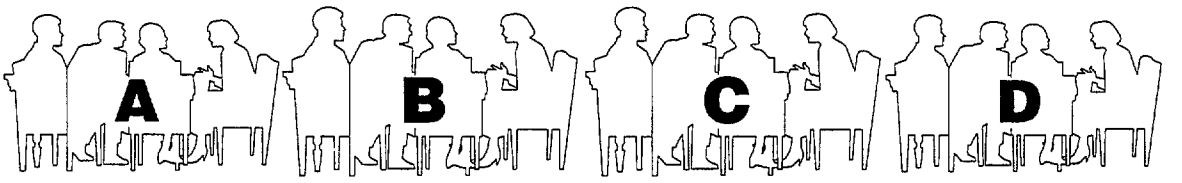
Whenever you finish a dBase IV session or you want to take a break, you should exit or **quit** dBase IV before you turn off your computer. Follow the steps below:

1. Press **F10** to access the menu bar
2. Choose **Exit**
3. Choose **Quit to Dos**.

Exercise 6. Developing basic computer skills (computer practice)

Phase 1. Computer practice (45 minutes)

1. Form four groups, each electing a rapporteur. You will use the computer assigned by the trainer.



2. Read handouts 2.6.1 and 2.6.2. These handouts are your guidelines to practice. The rapporteurs use the worksheet (handout 2.6.4) to take notes on key issues raised during this practicing session to report to the audience.

Phase 2. Reporting and discussion (40 minutes)

3. The rapporteurs present the lessons learned by their group.
4. The trainer will open a discussion.

Exercise 6. Worksheet

DAY TWO

Session 7
Management Information Systems for Research Program Analysis

Instructions to Trainers

SESSION 6

14:45 – 15:30 Session 7. Management information systems for research program analysis

15:30 – 15:45 Tea/Coffee Break

15:45 – 17:00 Session 7. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss management information systems for research program analysis.
- Discuss information requirements for planning.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Give a brief presentation. You will find the information in handout 2.7.1 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 2.7.1 and be sure to ask participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 6

Exercise 7. Developing a database structure for research program analysis. (1 hour 40 minutes)

1. Distribute handouts 2.7.2 and 2.7.3. Handout 2.7.2 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur.
3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining.
(55 minutes)

Phase 2. Reporting and discussion

4. Ask the rapporteurs to present the results of the groups' discussions. Approximately five minutes are available for each presentation. (20 minutes)
5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (15 minutes)
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you learned?"
2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 2.7.4 and use handout 2.7.5 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 2.7.6. (15 minutes)

DAY TWO

Session 7
Summary of Overheads

**Objectives of Session 7.
MIS for Research Program Analysis**

7. Discuss MIS for research program analysis
8. Discuss information requirements for planning

2.7.1

MIS for Research Program Analysis

2.7.2

**Questions Answered by
Information on Research Programs**

1. What research has been done in the past?
2. What programs or projects are currently going on?
3. Where are the projects being executed?
4. Who is executing the projects and who are the cooperating partners?
5. When did the projects start and what are the expected completion dates?
6. What are the resource allocations?
7. Who funds the projects?

2.7.3

Uses of Information on Research Programs

- Program planning and formulation
- Budgeting and resource allocation

2.7.4

Program Planning and Formulation

A deliberate effort aimed at focusing on areas of national priority that would show more impact upon introduction of new technologies

2.7.5

Steps of Program Planning and Formulation

1. Definition of objectives
2. Determining the activities to achieve the objectives
3. Establishing a planning and programming cycle
4. Determining schedule of activities

2.7.6

**Information Required for
Program Planning and Formulation**

- Information on external environment
- Information on internal environment

2.7.7

Budgeting and Resource Allocation

A program budgeting system is a system by which information on individual research activities and resources, allocated for their implementation, is collected and processed

2.7.8

Table 1. Information Requirements and Possible Sources for Program Planning and Formulation

Information required	Possible source
• Research priorities	National research plan
• Economic information	Government statistics
• Research technical activities	MIS Research programs
Resource Allocation	
• Funding and sources	MIS financial resources
• Human resources availability	MIS human resources
• Equipment and facilities	MIS facilities

2.7.9

**Reports Generated for Budgeting
and Resource Allocation**

- Financial resources
- Human resources
- Physical resources
- Project allocation

2.7.10

Financial Resources

- Allocation of funds by commodities
- Allocation of funds by individual projects
- Sources of funds
- Allocation of funds by agro-ecological regions

2.7.11

Human Resources

- Deployment of scientists by commodities
- Deployment of scientists by project
- Scientists' time allocation by projects

2.7.12

Physical Resources

- Allocation of facilities and equipment by projects
- Allocation of facilities and equipment by commodities

2.7.13

Projects

- Allocation of projects by agro-ecological regions
- Allocation of projects by stations

2.7.14

Issues on Data Collection

1. What information is needed by managers?
2. How is the data collected?
3. When and how should the database be updated?
4. Who is responsible for data collection?

2.7.15

Management Information Systems for Research Analysis[1]

1. Introduction

Information on research programs is needed at all levels of decisionmaking: by policy-makers, planners, donors, and research leaders and scientists. Information regarding the research institution's technical activities is continuously used at both national and institutional levels for long-term and short-term planning in making decisions on how resources shall be allocated and used. Hence the information is used to answer, among others, the following questions:

a) What research has been done?

b) What research programs and projects are currently going on?

c) Where are these executed?

d) Who is executing?

e) When did the research project start and when did it end or when is it expected to end?

f) What resources are used?

g) Where do the resources come from?

The above list, though not exhaustive, provides an indication of the type of information usually required to make management decisions. All research institutions have management information on research projects in one form or another. However, the information is often controlled and kept by the individual project or program leader. Access to this information by other decision-makers, for planning and or evaluation purposes, often poses a problem. Quite often during the initial stages of planning of projects, the research manager will be provided with the information for approval, mobilization, and allocation of resources. Information on implementation progress is usually not provided until more resources are required. At this stage the manager will usually have no idea as to whether or not the resources have been utilized efficiently and whether any amendments in the plan from the original were or are necessary.

Progress on implementation of research projects and use of resources is very difficult to follow without a proper management information system. Research programs' management information sub-system is therefore to monitor progress on implementation and is one of the basic components of a research institution's MIS.

2. Information Requirements for Planning

The effectiveness and relevance of the research programs and projects will depend highly on management's efficiency in identifying research priorities, formulating research projects and implementation. These activities cannot be executed efficiently without any information on the institution's past and present technical activities. Information on the research programs will help in assessing whether or not research addresses the national development priorities and determine whether it is necessary to revise the long-term research plan. The information is also used to assess conformity of individual programs to national research objectives as indicated in the research master plan.

[1] Extracted from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

Combining this with information on priority issues for research makes it easier to prepare relevant comprehensive projects for funding. The necessary information would conveniently be stored in a database and provides justification for the new programs to ascertain that national priorities have been addressed. Among some of the more important uses of information on research programs are the following.

2.1 Program planning and formulation

Program formulation is a deliberate effort aimed at focusing on areas of national priority that would show more impact upon introduction of new technologies. This activity involves several processes: 1) definition of objectives; 2) determining the program, to achieve the objectives; and 3) establishing a planning and programming cycle. In this context, the goals and objectives of the institute are translated into specific research programs and identified problems translated into relevant and researchable questions and resources allocated.

The research program planning framework is therefore a process by which information (input) is converted through a decisionmaking process (throughput) into a plan which consists of programs, projects and studies (output). To do this efficiently, adequate and timely information is an essential element. Two types of information are required:

a) Information on external environment – national priorities, economic information and activities of other research institutions. This information will help in focusing the research to be in line with the national development goals and ensure complementarity of activities undertaken by the different research institutes. The critical issues will be how such information will be obtained. Unless individual institutions and departments have properly set up information gathering, storage and dissemination systems, this may be a very difficult task.

b) Information on technical activities of the institution. What research has been done? What projects are currently underway and what are the objectives? This information is necessary in order to avoid duplications and repetitions and to ensure that activities complement each other.

Table 1. Basic checklist of information for planning and formulating research programs.

Information	Possible source
Program Planning	
Research priorities	National research plan
Economic information	Government statistics
Research technical activities	MIS research programs
Resource Allocation	
Funding and sources	MIS financial resources
Human resources availability	MIS human rsources
Equipment and facilities	MIS facilities

2.2 Budgeting and resource allocation

In developing realistic work plans and budgets, research managers require information to match resource requirements to proposed projects. The major problem faced by most research institutions is the dispersion of very few resources over a wide coverage of researchable areas and too many research stations or sites. A minimum level of investment is required for each program to be able to run efficiently. The critical mass of resources should therefore be attained for each individual program and indeed for the research institute. Therefore it is important to establish these minimum levels for individual programs and prioritize the research projects. Where resources are limited, resource allocation is expected to reflect research priorities. Quite often allocation of resources, particularly where donor funding is involved, shows very little relationship with national research priorities. Unless proper information on individual programs and projects is maintained, this may not be immediately noticeable.

A program budgeting system is therefore a system by which information on individual research activities and resources allocated for their implementation is collected and processed. All quantifiable data on projects related to human resources, equipment and facilities (deployment), and direct operational costs are collected. The information to be generated from such a system would include:

a) The number of scientists involved in individual projects and their time allocations, which is necessary for planning of human resources

b) Objectives of the projects, which is necessary to make sure that research activities are in sync with national development plans

c) Location, duration to ensure appropriate coverage of ecological areas/regions

d) Source(s) of funds

e) Material or direct operating costs

This information would primarily be obtained from within the institution. Table 2 presents potential use of information generated.

The following types of reports can be produced to provide information needed to make management statements:

- Financial resources
  - allocation of funds by commodities
  - allocation of funds by individual projects
  - sources of funds
  - allocation of funds by agro-ecological regions
- Human resources
  - deployment of scientists by commodities
  - deployment of scientists by projects
  - scientists' time allocation by projects
- Physical resources
  - allocation of facilities and equipment by projects
  - allocation of facilities and equipment by commodities
- Project allocation
  - allocation of projects by agro-ecological regions
  - allocation of projects by stations

Table 2. Potential output and use in Project MIS.

			Level of use		
Output	Type of information	Source of information	Scientist	Manager	National
Time and financial budget breakdowns	Time and finances allocated to science endeavors broken down by operations project, discipline, regions, centers, commodities, and themes	Personnel time allocation data sheet accounting	Can assess progress towards objectives regarding time defined objectives for assessment	Can identify activities and operations (by individual scientist or in aggregate) that are out of sync or can identify problems for corrective action	Aggregate commodity, thematic and system information, and regional data will provide information for perspective regarding original goals and objectives
Personnel: time cost	Information by personnel category matched to budget	Personnel time allocation data sheet Employment/personnel forms	If overloaded, can request supplemental or entrepreneurial funds Can identify expertise needed	Can identify if personnel being over- or under-utilized Can identify training needs for those in service Can identify gaps in capability for future training needs	Assist in setting goals and objectives within capabilities or authorize new thrust and attendant needs
Variable aggregation	Development and research objectives target groups	Operation data sheet Project data sheet Accounting Extension feedback	Feedback from client groups on applicability and adaptability can allow corrective action	Information can assist in the prioritization of research projects in light of objectives from national level	Aggregation on utilization of scientific product by target groups will provide information on goal attainment, therefore can assess correctness of goals and service capabilities
Direct operating costs (DOC)	Utilization and costs of experimental and operational inputs	Operation data sheet Accounting	Can assess if original proposal request for inputs was accounted	Can assess if limited DOC is being over-utilized by specific projects or scientists	Can determine if DOC/personal allocation is sufficient to provide staff and research
Institutional linkage	Linkage with other research projects: internal, other institute, from technical assistance, and from development institutes	PDS	Is provided additional information for incorporation into project experiment	Can facilitate efficiency of projects by incorporating information and minimizing duplication	Can make decisions for selection of institutes or regions for specialization or cooperation

3. Data Content, Data Collection, Updating, and Management

All research institutions have one way or another for collecting management information on research activities, whether formalized or not. Some of the most important issues to be addressed in setting up a formal system are the following.

3.1 What information is needed by manager?

In general, data collected on research activities should contain some of the following aspects:

- Scientific aspect
  - title
  - objectives
  - program/commodity
- Administrative aspects
  - human resources
  - financial resources
  - physical resources
- Location of research
  - agro-ecological region
  - actual station location

Based on these general criteria, any further data to be collected will depend on the individual institution's requirements.

3.2 How is the information collected?

There is a need to develop a standard format for compiling data on individual programs. Creation of a trial database on research programs will be necessary. The type of data to be collected may be specific for individual institutions, therefore the format for data entry may need to be customized according to the institution's needs. An analytical synthesis of the data should provide a clear picture of the research currently underway, and the relative use of resources. Preliminary analysis and reporting on research projects should indicate whether or not the information collected is sufficient to answer most if not all of the management questions.

3.3 When and how should the database be updated?

The real challenge to management is how to keep the database up to date. Any database must be kept current to keep it useful. Information can be collected through regular monitoring of implementation progress of the projects. A regular monitoring system of the individual projects can therefore provide information for the Project MIS sub-system. This data on individual projects can therefore be used to produce various reports aggregated or disaggregated by projects and programs to provide information needed by managers at various levels. Time series data needed for long-term and strategic planning can also be obtained from this MIS sub-system.

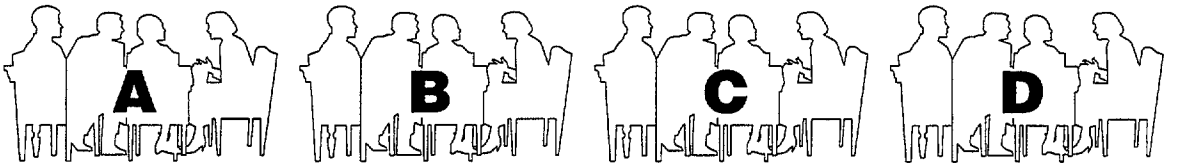
3.4 Who is responsible for the collection of data?

Individual scientists leading the projects would be responsible for data collection, through systematic record keeping and reporting. The frequency of filing project data reports will need to be set in order to avoid obscurity. It is important to establish common key words for controlled vocabulary. This will ensure that everybody is talking about the same thing (e.g., variety and cultivar, heterosis and hybrid vigor).

Exercise 7. Developing a database structure for research program analysis (group work)

Phase 1. Group work (55 minutes)

1. Form four groups of participants, each electing a rapporteur.



2. Discuss and work on the following tasks:
   a) Identify the entities and corresponding attributes to be collected and stored in the database.
   b) Design a database structure required for setting up a Program MIS which can supply the information needs identified above.
   c) Create the database file.
   d) Create the data entry form and use it to enter 50 records.
   e) Use the database to create various report queries.
3. The rapporteurs prepare a report to present to the audience.

Phase 2. Reporting and discussion (40 minutes)

4. The rapporteurs present and discuss the results of the group's work with the audience.

Exercise 7. Worksheet

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day two**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day two**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY THREE

Information Management for Research

DAY THREE — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss management information systems for financial resources.
2. Develop a database structure for financial resources.
3. Discuss the concept of INFORM.
4. Analyze INFORM structure.
5. Discuss INFORM implementation in agricultural research organizations.
6. Evaluate the usefulness of INFORM as a tool for MIS in agricultural research.
7. Discuss the information cycle.
8. Define information systems and management information systems.
9. Discuss management information system planning.
10. Discuss critical success factors for the implementation of MIS.

Handouts

3.8.1 Overview
3.8.2 Tentative Schedule
3.8.3 Management Information Systems for Financial Resources (text)
3.8.4 Exercise 8. Developing a Database Structure for Financial Resources
3.8.5 Exercise 8. Worksheet
3.9.1 INFORM: An Information System for Agricultural Research Management (text)
3.9.2 Exercise 9. Reflecting on INFORM: An Information System for Agricultural Research Management
3.9.3 Exercise 9. Worksheet
3.10.1 Planning and Development of Management Information Systems. An Overview (text)
3.10.2 Critical Success Factors (text)
3.10.3 Exercise 10. Critical Success Factors
3.10.4 Exercise 10. Worksheet
3.10.5 Strengths and Weaknesses
3.10.6 Guidelines to Provide Feedback on the Workshop
3.10.7 PAPA Form - First Stage

Information Management for Research

DAY THREE — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 8. Management Information Systems for Financial Resources** (Presentation and exercise 8)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:45	**Session 8. (Continued)**
11:45 – 13:00	**Session 9. INFORM: An Information System for Agricultural Research Management** (Presentation and exercise 9)

13:00 – 14:00 Lunch

14:00 – 14:45	**Session 9. (Continued)**
14:45 – 15:30	**Session 10. Planning and Development of MIS: An Overview** (Presentation and exercise 10)
15:30 – 15:45	Tea/Coffee Break
15:45 – 17:00	**Session 10. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY THREE — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
3.8.1	Overview	❐	❐
3.8.2	Tentative Schedule	❐	❐
3.8.3	Management Information Systems for Financial Resources (text)	❐	❐
3.8.4	Exercise 8. Developing a Database Structure for Financial Resources	❐	❐
3.8.5	Exercise 8. Worksheet	❐	❐
3.9.1	INFORM: An Information System for Agricultural Research Management (text)	❐	❐
3.9.2	Exercise 9. Reflecting on INFORM: An Inforamtion System for Agricultural Research Management	❐	❐
3.9.3	Exercise 9. Worksheet	❐	❐
3.10.1	Planning and Development of Management Information Systems. An Overview (text)	❐	❐
3.10.2	Critical Success Factors (text)	❐	❐
3.10.3	Exercise 10. Critical Success Factors	❐	❐
3.10.4	Exercise 10. Worksheet	❐	❐
3.10.5	Strengths and Weaknesses	❐	❐
3.10.6	Guidelines to Provide Feedback on the Workshop	❐	❐
3.10.7	PAPA Form - First Stage	❐	❐

Overheads

3.8.1	Objectives of Day Three	❐	❐
3.8.2	Schedule of Day Three	❐	❐
3.8.3	Objectives of Session 8. MIS for Financial Resources	❐	❐
3.8.4	MIS for Financial Resources	❐	❐
3.8.5	Why Information on Financial Resources?	❐	❐
3.8.6	Why Is Information Required?	❐	❐
3.8.7	Information Is Necessary	❐	❐
3.8.8	Program Financial Plan or Budget	❐	❐
3.8.9	Financial Information on Human Resources	❐	❐
3.8.10	Example: Makanda Livestock Research Institute	❐	❐
3.8.11	Summary of Overall Budget Makanda Department of Research	❐	❐
3.8.12	Summary of Total Operating Budget/Average Annual Costs per Scientist	❐	❐
3.8.13	Summary of Total Operating Budget (pie chart)	❐	❐

		Yes ✓	No ✓
3.8.14	Summary of Total Operating Budget (graph)	☐	☐
3.8.15	Averge Total Costs per Scientist (pie chart)	☐	☐
3.8.16	Averge Total Costs per Scientist (graph)	☐	☐
3.9.1	Objectives of Session 9. INFORM: An Information System for Agricultural Research Management	☐	☐
3.9.2	INFORM: An Information System for Agricultural Research Management	☐	☐
3.9.3	Definition of INFORM	☐	☐
3.9.4	Management Information Systems	☐	☐
3.9.5	How Does INFORM Work?	☐	☐
3.9.6	Examples of Data on Researchers	☐	☐
3.9.7	An Example of the Graphical Output of INFORM	☐	☐
3.9.8	An Example of Resource Allocation by Discipline (pie chart)	☐	☐
3.9.9	Comparison of National Priorities for Commodities with Their Actual Resource Allocations	☐	☐
3.10.1	Objectives of Session 10. Planning and Development of MIS: An Overview	☐	☐
3.10.2	Planning and Development of MIS: An Overview	☐	☐
3.10.3	Information Cycle	☐	☐
3.10.4	Information Systems	☐	☐
3.10.5	Management Information Systems	☐	☐
3.10.6	Different Characteristics of MIS Structures	☐	☐
3.10.7	Systems Development Life Cycle	☐	☐
3.10.8	Seven Steps to Analyze and Design a Structural System	☐	☐
3.10.9	Seven Reasons for MIS Planning	☐	☐
3.10.10	Objectives of MIS Planning	☐	☐
3.10.11	Six Levels of Strategic Planning for MIS	☐	☐
3.10.12	Critical Success Factors	☐	☐
3.10.13	Examples of CSF for INFORM Implementation	☐	☐

Materials

• Personal Computers	☐	☐
• Printers	☐	☐
• Diskettes	☐	☐
• Spare ink or toner for printers	☐	☐
• Overhead projector	☐	☐
• Spare bulbs for overhead projector	☐	☐
• Extension cords	☐	☐
• Projector screen	☐	☐
• Flipchart stands (minimum 2)	☐	☐
• Flipchart paper/pads (about 10 per day)	☐	☐
• Markers for writing on newsprint	☐	☐
• Markers for writing on transparencies	☐	☐

	Yes ✓	No ✓
• Blank transparencies	❒	❒
• Stapler	❒	❒
• Tape (strong masking tape and regular tape)	❒	❒
• Push pins	❒	❒
• Glue	❒	❒
• Pencils/notepads/pens	❒	❒
• Pencil sharpeners	❒	❒
• Certificates	❒	❒
• Photocopying facilities	❒	❒
• Extra notepads and pens	❒	❒
• Scissors	❒	❒

DAY THREE

Session 8
Management Information Systems for Financial Resources

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

– Review of the previous day's activities.

– Summary of the evaluation of the previous day.

– Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day three (handouts 3.8.1 and 3.8.2) to the participants. Use overheads 3.8.1 and 3.8.2 to review the objectives and schedule. Ask if clarifications are needed. (10 minutes)

SESSION 8

09:00 – 10:30 Session 8. Management Information Systems for Financial Resources

10:30 – 10:45 Tea/Coffee Break

10:45 – 11:45 Session 8. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss management information systems for financial resources.
- Develop a database structure for financial resources.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Give a brief presentation on management information systems for financial resources. You will find the information in handout 3.8.3 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 3.8.3 and be sure to ask participants if

they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 8

Exercise 8. Developing a database structure for financial resources. (2 hours 10 minutes)

1. Distribute handouts 3.8.4 and 3.8.5. Handout 3.8.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur.
3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (1 hour 30 minutes)

Phase 2. Reporting and discussion

4. Ask the rapporteurs to present the results of the groups' discussions. Approximately five minutes are available for each presentation. (20 minutes)
5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

DAY THREE

Session 8
Summary of Overheads

Objectives of Day Three

1. Discuss MIS for financial resources
2. Develop a database structure for financial resources
3. Discuss the concept of INFORM
4. Analyze INFORM structure
5. Discuss INFORM implementation in agricultural research organizations
6. Evaluate the usefulness of INFORM
7. Discuss the information cycle
8. Define information systems and MIS
9. Discuss MIS planning
10. Discuss critical success factors for the implementation of MIS

3.8.1

Schedule of Day Three

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 8. MIS for Financial Resources
	Tea/Coffee Break
10:45 – 11:45	Session 8. (Continued)
11:45 – 13:00	Session 9. INFORM: An Information System for Agricultural Research Management
	Lunch
14:00 – 14:45	Session 9. (Continued)
14:45 – 15:30	Session 10. Planning and Development of MIS: An Overview
	Tea/Coffee Break
15:45 – 17:00	Session 10. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

3.8.2

Objectives of Session 8. MIS for Financial Resources

1. Discuss MIS for financial resources
2. Develop a database structure for financial resources

3.8.3

Management Information Systems for Financial Resources

3.8.4

Why Information on Financial Resources?

1. Diminishing financial support for proper execution of programs and support services
2. The need to carefully rationalize the management of these scarce resources

3.8.5

Why Is Information Required?

Information is required on the institution's overall budgets and expenditures in order to make good decisions in planning, mobilization, and allocation of financial resources

3.8.6

Information Is Necessary

To assist research managers in financial planning information is necessary in the following areas:

- research programs
- human resources
- facilities and equipment
- funding of research

3.8.7

Program Financial Plan or Budget

based on:

- research material costs
- transport costs
- subsistence costs for out-station work
- monitoring and evaluation costs
- publication costs

3.8.8

Financial Information on Human Resources

Number of:
- professionals
- technical support staff
- field labor
- administrative support staff
- staff on training

and their associated costs

3.8.9

Example:

Makanda Livestock Research Institute

3.8.10

Summary of Overall Budget Makanda Department of Research

	Cost (US$)
1. Personnel salaries and wages (number of staff)	
a) Scientists (20)	195,000
b) Technical staff (20)	120,000
c) Administration (20)	80,000
d) Field labor (140)	140,000
2. Small equipment	
a) Vehicles	16,000
b) Subvention (per diem)	1,000
c) Celebration	1,000
d) Office supplies	1,000
3. Maintenance and repairs	
a) Physical	15,000
b) Buildings	15,000
4. Printing and dissemination	
a) Printing and photocopying	1,000
b) Communication	2,000
c) Books and journals	10,000
5. Utilities	
a) Power	2,000
b) Water	2,000
c) Stationery	2,000
6. Research program materials and supplies	
a) Cattle feed and milk	50,000
b) Small ruminants	55,000
TOTAL	757,000

3.8.11

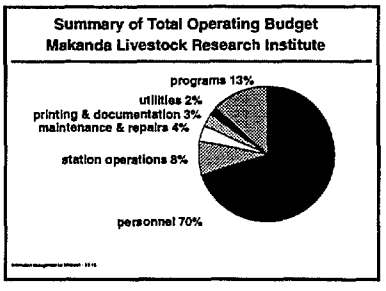
Summary of Total Operating Budget for Makanda Research Institute

Category	Cost (US$)	%
1. Personnel	527,800	70
2. Station operations	60,000	8
3. Maintenance & repairs	30,000	4
4. Printing and documentation	25,000	3
5. Utilities	15,000	2
6. Research programs	100,000	13
TOTAL	757,000	100

Average Annual Costs per Scientist at Makanda Research Institute

Category	Cost (US$)	%
1. Scientists' salaries	9,250	26
2. Research support staff	13,500	36
3. Administration staff	3,000	8
4. Station operations	3,000	8
5. Research operations	5,000	13
6. Non-research costs	3,500	9
TOTAL	37,850	100

3.8.12



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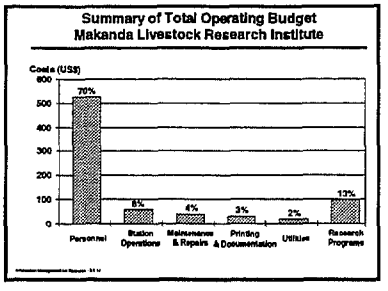

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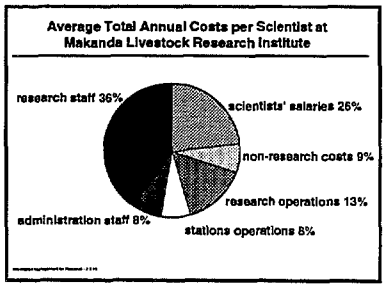

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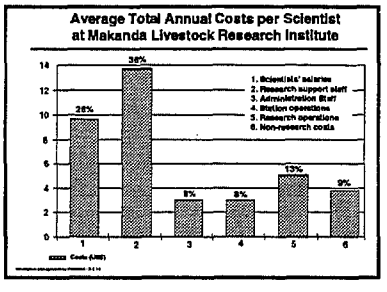


3.8.16

Handout — Overview of Day Three

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss management information systems for financial resources.
2. Develop a database structure for financial resources.
3. Discuss the concept of INFORM.
4. Analyze INFORM structure.
5. Discuss INFORM implementation in agricultural research organizations.
6. Evaluate the usefulness of INFORM as a tool for MIS in agricultural research.
7. Discuss the information cycle.
8. Define information systems and management information systems.
9. Discuss management information system planning.
10. Discuss critical success factors for the implementation of MIS.

Handouts

3.8.1 Overview
3.8.2 Tentative Schedule
3.8.3 Management Information Systems for Financial Resources (text)
3.8.4 Exercise 8. Developing a Database Structure for Financial Resources
3.8.5 Exercise 8. Worksheet
3.9.1 INFORM: An Information System for Agricultural Research Management (text)
3.9.2 Exercise 9. Reflecting on INFORM: An Information System for Agricultural Research Management
3.9.3 Exercise 9. Worksheet
3.10.1 Planning and Development of Management Information Systems. An Overview (text)
3.10.2 Critical Success Factors (text)
3.10.3 Exercise 10. Critical Success Factors
3.10.4 Exercise 10. Worksheet
3.10.5 Strengths and Weaknesses
3.10.6 Guidelines to Provide Feedback on the Workshop
3.10.7 PAPA Form - First Stage

Handout — Tentative Schedule of Day Three

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 8. Management Information Systems for Financial Resources** (Presentation and exercise 8)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:45	**Session 8. (Continued)**
11:45 – 13:00	**Session 9. INFORM: An Information System for Agricultural Research Management** (Presentation and exercise 9)

13:00 – 14:00 Lunch

14:00 – 14:45	**Session 9. (Continued)**
14:45 – 15:30	**Session 10. Planning and Development of MIS: An Overview** (Presentation and exercise 10)
15:30 – 15:45	Tea/Coffee Break
15:45 – 17:00	**Session 10. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Management Information Systems for Financial Resources[1]

1. Introduction

Most research institutions within the SADC region are faced with a continued problem of diminishing financial resources, relative to the size and amount of work expected to be implemented. While the size of the individual NARS has increased in terms of human resources employed, and thus the budget for salaries, benefits and allowances, the recurrent budget for execution of scientific programs and support services has either remained stagnant or gone down. Although potentially some funding may be available for limited research, through various national and international research grants, the financial requirements to meet total operation of medium size research projects and the running costs of the research stations/institutions have barely been met. Domestic funds are hardly sufficient to meet these costs. A large amount of funding is sourced externally as loans or grants from donors. Without this facility, most NARS may operate with insufficient funding which does not even constitute a critical mass for effective operations. Hence, the research managers, whether by design or default, have to carefully and rationally allocate these scarce resources to various operations of the institution to enable them to continue the execution of their mandates. The managers therefore have to clearly demonstrate the capacity to do this by putting in place and operationalizing an efficient system for financial resource information in the NARS.

Information is required on the institution's overall budgets and expenditures in order to make sound and clear decisions in planning, mobilization and allocation of the limited financial resources. In this regard, two major questions concerning finances need to be answered:

a) What constitutes the overall budget for the research station or the institute as a whole? In other words, where is the money being spent?

b) Where does the money come from? Who are the funding agencies?

A well-managed MIS will be able to provide this crucial information without any unnecessary delays.

2. Information for Planning and Management

Both long- and short-term planning of the institution's financial resources require information. Information for long-term planning is required at national and institutional levels. At the national level the type of information required is strategic: information on the overall economy of the country and on the agricultural sector environment. This information is necessary in allocation of financial resources between sectors and within the sectors. Hence, decisions are made on the amount of funding that the government and the private sector are prepared to invest in research. Other factors, however, not necessarily measurable, such as politics, may also influence these decisions.

All research institutions go through annual financial planning and some even do long-term planning. During this planning process, information on all activities (both technical and support and their past expenditure and – where salable products are produced by the research – revenue

[1] Source: Setshwaelo, L.L. 1995. Management Information Systems for Financial Resources. Gaborone, Botswana: CICE.

generation levels) is used as a base in allocation of funds and budgeting at the institutional and station levels. However, where management of information is poor, the planning process becomes merely a routine adjustment for inflation rate, year after year, and does not take into account the real cost of these activities. The inter-relationship or interface of a financial MIS with all the activities and functional areas of the research and their information requirements, indicates that there is a need to somehow integrate these other information sub-systems with the financial system. Hence, from the research point of view, financial information is required from the following functional areas and their sub-systems:

2.1 Research programs

Financial planning for research projects will involve all expenditures incurred as a direct result of implementing a specific program (composed of individual projects). This would include:

- research material costs
- transport costs
- subsistence costs for out-station work
- monitoring and evaluation costs, and
- publication costs

A program financial plan or budget based on these expenditure items would be able to reveal beforehand, whether or not sufficient funds will be available to implement the program. Ideally, the cost of scientists in individual project budgets should be included, however, where there are multi-disciplinary teams working on projects, the scientists' time and thus costs will be shared between projects based on their percent time allocation. This information from individual research projects can therefore be pulled together to estimate the total cost within the program.

2.2 Human resources

In both developing and developed countries, personnel costs account for over 60% of the total research budget, sometimes up to 80% in developing countries. This leaves a very small part to cater for both research operational costs and support services. Financial implications of the human resources component and its planning therefore need to be given serious consideration if a balance is to be maintained. Over the years, the NARS have significantly built and expanded their labor force and thus, consequently, increased personnel budgets and costs. Usually this is done with very little or without any relative increase in the research operational budget and support services. Also where a vigorous human resources development program has been followed, financial costs of actual training, payment of salaries for people on study leave (sometimes referred to as training allowances), and employment of temporary assistance, usually expatriates, account for a large percentage of the institute's total budget.

In order to maintain a reasonable balance within the overall budget, proper and accurate financial information on the human resources has to be maintained to assist in the planning process of training, recruitment, etc. This information relates to the following:

- Number of professionals and their associated costs (salaries, benefits, and allowances)
- Number of technical support staff and their associated costs
- Number of field labor and their associated costs
- Number of administrative support staff and their associated costs

- Number of staff on training and all their associated costs (this should include temporary assistance).

Usually this information would be available within the institute, but only used for statistical purposes rather than for planning and management decisions within the NARS. Hence the need to put the information together in a format that is usable by the research managers cannot be over-emphasized. Given the budget in most of the NARS, this information may reveal whether or not the institution has to cut down on recruitment, reduce staff (through re-deployment within the agricultural sector) or slow down on the long-term training program. Though very difficult to accept, these are the realities facing some of the NARS, but due to lack of proper use of information this may not have clearly come to light nor been recognized.

2.3. Facilities and equipment

Management of the research facilities and equipment involves several activities which require money: development of facilities, procurement and maintenance of equipment. Planning of facilities development and equipment acquisition and disposal implies that information is required in the following areas to make informed management decisions:

- quantity, cost and value of equipment on hand;
- cost of maintenance.

Such information may indicate whether or not maintenance or repair costs incurred on some of the equipment are actually justifiable or whether it is time to consider planning for replacements and, also, it allows the research managers to make arrangements for mobilization of funds. It is not uncommon to find equipment that has been rendered unusable mainly due to lack of funds to carry out repairs and proper maintenance services.

2.4. Funding of research

One of ten very crucial questions facing the research managers is where the funds to carry out research will come from. Research within the SADC region and especially Botswana has been largely funded through donor projects. In order for the research managers to be in a position to source funding and of course, encourage the public sector and private sector to put money in research, he or she should be able to confidently show the trend in the level of funding by all sources over a given period of time. To do this, documentation on sources of funds and related projects has to be available. With a proper MIS set up, such information should be easily accessible.

All the information requirements indicated above are necessary to assist research managers in financial planning for the institution. The following types of reports can therefore be produced from the financial MIS sub-system:

a) Total costs of research operations relative to the overall budget

b) Total costs of personnel relative to the overall budget

c) Average cost per scientist in the institution

d) Cost of library, documentation and publication

e) Capital costs

f) Total maintenance costs for equipment

g) Level of funding by the different sources

The example given below of the Makanda Livestock Research Institute will help to demonstrate the type of management information that can be produced from a financial MIS.

Summary of Overall Budget Makanda Department of Research

	Cost (US$)
1. Personnel salaries and wages (number of staff)	
a) Scientists (20)	197,000
b) Technical staff (20)	120,000
c) Administration (20)	60,000
d) Field labor (100)	150,000
2. Station operations	
a) Vehicles	30,000
b) Subsistence (per diem)	15,000
c) Conferences	5,000
d) Office supplies	10,000
3. Maintenance and repairs	
a) Physical plant	15,000
b) Buildings	15,000
4. Printing and documentation	
a) Printing and photocopying	10,000
b) Communication	5,000
c) Books and journals	10,000
5. Utilities	
a) Phone	5,000
b) Water	5,000
c) Electricity	5,000
6. Research program materials and supplies	
a) Cattle meat and milk program	50,000
b) Small ruminants program	50,000
TOTAL	**757,000**

Table 1. Summary of total operating budget for Makanda Research Institute

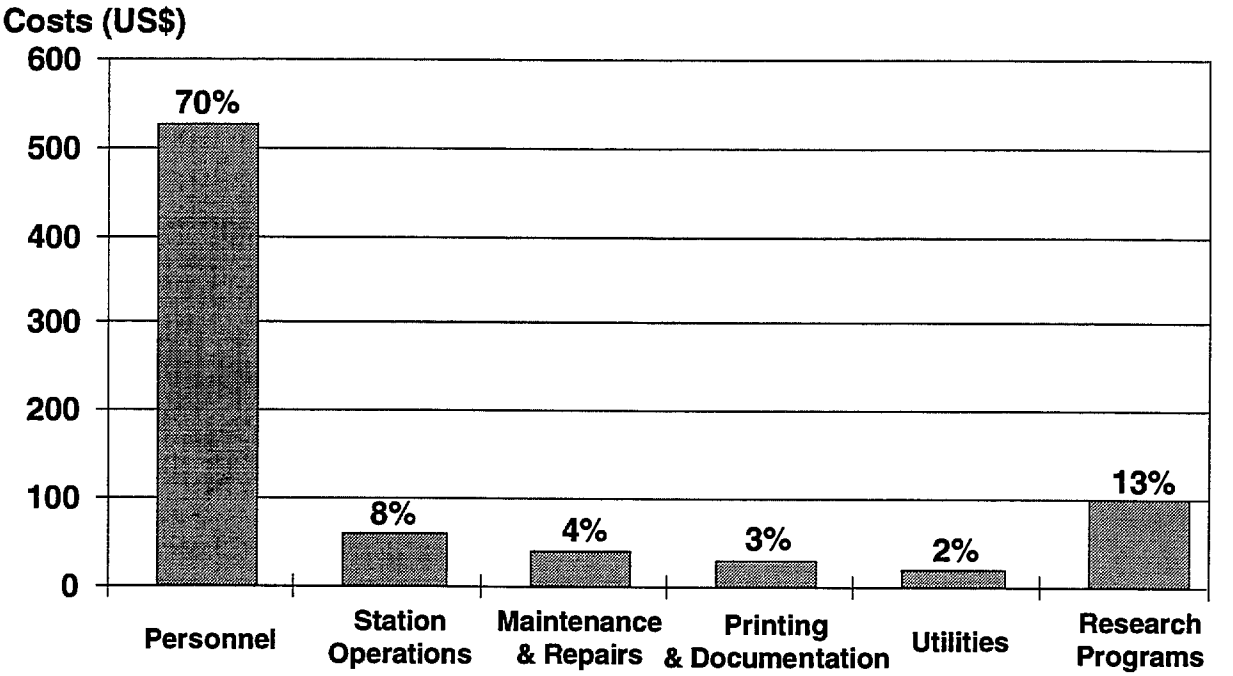
Category	Cost (US$)	%
Personnel	527,000	70
Station operations	60,000	8
Maintenance and repairs	30,000	4
Printing and documentation	25,000	3
Utilities	15,000	2
Research programs	100,000	13
TOTAL	757,000	100

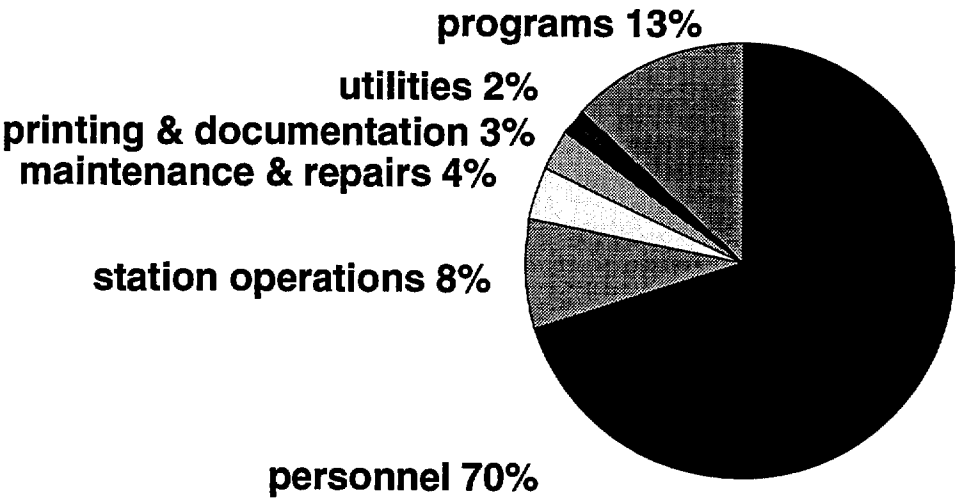
Table 2. Average annual costs per scientist at Makanda Research Institute

Category	Cost (US$)	%
Scientists' salaries	9,850	26
Research support staff	13,500	36
Administration staff	3,000	8
Station operations	3,000	8
Research operations	5,000	13
Non-research costs	3,500	9
TOTAL	37,850	100

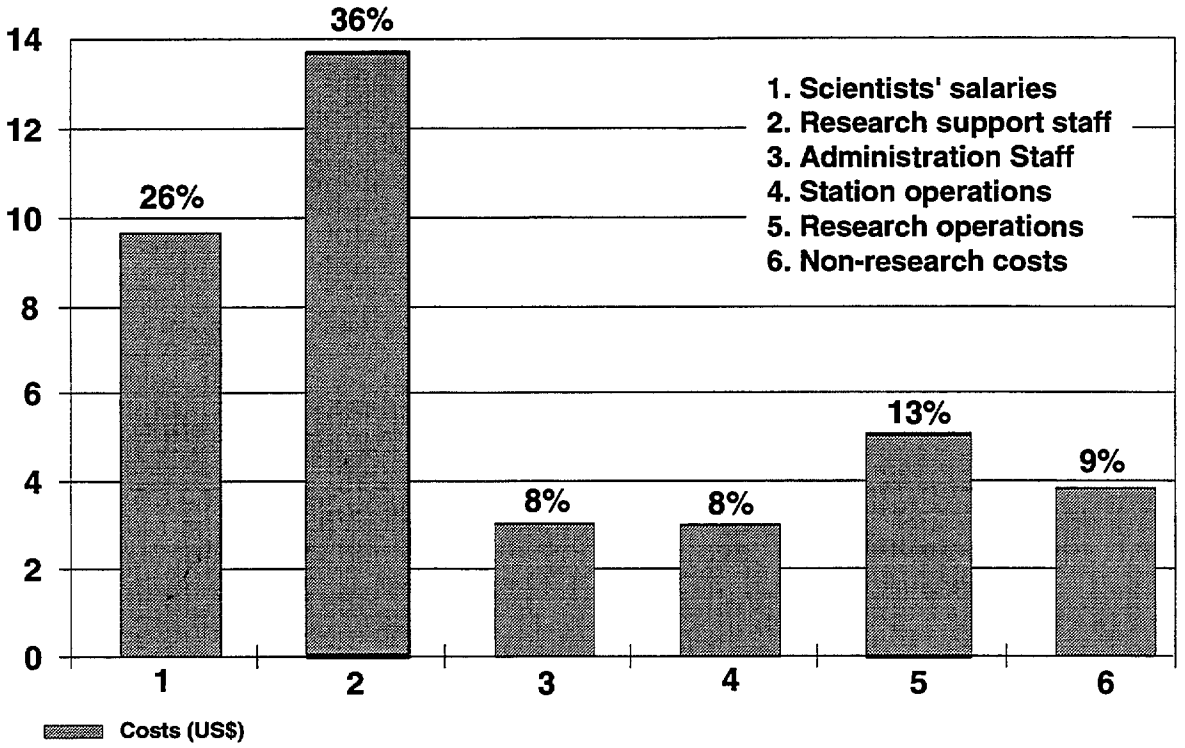
This information can therefore be used to produce the necessary graphs and charts.

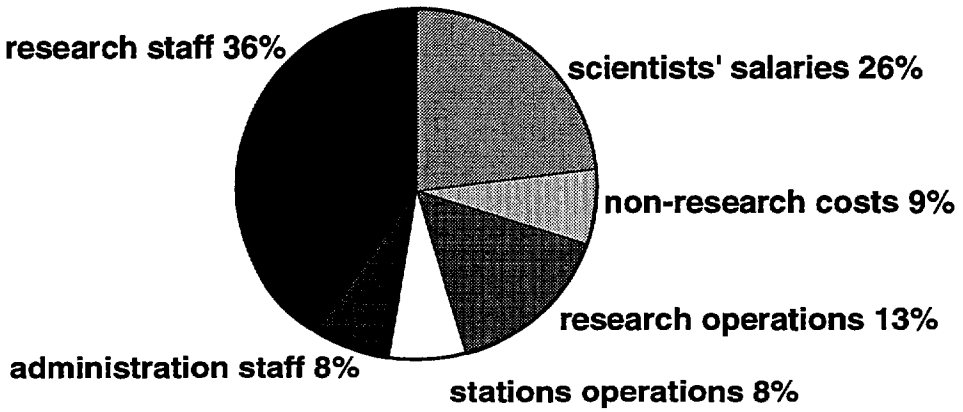
Summary of Total Operating Budget
Makanda Livestock Research Institute





Average Total Annual Costs per Scientist at Makanda Livestock Research Institute





Exercise 8. Developing a database structure for financial resources (group work)

Phase 1. Group work (1 hour 30 minutes)

1. Form four groups, each group electing a rapporteur.

2. Identify the information needs of financial resources management.
3. Identify the entities and corresponding attributes to be collected and stored in the database.
4. Using the information above, design a database structure required for setting up an MIS for financial resources which can supply the information needs identified.
5. The rapporteur takes note of key issues discussed during this phase on the worksheet (handout 3.8.5) to report and discuss with the audience.

Phase 2. Reporting and discussion (35 minutes)

6. The rapporteurs present and discuss the results of their group's work with the audience.

Exercise 8. Worksheet

DAY THREE

Session 9
INFORM: An Information System for Agricultural Research Management

Instructions to Trainers

SESSION 9

11:45 – 13:00 Session 9. INFORM: An Information System for Agricultural Research Management

13:00 – 14:00 Lunch

14:00 – 14:45 Session 9. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss the concept of INFORM.
- Analyze INFORM structure.
- Discuss INFORM implementation in agricultural research organizations.
- Evaluate the usefulness of INFORM as a tool for MIS in agricultural research.

PROCEDURE

Training techniques: presentation, work in pairs.

PRESENTATION

(experience) Give a brief presentation focusing on INFORM. You will find the information in handout 3.9.1 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 3.9.1 and be sure to ask participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 9

Exercise 9. Reflecting on INFORM: an information system for agricultural research. (1 hour 40 minutes)

1. Distribute handouts 3.9.2 and 3.9.3. Handout 3.9.2 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Work in pairs

2. Divide the participants into pairs and ask each pair to decide on a rapporteur.
3. *(experience)* As the pairs work, circulate among them to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (55 minutes)

Phase 2. Reporting and discussion

4. Ask a few volunteers to present the results of their pair's discussion. State the amount of time (e.g., three or five minutes) you will allow for each presentation. (20 minutes)

5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (20 minutes)

6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the next session.

DAY THREE

Session 9
Summary of Overheads

Objectives of Session 9.
INFORM: An Information System for Agricultural Research Management

3. Discuss the concept of INFORM
4. Analyze INFORM structure
5. Discuss INFORM Implementation
6. Evaluate the usefulness of INFORM

3.9.1

INFORM: An Information System for Agricultural Research Management

3.9.2

Definition of INFORM

A computer-based management information system that provides agricultural research managers with facts they need for their tasks

3.9.3

Management Information Systems

present information so that the key features of the underlying research system can be quickly and clearly identified

3.9.4

How Does INFORM Work?

has efficient procedures for capturing and processing data in order to deliver the information required

3.9.5

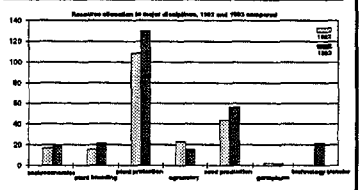
Examples of Data on Researchers Held by the INFORM Management Information System

Personal Data	Percentage time distribution	Percent of time spent per year	Research time breakdown	Percent of time spent per year
Name	Research	50	Experiment A	40
Date of birth	Management/administration	10	Experiment B	20
Highest degree	Extension		Experiment C	10
Discipline	Training	10	Experiment D	10
Main crop	Degree studies		Experiment E	
Studying now?	Other		Experiment F	
Expected degree			Experiment G	
	TOTAL TIME	100		80

*The percentage of time spent on research (50 percent in this case) is broken down into time spent on each experiment

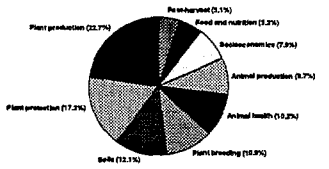
3.9.6

An Example of the Graphical Output of INFORM



3.9.7

An Example of Resource Allocation by Discipline



3.9.8

Comparison of National Priorities for Commodities with Their Actual Resource Allocations

National priorities (national representation)				Actual resource allocations	
Tea	1	1	1	1	Coconut
Rubber	2	2	2	2	Rubber
Rice	3	3	3	3	Tea
Coconut	4	4	4	4	Rice
Milk	5	5	5		
		6	6		
		7	7		
		8	8	8	Potato
		9	9		
		10	10		
		11	11		
		12	12		
		13	13		
		14	14		
		15	15		
		16	16		
		17	17	17	Milk
		18	18		
		19	19		
		20	20		
		21	21		
Potato	22	22	22		

The information in the left column is provided by national planners. Information on the right side provided by INFORM

3.9.9

INFORM: An Information System for Agricultural Research Management[1]

National agricultural research systems were comparatively well funded in the 1960s and early 1970s. In the 1980s and early 1990s, however, they have faced a more difficult economic climate. With the limited resources now available it has become increasingly important to raise the efficiency of agricultural research in order to maximize the output of enhanced technology to farmers.

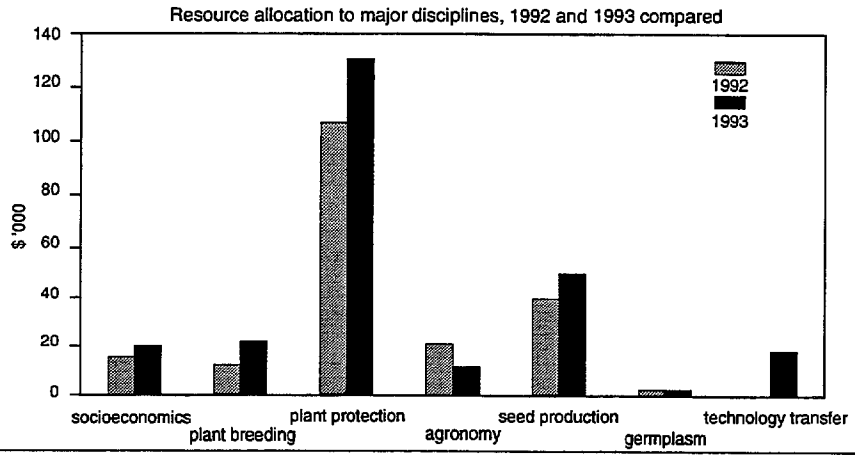
This challenge is the responsibility of research managers. To meet it they need good information about the research systems they manage: information about inputs to research (people, finance, and physical resources), the research program (experiments), and finally, research outputs (improved technologies and reports on experiments and impact). Such information should be available in aggregate form so that managers are not overburdened by detail. It should be timely, reasonably accurate, and available in various forms to serve particular management issues.

A tool to provide managers with this information is called a management information system. ISNAR, in collaboration with a number of countries' national agricultural research systems (NARS), has developed such a system, called INFORM (Information for Agricultural Research Managers).

The INFORM Management Information System

INFORM is a computer-based management information system that provides agricultural research managers with the facts they need for their prime tasks of priority setting, budgeting, monitoring, and evaluation. Figure 1 is an example of the graphical output of INFORM. The figure shows the resources used in a research institute in each of seven major disciplines. It also compares this information for the current and previous years. With just a glance at the figure a manager can see the much greater resource use within one research discipline, and additionally,

Figure 1. An example of the graphical output of the INFORM information system.

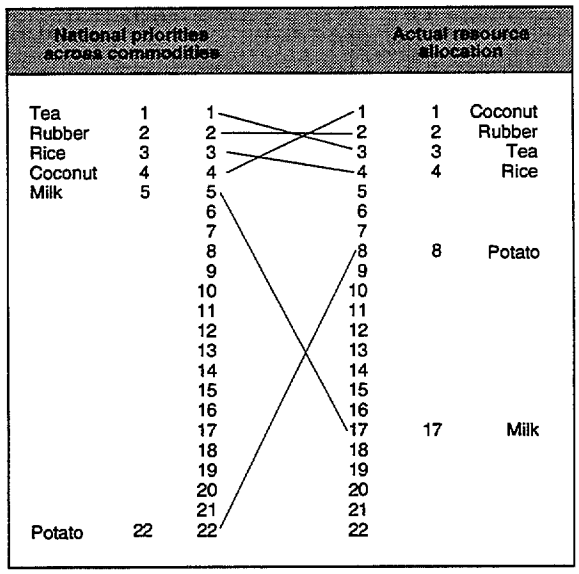


[1] Extract from: Vernon, R. October 1995. INFORM: An information system for agricultural research managers. Briefing Paper No.21. The Hague: ISNAR.

that this difference increased in the current season. The manager may then want to explore the reasons for this disparity and find out whether it is in accordance with agreed research priorities and policies.

A management information system presents information so that key features of the underlying research system can be quickly and clearly identified. The role of the manager is to interpret this information and decide what action is needed, if any. For example, the left column of figure 2 shows the relative national priority accorded to selected commodities. On the right is INFORM-produced data on actual allocation of research resources to these commodities. In this case, resource allocations did not appear to match national priorities. The research manager's task is to explore the reasons for such apparent inconsistencies and, if necessary, to reorganize the research program to bring it closer in line with the agreed priorities.

Figure 2. Comparison of national priorities for commodities with their actual resource allocations. The information in the left column is provided by external sources. Information on the right was provided by INFORM.



A Closer Look at INFORM's Structure

The content of a management information system must reflect the type of institution it represents, and INFORM is no exception. In research organizations, scientists are arguably the most important and usually the most costly component. To reflect personnel's importance, INFORM maintains a discrete set of data on each scientist. Only data important to the management of the research program are included: INFORM is not a personnel information system. Table 1 shows examples of the human resource data needed for research management.

Once basic personnel data has been entered, using INFORM, tables and graphs can be generated. The second column of table 1 shows a scientist's estimates of time allocated to the main functions of research, management, training, study, and others. In the last column of table 1, the time attributed to research (80 percent of one person year in this example) is disaggregated further into the time spent on individual experiments. Using the formula of 1 week = 2% of a person year, such attribution can be done easily and with sufficient accuracy for management purposes. Salary information from the payroll is then used to convert scientists' time to costs.

Managers can use the personal details from column one in the table to compare scientists' specialisms with the disciplinary requirements of the research program. One step in this process could be to use INFORM to generate a table, such as table 2, which shows the current and

Table 1. Examples of data items on researchers held by the INFORM management

Personal data	Percentage time allocations	Percent of one person year	Research time breakdown *	Percent of one person year
Name	Research	80	Experiment A	40
Date of birth	Management/administration	10	Experiment B	20
Highest degree	Extension		Experiment C	10
Discipline	Training	10	Experiment D	10
Main crop	Degree studies		Experiment E	
Studying now?	Other		Experiment F	
Expected degree			Experiment G	
	TOTAL TIME	100		
			TOTAL TIME	80

** The percentage of time spent on research (80 percent in this case) is broken down into time spent on each experiment.*

projected complement of scientists by discipline.

INFORM has efficient procedures for capturing the data it needs and processing it to deliver the information required. Basic information about researchers, as in table 1, is collected in the first year of INFORM implementation at a meeting of scientists. In subsequent years, INFORM operators can print personalized forms on which each staff member only has to indicate any changes from the previous year. This general data capture is done only once per year. Program leaders provide information on each research activity within their domain, and scientists record their time allocations to each activity (see the last column of table 1). These time allocations are multiplied by each scientist's salary to give the scientist's cost to each experiment. This is done for other costs where they are directly attributable to individual research activities. In making these calculations, it is helpful to have a good accounting system that relates to the research program. Indirect costs, such as those of administrative staff and utilities, are calculated using a simple formula:

$$\text{Cost of electricity for an experiment} = \frac{\text{Scientists' salary costs for that experiment}}{\text{Total scientists' salary costs for research}} \times \text{Total electricity bill}$$

Table 2. Information provided by INFORM on current potential numbers of researchers by discipline

Current and projected numbers of PhD holders in each discipline					
Discipline	**Current number of PhDs**	**Retiring by year 2000**	**Currently in training**	**Potential number in year 2000**	**Percent change**
Plant production	12	3	4	13	8
Plant protection	8	1	3	10	25
Soils	7	2	4	9	29
Animal health	5	1	0	4	–20
Plant breeding	5	2	2	5	0
Socioeconomics	3	0	3	6	100
Postharvest	2	0	0	2	0
Animal production	2	1	3	4	100
ALL	44	10	19	53	20

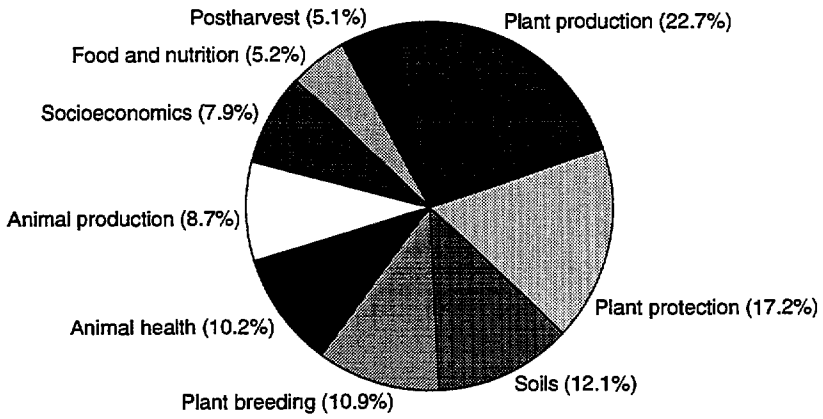
Note: A similar table can be made for MSc holders in each discipline.

The result is a wide range of management information that provides answers to a variety of questions:

- What proportion of the research program is allocated to each commodity? What proportion is allocated to each station and to each agroecological region? What proportion has nutrition (or pathology, or soils...) as its main discipline?
- What proportion of a scientist's time is spent on research, management, extension, and training? What proportion is spent on specific research activities?
- How many researchers have first degrees, MSc, or PhD degrees? How many fall into each age group, gender, or grade level?
- What proportion of the research budget is assigned to scientists' salaries, labor, or transport? How much is from national funds and from donor funds? How does this vary between forestry, crops, and livestock research?

Answers to such questions are easily depicted in graphical, tabular, or pie-chart form. Without the INFORM system, at least some of the information necessary to answer such questions may

Figure 3. An example of resource allocation by discipline shown in a pie-chart form



exist, but is often in several different places and formats. INFORM aggregates this information, together with new data that is collected for this purpose. It then generates information in an easily usable form.

Key words

Key words selected from experiment titles, objectives, and other sources provide a powerful tool for the identification of all experiments relating to a particular topic or theme. The ability to access such information is valuable to both scientists and managers. *Who* is doing *what* research *where* can be determined quickly. Duplication of research activities can be avoided and cross-program linkages facilitated. Key words also can be used to identify the breadth of a research program in any specific area identified by an appropriate term. A scientist, when planning a research program, may interrogate the INFORM data base to see what other work is or has been done, for example, on a particular micronutrient or pathogen. Further, INFORM readily allows key words to be combined. A scientist or manager can ask, for example, what experiments are being or have been conducted on *boron* responses in *cotton* or *lucerne*.

For its key words, INFORM uses a selection of terms relating to agricultural research taken from the AGROVOC thesaurus of agricultural terminology developed by the Food and Agriculture Organization of the United Nations (FAO). The thesaurus is also used in the AGRIS international information system for agricultural research and technology and in the CARIS current agricultural research information system. This thesaurus is available in most countries. The selection made from AGROVOC for INFORM, of some 900 terms, is provided in volume four of the *INFORM Guidelines,* a publication produced by and available from ISNAR.

INFORM Implementation

INFORM has been introduced to senior agricultural research managers in some three dozen countries. Of these more than half have incorporated INFORM's broad principles into at least some of their research planning, monitoring, and evaluation. Considerable experience has accumulated as a result. In 1993 and 1994 the use of INFORM in research organizations in Latin America, Asia, and Africa were reviewed by ISNAR and an external review team. A number of conclusions were drawn.

An implementation sequence is necessary

It is clear that in most cases a sequence of activities, rather than a single training event, is necessary to properly implement INFORM in a national agricultural research institute. Initial meetings with top management and institute directors are required, followed by seminars with researchers and their directors. At these meetings INFORM is demonstrated and the information needs of managers is explored. The current state of data on researchers, research activities, budgets, and physical resources, and of any existing information systems is also explored and documented.

After this initial inventory, any additional data needed for management purposes is collected. ISNAR has developed a methodology for efficient data capture. Training typically is given to two staff from each research station in data capture, processing, and production of management reports. Station directors are introduced to skills in harnessing the system to their management needs.

Follow-up visits in the subsequent months assist in the resolution of any problems, and in evaluating the performance of the system according to a standard set of criteria (table 3).

Table 3. Suggested criteria for evaluating an INFORM implementation

Stage	Criteria for evaluation
1	Evidence of standard INFORM data-base files for scientists and experiments for each research center and nationally
2	Practitioners' ability to issue INFORM's standard outputs including the following: – table 1: scientists' activities and time allocations – table 2: experiments and their participating scientists – table 3: research activities and their costs – other graphical outputs
3	Use of INFORM outputs in research institutes and nationally in research planning, monitoring, and evaluation; the number of cycles (years or seasons) for which this has occurred

These focus on the establishment of data-base files, the generation and distribution of outputs, and finally, the institutionalization of INFORM through its integration into the routine cycle of priority setting, program design, budgeting, monitoring, and evaluation. The criteria provide targets for achievement in successive stages of the implementation.

Selection of INFORM practitioners

Practitioners who will be responsible for operating the INFORM system at each research station or institute must be selected with care. At least two practitioners should be trained at each site. They should be staff members likely to remain on post for the coming year or two. Because the value of computer training declines rapidly if not used immediately, they must have good access to a computer at the time of training.

Software selection

In principle, INFORM can be established with any easy-to-use database software with a facility for graphical outputs. However, to date most small INFORM implementations have used the data-base package Reflex. A larger relational data-base model is also available.

Exercise 9. Reflecting on INFORM: an information system for agricultural research management (work in pairs)

Phase 1. Work in pairs (55 minutes)

1. Form pairs, each pair deciding on a rapporteur.
2. Read handout 3.9.1and compare INFORM with your experience in managing information systems in your organization.
3. List two advantages and two disadvantages of this tool.
4. List two recommendations to minimize or overcome the disadvantages of INFORM.

Phase 2. Reporting and discussion (40 minutes)

5. Volunteer to present your report when the trainers invite participants to do so. Remember that few volunteers will be invited. Be one of them!

Exercise 9. Worksheet

DAY THREE

Session 10
Planning and Development of MIS: An Overview

Instructions to Trainers

SESSION 10

14:45 – 15:30 Session 10. Planning and Development of MIS: An Overview

15:30 – 15:45 Tea/Coffee Break

15:45 – 17:00 Session 10. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss the information cycle.
- Define information systems and management information systems.
- Discuss management information system planning.
- Discuss critical success factors for the implementation of MIS.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Give a brief presentation on the planning and development of MIS. You will find the information in handout 3.10.1 very useful to support your ideas. Note that your presentation will be based on handout 3.10.1 only. Exercise 10 will cover handout 3.10.2. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 3.10.1 and be sure to ask participants if they have any comments or questions, or if they need clarification.
(30 minutes)

EXERCISE 10

Exercise 10. Critical success factors. (1 hour 25 minutes)

1. Distribute handouts 3.10.2, 3.10.3, and 3.10.4. Handout 3.10.3 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur.
3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they

may have while working. Be sure to remind them of the time remaining. (40 minutes)

Phase 2. Reporting and discussion

4. *(process)* Have each rapporteur present their group's results to the audience. Each rapporteur has five minutes to present. (20 minutes)
5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (15 minutes)
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 3.10.5 and use handout 3.10.6 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 3.10.7. (15 minutes)

DAY THREE

Session 10
Summary of Overheads

Objectives of Session 10.
Planning and Development of MIS: An Overview

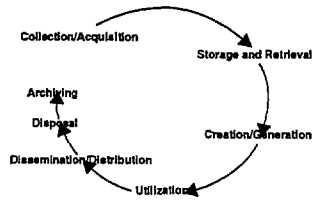
7. Discuss the information cycle
8. Define information systems and management information systems
9. Discuss MIS planning
10. Discuss critical success factors for the implementation of MIS

3.10.1

Planning and Development of Management Information Systems: An Overview

3.10.2

Information Cycle



3.10.3

Information Systems

Sets of elements that interact to provide information required to meet needs of a business entity

3.10.4

Management Information Systems

Sets of elements that interact to provide managers with information they need to make decisions and govern their organizations

3.10.5

Different Characteristics of MIS Structures

- centralized
- hierarchical
- distributed
- decentralized

3.10.6

Systems Development Life Cycle

different phases:

study ----▶ design -------▶ development -------▶ operations

3.10.7

Seven Steps to Analyze and Design a Structural System

1. Investigate the current system
2. Produce specifications of the required system
3. Select from the technical options
4. Produce user specifications
5. Design the data
6. Design the processes
7. Produce the physical design

3.10.8

Seven Reasons for MIS Planning

1. Integrate MIS objectives in the organization's plans
2. Focus on the objective of MIS
3. Provide allocation of resources for MIS developments
4. Ensure an efficient and systematic development of MIS
5. Provide basis for control of MIS projects at all stages
6. Balance MIS benefits and costs
7. Increase participation of users in MIS development

3.10.9

Objectives of MIS Planning

- Provide guidelines for and direction to continuing systems development studies and projects
- Provide a foundation for coordinated development of MIS
- Provide adaptability of MIS to business change and growth
- Minimize cost of integrating related MIS with each other
- Reduce total number of small, isolated systems to be developed, maintained, and operated
- Ensure MIS plan is part of the organization plans
- Ensure resource allocations for information systems development are incorporated in the organization plans

3.10.10

Six Levels of Strategic Planning for MIS

1. Strategic business planning
2. Strategic applications planning
3. Strategic data planning
4. Strategic technology planning
5. Strategic organization planning
6. Migration planning

3.10.11

Critical Success Factors

Management aspects believed to be crucial to the success of an operation

3.10.12

Examples of CSF for INFORM Implementation

- Support from the top management
- Scientists' interest should be met
- Director's cooperation is needed in the selection of MIS trainee practitioners
- An MIS training workshop should include two intending practitioners
- MIS should produce useful outputs soon
- MIS implementation should itself have goals which are defined QQT

3.10.13

Eastern and Southern African Management Institute

Planning and Development of Management Information Systems[1]

An Overview

by

A.S. Sithole

[1] Source: Sithole, A.S. 1995. Information Technology: Overview. Arusha, Tanzania: ESAMI.

Information Cycle

1. Collection/acquisition
2. Storage and retrieval
3. Creation/generation
4. Utilization
5. Dissemination/distribution
6. Disposal
7. Archiving

System

A set of elements that interact to achieve desired goals or objectives. It has inputs, outputs and processes, and has both an internal and external environment. A system has a boundary.

Information Systems

A set of elements that interact to provide information required to meet the needs of a business entity, i.e., strategic, tactical, and/or operation information.

Management Information Systems

Sets of elements that interact to provide managers with information they need to govern their organizations and make decisions.

Management Information System Structures

- Centralized characteristics:
  - use central computer - the creation of a mainframe
  - efficient but tends to be slow in responding to needs of a multi-level organization
- Hierarchical characteristics:
  - type of computing depends on managerial level
  - computer power distributed in terms of managerial information needs
- Distributed characteristics:
  - separate computers support independent centers
  - computer power placed where it is needed
  - provides localized computing support
- Decentralized characteristics:
  - each division handles its own data processing needs
  - more secure in terms of access to unauthorized users
  - expensive
  - duplicate facilities and files

Systems Development Life Cycle

The process includes forward motion and feedback. The cycle helps a management information processing system user define the objectives/goals of that system as well as provide a proven work methodology. The trial and error approach to system development will therefore be

eliminated. The methodology is divided into four (4) main phases, namely **study**, **design**, **development**, and **operations**.

Please note that although there are other methodologies available on the market, the concept is the same.

Study phase

In this phase, problems within a system are identified, alternate system solutions studied and recommendations made. As the end of this phase, management or user or steering committee has to critically review recommendations made and make a decision to retract, re-do study phase activities, or proceed to the next phase.

Design phase

In this phase, a detailed design of the selected system is done. As in the study phase, a review must also be done and decisions made as to whether to re-do the study or design phase or proceed to the next phase. The following actions take place:

- The specifications of the information system are produced, i.e., the outputs, inputs, files/database, processing or procedures (automated/manual), the system controls
- The hardware required to support items specified above
- The infrastructures that will be required to support the planned systems (organization structures, manpower, accommodation, etc.)
- The performance objectives required of the systems

Development phase

In this phase, the system is constructed from specifications prepared in the design phase.

- Development of programs and procedures actually starts as per the specifications above where software is to be developed
- Evaluation, selection and acquisition of software systems which meet the specifications with very minor modifications
- Evaluation, selection and acquisition of hardware systems which will best run the selected software or that to be developed
- Module, program and system tests are performed to ensure that they operate to specifications
- Training of users/management will have to start
- The new/updated system will have to be integrated into the operational business environment. This changeover would have to be in parallel, direct or staged implementation depending on the complexity, the degree of risk and the impact of failure

Operations phase

In this phase, system changeover, operation and maintenance occurs. A series of reviews are also done here.

- Routine operation where all users concerned assume their roles in the new/revised system; anything that can go wrong will go wrong

- A post implementation review must be done by a team headed by the owner/user of the system
- Periodic reviews should be done to check whether the system is performing as planned (see information systems plan objectives); hardware and software expected performance data should also be taken into account
- Requests for changes to the system are managed; if major, there must be top management approval and a proper procedure for the request must be followed. For major repairs there is need to study the impact of no change or change. For general maintenance the information service manager can approve and sometimes even lower ranks.

Structured Systems Analysis and Design

1. Investigate the current system – carry out an analysis of the present system operations and identify the problems.
2. Produce specifications of the required system – produce a logical view of the system.
3. Select from the technical options – identify and specify possible ways of realizing a physical implementation of the system.
4. Produce user specifications.
5. Design the data – construct composite logical data models or entity descriptions of the proposed system.
6. Design the processes – produce a complete logical model or process outline of the validation, enquiry, update and other routines that are to take place in the system.
7. Produce a physical design – produce file/database definitions as well as program specifications, implementation plans, user, and operations manuals.

Management Information System Planning

There are seven major reasons for MIS planning:

1. To integrate MIS objectives in the organization plans (both long- and short-term)
2. To focus on the objective of MIS
3. To provide for allocation of resources for MIS developments
4. To ensure an efficient and systematic development MIS
5. To provide the basis for control of MIS projects at all stages
6. To balance MIS benefits and costs
7. To increase participation of users in MIS development thus avoiding resistance to change

The following is a list of objectives of MIS planning:

1. To provide guidelines for and direction to continuing systems development studies and projects
2. To provide a foundation for coordinated development of consistent, comprehensive, corporate-wise and inter-organization MIS

3. To provide adaptability of MIS to business change and growth without periodic major overhaul
4. To minimize the cost of integrating related MIS with each other
5. To reduce the total number of small, isolated systems to be developed, maintained, and operated
6. To ensure that MIS plan is part of the organization plans
7. To ensure that resource allocations for information systems development are incorporated in the organization plans

Strategic planning for MIS needs to take place at six levels:

1. Strategic business planning

   Describes mainly the management objectives and capital investment guidelines for the organization. Consideration could, however, be given here on implications of technology on the future of the business. Relevant focus regarding MIS could be on the effective and efficient management of information required to support the operations of the business.

2. Strategic applications planning

   Describes the scope of the various sub-systems which are required to handle the data and to produce the required information.

   The applications are considered under:

   - Operational information systems – deliver data and information that is required to support the day-to-day functions of an organization
   - MIS – deliver information required by managers and supervisors on a regular basis
   - Executive information systems (EIS) – support highest level of decisionmaking; the information output is used for long-term planning and evaluation as well as for policy formulation and direction setting

   Tools such as data flow diagrams are used.

3. Strategic data planning

   - The data entities and attributes which are shared in an enterprise are described.
   - Data models are established which could be used in many applications and independent of the applications that use the data.
   - Tools such as TNF analysis, logical data structuring, etc., are used.

4. Strategic technology planning

   - The main elements and options for software, hardware and communications are identified.
   - Broad specifications of the technologies appropriate and to be used by an organization are described.
   - The platform options and technology types are considered.

5. Strategic organization planning

   An analysis is done of the likely organizational requirements as a result of setting up the MIS, i.e., management, personnel, policies and procedures, security and control, etc.

N.B. The five levels of planning outlined must be considered in the light of existing architectures within the organization (which calls for a stocktake of IT resources in place) and available architectures on the market (which calls for a market and industry study to check the availability and sustainability of required technologies).

6. Migration planning

Migration planning takes note of opportunities and constraints that exist (financial or otherwise). Here the outline of a project plan for putting the MIS in place is presented, which will enable an organization to undertake the project in a logical, systematic and coordinated manner. Estimates are made of the likely costs associated with each task in the plan.

Critical Success Factors[1]

Critical success factors (CSFs) are management aspects believed to be crucial to the success of an operation. A set of CSFs for the implementation of an MIS have been derived and are summarized below. Further experience is likely to offer more. In the discussion that follows, problem and suggested solution are presented together. An MIS implementation requires a **sequence of several different interventions** that go beyond a single workshop. This is because attention has to be paid to a number of crucial issues that cannot all be encompassed within the workshop.

For example, it is essential that senior management at both institute and national level are involved, assistance with data capture is needed, either before or after the workshop, and the scientists, the source of much of the data, need to be integrated into the system. The system once established needs to be institutionalized, that is, integrated into the management processes of research planning, program formulation and monitoring. The interventions needed to achieve these several targets are described in more detail below and their essence summarized on the following page.

The **support of top management** needs to be sought at an early stage: he or she needs to have an overview of the system, what it entails in staff time and what it can do for the institution, its manager(s), and its scientists. This applies to national HQ and to individual research institutes and centers.

The **scientists need to be closely involved**, firstly because their cooperation in the supply of data is essential and, secondly, because they have quite a lot to gain from the system themselves. Failure to involve them greatly increases the difficulty of data collection. There is merit in presenting scientists at each institute with a short seminar that demonstrates the essence of the system, describes the benefits (e.g. identification of researchers and experiments in their discipline or commodity) and the costs (filling in a data capture form only once a year). This has proved a valuable means of securing not only their interest but an opportunity for rapid data capture, too. Data capture forms can be distributed, completed and collected during the seminar.

Each institute **director's cooperation is needed in the selection of MIS trainee practitioners**, particularly in choosing people likely to remain in a post for, say, at least the following year.

Suggested Critical Success Factors for INFORM implementation

1. The **support of top management** needs to be sought at an early stage: he or she needs to have an overview of the system, what it entails in staff time and what it can do for the institute, its director and its scientists.
2. Scientists' interests should be met by giving them a short presentation on INFORM, and later by ensuring that outputs from the system reach them, too.
3. The **director's cooperation is needed in the selection of MIS trainee practitioners**, particularly in choosing researchers likely to remain in a post for, say, at least the following year. Scientists selected for the main MIS training workshop for intending INFORM

[1] Extract from: Vernon, R. May, 1994. Evaluation of ISNAR's implementation of INFORM. Discussion Paper No. 94-12. The Hague: ISNAR.

practitioners must have **good access to a computer** at the time of the training. Promises of computer procurement in the future are of little use: the value of computer training declines rapidly if not used.

4. The main MIS training workshop should include **at least two intending practitioners** from each institute, to allow for mutual assistance and support in implementation, and continuity in the event of one being unavailable due to sickness, a training course or maternity, for example.

5. The main MIS training workshop should be coupled closely with a **short course for directors** from the same institutes. They need to have the knowledge of the system's contents and functions to be able to be proactive with regard to the outputs that they receive, rather than passive recipients of what they may or may not be offered by the practitioners.

6. The MIS should produce **useful outputs soon**, firstly for use by station and institute managers, then for national managers and for scientists. This is the whole purpose of the system and if neglected the support of these constituencies will wane. Output from the personnel and project files should proceed without waiting for project budgeting output, which tends to be more complicated and may be included in the next round of output. Absence of some data such as that from a particular program or station should not hold up the issue of outputs for long; if necessary proceed without the missing data this time round. Otherwise the system will take on the time scale of the slowest. Most MIS information declines in value with time.

7. The MIS implementation **should itself have goals**, which (in classic logical framework terminology) should be defined qualitatively, quantitatively and by time (QQT). These will vary in different implementations but a suggested list is as follows:

   a) Within days or a few weeks (T) of the training workshop issue the first MIS outputs, to include summary data (Q_1) on all (Q_2) research projects and research scientists.

   b) Have the MIS outputs used by managers in the next cycle of station, program and institute planning; make output available to research scientists, either printed output to each researcher or where computer usage is widespread, in electronic form.

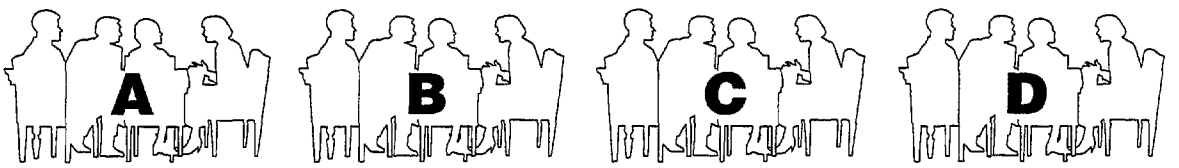
   c) Have the MIS integrated nationally and outputs used in the next cycle of national research program planning.

8. In some countries researchers are expected to report monthly and quarterly and there is sometimes a suggestion that INFORM would assist this task. It is important to recognize that INFORM is a research management information system and deals with aggregated data on key inputs and outputs of research. These do not usually change significantly during a cropping season. Major data capture and reporting, for an agricultural MIS, is therefore **required only annually** or, where there are two crops per year, seasonally. Only change such as new or departing personnel need normally be input at other times.

Exercise 10. Critical success factors (group work)

Phase 1. Group work (40 minutes)

1. Form four groups, each electing a rapporteur.



2. Read handout 3.10.2: "Critical Success Factors" to implement MIS. Discuss and compare with your experience.

   List **as a group**:

   a) Key components of the process which are relevant to your organization

   b) Constraints you face and ways to overcome them

   c) Favorable conditions in your organization to implement MIS

   d) Anticipated results in your organization assuming that MIS is effectively implemented

3. The rapporteur summarizes the results of the group's analysis on the flipchart or overhead to present to the audience.

Phase 2. Reporting and discussion (40 minutes)

5. The rapporteurs present and discuss the results of the groups' work with the audience.

Exercise 10. Worksheet

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day three**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day three**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try out when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY FOUR

Information Management for Research

DAY FOUR — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Design the database structure for physical resources.
2. Discuss tools and techniques for data collection.
3. Define necessary requirements to undertake data collection.
4. List advantages and disadvantages of each method.
5. Discuss management information systems for human resources.
6. Describe the use of human resources management information systems.
7. Practice the design of a database for human resources.

Handouts

4.11.1 Overview
4.11.2 Tentative Schedule
4.11.3 Development and Management of Physical Resources (outline)
4.11.4 Exercise 11. Design the Physical Resources MIS
4.11.5 Exercise 11. Worksheet
4.12.1 Exercise 12. Tools and Techniques for Data Collection
4.12.2 Planning and Development of Management Information System: Data Collection (text)
4.13.1 Management System for Human Resources (text)
4.13.2 Exercise 13. Human Resources MIS
4.13.3 Exercise 13. Worksheet
4.13.4 Strengths and Weaknesses
4.13.5 Guidelines to Provide Feedback on the Workshop
4.13.6 PAPA Form – First Stage

Information Management for Research

DAY FOUR — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 11. Development and Management of Physical Resources** (Presentation and exercise 11)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:45	**Session 11. (Continued)**
11:45 – 13:00	**Session 12. Management Information Systems (MIS): Data Collection** (Presentation and exercise 12)

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 13. Management Information Systems for Human Resources** (Presentation and exercise 13)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 13. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY FOUR — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
4.11.1	Overview	❐	❐
4.11.2	Tentative Schedule	❐	❐
4.11.3	Development and Management of Physical Resources (outline)	❐	❐
4.11.4	Exercise 11. Design the Physical Resources MIS	❐	❐
4.11.5	Exercise 11. Worksheet	❐	❐
4.12.1	Exercise 12. Tools and Techniques for Data Collection	❐	❐
4.12.2	Planning and Development of Management Information System: Data Collection (text)	❐	❐
4.13.1	Management System for Human Resources (text)	❐	❐
4.13.2	Exercise 13. Human Resources MIS	❐	❐
4.13.3	Exercise 13. Worksheet	❐	❐
4.13.4	Strengths and Weaknesses	❐	❐
4.13.5	Guidelines to Provide Feedback on the Workshop	❐	❐
4.13.6	PAPA Form – First Stage	❐	❐

Overheads

4.11.1	Objectives of Day Four	❐	❐
4.11.2	Schedule of Day Four	❐	❐
4.11.3	Objective of Session 11. Development and Management of Physical Resources	❐	❐
4.11.4	Physical Resources	❐	❐
4.11.5	Scope of Physical Resources Management	❐	❐
4.11.6	Information Use	❐	❐
4.11.7	Information Use (continued)	❐	❐
4.11.8	Planning and Development – Macro Level	❐	❐
4.11.9	Planning and Development – Micro Level	❐	❐
4.11.10	Utilization and Support Services	❐	❐
4.11.11	Utilization and Support Services (continued)	❐	❐
4.12.1	Objectives of Session 12. Management Information Systems: Data Collection	❐	❐
4.12.2	Planning and Development of MIS: Data Collection	❐	❐
4.12.3	Tools and Techniques	❐	❐
4.12.4	Qualities of "Good" Data	❐	❐

		Yes ✓	No ✓
4.12.5	Qualities of "Good" Collection	❒	❒
4.13.1	Objectives of Session 13. MIS for Human Resources	❒	❒
4.13.2	Management Information Systems for Human Resources	❒	❒
4.13.3	Personnel	❒	❒
4.13.4	Human Resources MIS	❒	❒
4.13.5	Functions Facilitated by HRMIS	❒	❒
4.13.6	Personnel Management	❒	❒
4.13.7	HRMIS – Information Architecture	❒	❒
4.13.8	Information for Planning	❒	❒
4.13.9	HRMIS – Systems Architecture	❒	❒
4.13.10	Databases	❒	❒
4.13.11	Human Resource Information	❒	❒
4.13.12	HRI – Database	❒	❒
4.13.13	HRMIS – Technological Architecture	❒	❒
4.13.14	Elements of Technological Architecture	❒	❒
4.13.15	Types of Staff	❒	❒

Materials

● Personal Computers	❒	❒
● Printers	❒	❒
● Diskettes	❒	❒
● Spare ink or toner for printers	❒	❒
● Overhead projector	❒	❒
● Spare bulbs for overhead projector	❒	❒
● Extension cords	❒	❒
● Projector screen	❒	❒
● Flipchart stands (minimum 2)	❒	❒
● Flipchart paper/pads (about 10 per day)	❒	❒
● Markers for writing on newsprint	❒	❒
● Markers for writing on transparencies	❒	❒
● Blank transparencies	❒	❒
● Stapler	❒	❒
● Tape (strong masking tape and regular tape)	❒	❒
● Push pins and glue	❒	❒
● Pencils/notepads/pens	❒	❒
● Pencil sharpeners	❒	❒
● Certificates	❒	❒
● Photocopying facilities	❒	❒
● Extra notepads and pens	❒	❒
● Scissors	❒	❒

DAY FOUR

Session 11
Development and Management of Physical Resources

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Review of the previous day's activities.

- Summary of the evaluation of the previous day.

- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day four (handouts 4.11.1 and 4.11.2) to the participants. Review the objectives and schedule using overheads 4.11.1 and 4.11.2. Ask if clarifications are needed. (10 minutes)

SESSION 11

09:00 – 10:30 Session 11. Development and Management of Physical Resources

10:30 – 10:45 Tea/Coffee Break

10:45 – 11:45 Session 11. (Continued)

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Design the database structure for physical resources.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Give a brief presentation on the development and management of physical resources. You will find the information in handout 4.11.3 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handout 4.11.3 and be sure to ask participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 11

Exercise 11. Design the physical resources MIS.
(2 hours 10 minutes)

1. Distribute handouts 4.11.4 and 4.11.5. Handout 4.11.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur.

3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (45 minutes)

Phase 2. Computer practice

4. Assign the groups to the respective computers in the training room. The groups design a database structure, create the database file, create the data entry form, and enter data. (45 minutes)

Phase 3. Reporting and discussion

5. Ask the rapporteurs to present the results of their group's discussion and practice. Approximately five minutes are available for each presentation. (20 minutes)

6. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)

7. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the next session.

DAY FOUR

Session 11
Summary of Overheads

Objectives of Day Four

1. Design the database structure for physical resources
2. Discuss tools and techniques for data collection
3. Define necessary requirements to undertake data collection
4. List advantages and disadvantages of each method
5. Discuss MIS for human resources
6. Describe the use of human resources MIS
7. Practice the design of a database for human resources

4.11.1

Schedule of Day Four

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 11. Development and Management of Physical Resources
	Tea/Coffee Break
10:45 – 11:45	Session 11. (Continued)
11:45 – 13:00	Session 12. Management Information Systems (MIS): Data Collection
	Lunch
14:00 – 15:30	Session 13. MIS for Human Resources
	Tea/Coffee Break
15:45 – 17:00	Session 13. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

4.11.2

Objective of Session 11. Development and Management of Physical Resources

1. Design the database structure for physical resources

4.11.3

Physical Resources

Component	Examples
Buildings:	laboratories, glass houses, field shelters, offices, stores
Land:	experimental, roads and landscape, fencing
Equipment:	routine analytical equipment, tractors, generators, computers
Supplies:	water, power, furniture

4.11.4

Scope of Physical Resources Management

Effective management of resources embraces:

- Procurement – purchasing
- Transportation
- Receiving
- Inventory control – store keeping
- Servicing and maintenance

4.11.5

Information Use

1. Procurement
   - Making correct and right decisions on acquisition of the right quality of materials, at the right time, in the right quantity, from the right source, at the right price

4.11.6

Information Use (continued)

2. Supply
   - Ensure steady supply of materials and services
3. Protection and maintenance of facilities
4. Inventory
5. Planning for space
6. Develop staff, policies, procedures, and organizational structures to meet the above objectives

4.11.7

Planning and Development – Macro Level

1. Macro level issues (at national level)

1.1 Strategies and plan
1.2 Consolidation of stations network
1.3 Regionalization and decentralization
1.4 Rehabilitation
1.5 Supply and purchasing policies
1.6 Maintenance and repair policies
1.7 Personnel development policies
1.8 Inventory control procedures
1.9 Monitoring procedures
1.10 Centralized research support services
1.10.1 Central library and documentation services
1.10.2 Statistics, data processing, and socioeconomics
1.10.3 Plant protection: Museum and collections, survey and identification
1.10.4 Routine chemical analysis of food, feed, pesticides, and fertilizers
1.10.5 Seed banks
1.10.6 Maintenance of scientific instructions

4.11.8

Planning and Development – Micro Level

2. Micro level issues (at station level)

2.1 Buildings
2.2 Land
2.3 Equipment
2.4 Supplies
2.5 Centralized research support services and sharing facilities

4.11.9

Utilization and Support Services

3. Administrative

3.1 Supply and purchasing
3.2 Inventory control
3.3 Storage
3.4 Labor operations
3.5 Transport
3.6 Finance
3.7 Policies and procedures

4. Engineering (physical plant services)

4.1 Operations and management
4.2 Repair and maintenance
4.3 Policies and procedures

4.11.10

Utilization and Support Services (continued)

5. Farm operations

5.1 Land facilities allocations
5.2 Record keeping
5.2.1 Inventory and land database records
5.2.2 Inventory control
5.2.3 Commercial operations
5.2.4 Labor operations
5.2.5 Climatological records
5.3 Land development and maintenance
5.3.1 Experimental and non-experimental land
• Experimental design and plot layout
5.3.2 Soil and water management
5.3.3 Land preparation and levelling
5.3.4 Land levelling and clearing
5.4 Planting, harvesting, and post-harvesting
5.5 Mechanical operations
5.6 Crop and animal husbandry
5.7 Management of pests, nurseries, greenhouses, and field equipment

6. Research and non-research activities directly supporting research

6.1 Library and documentation services
6.2 Experimental design and statistics
6.3 Data management
6.4 Data processing methods
6.5 Land and management and record keeping
6.6 Seed banks
6.7 Pesticide chemical analysis
6.8 Pest and disease identification
6.9 Soil information
6.10 Climatological information

4.11.11

Handout — Overview of Day Four

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Design the database structure for physical resources.
1. Discuss tools and techniques for data collection.
2. Define necessary requirements to undertake data collection.
3. List advantages and disadvantages of each method.
4. Discuss management information systems for human resources.
5. Describe the use of human resources management information systems.
6. Practice the design of a database for human resources.

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4.13.3 Exercise 13. Worksheet
4.13.4 Strengths and Weaknesses
4.13.5 Guidelines to Provide Feedback on the Workshop
4.13.6 PAPA Form – First Stage

Handout — Tentative Schedule of Day Four

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 11. Development and Management of Physical Resources** (Presentation and exercise 11)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:45	**Session 11. (Continued)**
11:45 – 13:00	**Session 12. Management Information Systems (MIS): Data Collection** (Presentation and exercise 12)

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 13. Management Information Systems for Human Resources** (Presentation and exercise 13)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 13. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Development and Management of Physical Resources

Components of Physical Resources (facilities and materials)

1. Buildings

1.1 Multipurpose

1.2 Laboratory

1.2.1 Disciplinary research laboratories, offices for scientists

1.2.2 Service analytical laboratories, offices for technical staff

1.2.3 Gene banks

1.3 Controlled environment

1.3.1 Experimental animal unit

1.3.2 Greenhouses/glass houses

1.3.3 Constant temperature rooms (growth chambers)

1.3.4 Rain-out shelters (for drought experiments)

1.4 Crop research and crop handling

1.4.1 Seed cleaning, drying, bagging, storing, treating

1.4.2 Root washroom

1.4.3 Field shelters

1.5 Livestock

1.5.1 Barns, sheds, chutes, stalls, corrals, pens, poultry houses

1.5.2 Feed storage (silos, hay, silage)

1.5.3 Water/spraying baths

1.6 Services

1.6.1 Office for farm manager

1.6.2 Stores and supply unit (equipment, spare parts, office materials, chemicals, fertilizers, pesticides, laboratory-glassware, others)

1.6.3 Workshops (farm machinery service unit and shed, mechanical/electrical workshops and repair unit, welding workshop, carpentry, masonry, and painting workshop)

1.6.4 Pump-house, powerhouse

1.6.5 Security installations (fences, walls, gates, and gate houses)

1.6.6 Water storage means (ponds, tanks)

1.6.7 Liquid and solid water disposal (including toxic or otherwise environmentally hazardous material)

1.7 Administration

1.7.1 Offices for management, head of sections, scientists, finance, personnel, secretarial/clerical

1.8 Information

1.8.1 Library, documentation, reading room, conference rooms, auditorium

1.8.2 Computer services

1.9 Residential

2. Land

2.1 Experimental

2.2 Non-experimental

2.3 Roads and landscape

2.4 Irrigation and drainage

2.5 Fencing

3. Equipment

3.1 Laboratory

3.1.1 Pre-analysis preparation equipment

3.1.2 Routine analytical equipment of soils, fertilizers, water, pesticides, and feeds

3.1.3 Biological studies equipment: entomology, plant pathology and plant breeding, seed and plant physiology, microbiology, beekeeping, fisheries, animal sciences (physiology, diseases, food, and nutrition)

3.2 Field

3.2.1 Tractors

3.2.2 Tillage and cultivation

3.2.3 Planting

3.2.4 Fertilizer application

3.2.5 Crop protection

3.2.6 Harvesting, threshing, winnowing, hulling, cleaning, and grinding

3.2.7 Crop storage

3.2.8 Soil moisture and in situ soil characteristics determination

3.2.9 Surveying, levelling, and land development

3.2.10 Water pumping and irrigation, water supply control measurement and application

3.2.11 Plant growth, plant/water, and plant physiology

3.2.12 Livestock production (dairying, poultry, beekeeping, fishing)

3.2.13 Weather station (rainfall records, temperature, humidity, radiation, wind, evaporation measurement, soil temperature measurement, weather forecasting)

3.3 Utility

3.3.1 Vehicles for transport of people and materials

3.3.2 Generators, water pumps, refrigerators and air coolers, heating

3.4 Office and library

3.4.1 Typewriters, duplicating and photocopying machines

3.4.2 Drafting, communication and audio-visual equipment

3.4.3 Microcomputers, data- and word-processing

3.5 Workshop

3.5.1 Mechanics' tools, welding plants, hydraulic press, drills, chain, and laboratory equipment

3.5.2 Lathe, milling machines, and equipment required for major vehicles repairs

4. Supplies

4.1 Water (potable and irrigation)

4.2 Power

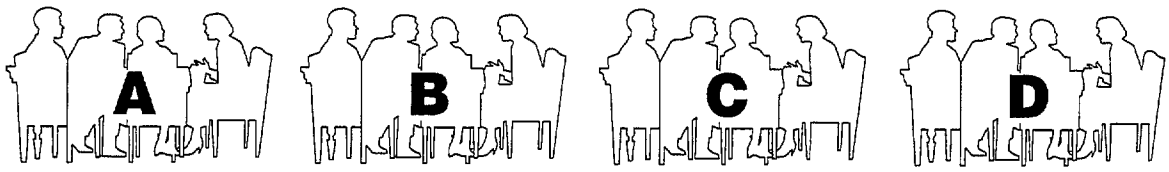
4.3 Expendable (consumable): office and library, laboratory, field, workshop, and utility

4.4 Non-expendable (non-consumable): furniture and others for office and library, workshop, utility, field, and laboratory

Exercise 11. Design the physical resources MIS (group work)

Phase 1. Group work (45 minutes)

1. Form four groups, each electing a rapporteur.



2. Discuss and agree on the following items:
   a. Identify the information needs required for planning purposes at:
      - national level
      - institute level
      - station level
   b. Identify the category of potential users of such information
   c. Identify the information needs required for policymaking purposes
   d. Identify the sources of data that can generate such information
3. Identify the entities and corresponding attributes to be collected and stored in the database.

Phase 2. Computer practice (45 minutes)

4. Design a database structure required for setting up PHYMIS which can supply the information needs identified in phase 1.
5. Create the database file.
6. Create the data entry form and use it to enter 50 records.
7. Use the database to create various report queries.

Phase 3. Reporting and discussion (35 minutes)

8. The rapporteur presents the summary of the group's work to the audience. Use a flipchart or overhead to facilitate your presentation.

Exercise 11. Worksheet

DAY FOUR

Session 12
Management Information Systems (MIS): Data Collection

Instructions to Trainers

SESSION 12

11:45 – 13:00 Session 12. Management Information Systems (MIS): Data Collection

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss tools and techniques for data collection.
- Define necessary requirements to undertake data collection.
- List advantages and disadvantages of each method.

PROCEDURE

Training techniques: presentation, discussion.

PRESENTATION

(experience) Distribute handout 4.12.1. Give a brief presentation on management information systems and data collection. You will find the information in handout 4.12.2 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation be sure to ask participants if they have any comments or questions, or if they need clarification.
(15 minutes)

EXERCISE 12

Exercise 12. Discussion. (55 minutes)

1. *(experience)* Invite participants to jot down key questions related to the tools and techniques which they use and/or might use to collect data for MIS in their organization.
2 *(experience, process)* Open the discussion. Take notes on the flipchart, using key words while the participants formulate and respond to questions.
3. *(process)* Facilitate the discussion and keep it alive.
4. Finally, provide your views on the results of the exercise.
5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

13:00 – 14:00 Lunch

DAY FOUR

Session 12
Summary of Overheads

Objectives of Session 12.
Management Information Systems: Data Collection

2. Discuss tools and techniques for data collection
3. Define necessary requirements to undertake data collection
4. List advantages and disadvantages of each method

4.12.1

Planning and Development of MIS: Data Collection

4.12.2

Tools and Techniques

1. Inspection and reading/examination
2. Observation
3. Statistical sampling and measuring
4. Questionnaires
5. Interviews

4.12.3

Qualities of "Good" Data

- reliable
- qualifiable
- verifiable
- valid
- relevant
- precise
- accurate
- complete

4.12.4

Qualities of "Good" Collection

Good data collection methods must be:
- unbiased
- efficient
- easily administered
- understandable

Good data collection sampling techniques are:
- random sampling
- systematic sampling
- stratified sampling

4.12.5

Exercise 12. Tools and techniques for data collection (plenary discussion)

1. Take notes of major issues presented by the trainer.
2. Remember that the questions and comments related to your job experience will provide the other participants with appropriate insights for analysis and application in their job environment.

Eastern and Southern African Management Institute

Planning and Development of Management Information Systems[1]

Data Collection

by

A.S. Sithole

[1] Source: Sithole, A.S. 1995. Information Technology: Overview. Arusha, Tanzania: ESAMI.

1. Tools and Techniques

1. Inspection and reading/examination
2. Observation
3. Statistical sampling and measuring
4. Questionnaires
5. Interviews

1.1 Inspection and Reading/Examination

Description

Method involves closely looking into system elements for clarification and perusal of written materials about system under investigation.

Things to consider before, during, and after

- Instruction and procedure manuals to understand the way system processes etc. are supposed to be performed
- Forms (data carriers) etc. to understand the system data flows and stores, i.e. purpose, who completes, where routed, authority carried by form, etc.
- Job descriptions and organization charts to understand duties and responsibilities
- Reports of previous system surveys to understand why system is currently operating the way it is
- Corporate plans etc. to understand the overall goal and objectives as well as expected system outputs, key assumptions, objectively verifiable indicators, and methods of verification
- Data collection on volumes, frequencies, trends, ratios, reliance check, i.e. facts and figures given by people against past records, omissions, etc.

When to use the method

- When required facts are documented elsewhere
- To verify and confirm facts collected using other techniques

Advantages

- Helps avoid duplication of effort

Disadvantages

- Misinterpretation of report information
- Difficulty in knowing what to read and when to stop
- Outdatedness of some documents

1.2 Observation

Description

- Method enables one to obtain an overall visual impact of system environments.

Things to consider before, during, and after

- Conditions – noise, lighting, temperature, ventilation?
- Layout – movement and ease of access?
- Furniture – enough? standards? status?
- Supervision – time wasted? interruptions? informal communication?
- Work – methods, sequence, bottlenecks and pace? load balance?
- Equipment – status? utilization?

When to use the method

- During representative periods and not peak times unless those are the periods under investigation
- To verify or confirm data collected using other techniques

Advantages

- Analyst has access to information about system under investigation first hand

Disadvantages

- It is time consuming
- Reaction of system players if they know that they are being observed might not give a true reflection of the actual situation
- There is possible misinterpretation of system processes displayed unless method is supported by other data collection techniques

1.3 Statistical Sampling and Measuring

Description

Method targets a representative portion of a group with an objective of making a general conclusion about system elements in relation to the group.

Things to consider before, during, and after

- The need to categorize the investigation target population by factors that qualify their being homogeneous
- Identification of factors to use as parameters of the investigation, e.g. quantities, times, intervals, rates, costs, etc.
- Data collection on volumes, frequencies, trends, ratios, recurrence, etc.

When to use the method

- To verify or confirm data already collected using other methods
- When other methods cannot provide the facts or the accuracy is suspect
- When there is a large base of data collection points for which it would not be cost-effective to use other methods

Advantages

- All the data need not be collected. A certain representative subset is sometimes sufficient depending on the decisions to be made

Disadvantages

- Services of a specialist may be required to determine sufficiency of the sample
- May be time consuming

1.4 Questionnaires

Description

Document containing a formulated series of questions to assist in the collection of data about a system under investigation.

Things to consider before, during, and after

- Document design
- Type of questions and branching
- Response time
- Mode of transmission
- The respondents intellect'
- Purpose of questionnaire
- Trial run before dispatch
- Response rate

When to use the method

- When no other method is practicable
- Where analyst is located remotely from staff to be questioned
- Where there is a large number of people to collect information from and interviewing all is not feasible
- For verification of facts found by other fact-finding techniques
- When questions are simple and require direct answers, e.g. yes or no

Advantages

- The use of high volume responses
- Inexpensive to administer
- Standardized wording reduces bias
- Eliminates influence from a questioner's voice

Disadvantages

- Has limitations on types of questions that can be asked
- Both questions and answers can be subject to misinterpretation
- Low return rate

1.5 Interviews

Description

Direct conversation between analyst and system key players.

Things to consider before, during, and after

- The purpose
- The interview environment
- Level of questions
- Criticisms
- Differentiation between fact and opinion
- Need to summarize points discussed at the end
- Background information about the interviewee
- Collection of key documents
- Flexibility on line of questioning

When to use the method

- Preferred method where there is easy access to system player
- To confirm already collected data from other methods

Advantages

- Analyst can evaluate what is said and how it is said by interviewee
- Interviewer can offer open-ended questions
- Interviewee can answer in own style
- Rapport could be established with user thereby lessening resistance to change

Disadvantages

- Lack of cooperation from system players
- Time consuming
- Costly

2. Qualities of "Good" Data

In any organization there is a need to collect data and that data has to meet some requirements. The list below contains some requirements for good data.

Good data is:

- reliable
- qualifiable
- verifiable
- valid
- relevant
- precise
- accurate
- complete
- up-to-date although some might be old

3. Qualities of "Good" Collection

When collecting good data, there are conditions that must be fulfilled. Good data collection methods must be:

- unbiased
- efficient
- easily administered
- understandable

Good data collection sampling techniques are:

- random sampling
- systematic sampling
- stratified sampling

DAY FOUR

Session 13
Management Information Systems for Human Resources

Instructions to Trainers

SESSION 13

14:00 – 15:30 Session 13. Management Information Systems for Human Resources

15:30 – 15:45 Tea/Coffee Break

15:45 – 17:00 Session 13. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss management information systems for human resources.
- Describe the use of human resources management information systems.
- Practice the design of a database for human resources.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

Presentation (15 minutes)

1. Distribute handout 4.13.1 at the beginning of this session.
2. *(experience)* Give a brief presentation on management information systems for human resources. You will find the information in the handout very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content.
3. Invite questions from the participants for clarification only.

EXERCISE 13

Exercise 13. Human resources MIS. (2 hours 25 minutes))

1. Distribute handouts 4.13.2 and 4.13.3. Give instructions. Read or invite a participant to read the exercise directions. It is important that you go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask each group to elect a rapporteur. (5 minutes)

3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining to finish the report. (1 hour 15 minutes)

Phase 3. Reporting and discussion

4. Ask the rapporteurs to present the results of their group's discussion. State the amount of time you will allow for each presentation. (maximum 30 minutes)
5. Open the discussion to the audience. Finally, you should provide your views on the results of the exercise. (25 minutes)
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 4.13.5 and use handout 4.13.6 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 4.13.7. (15 minutes)

DAY FOUR

Session 13
Summary of Overheads

Objectives of Session 13.
MIS for Human Resources

5. Discuss MIS for human resources
6. Describe the use of human resources MIS
7. Practice the design of a database for human resources

4.13.1

Management Information Systems for Human Resources

4.13.2

Personnel

One of the key functions of a research organization is to develop and maintain a critical mass of well-qualified scientific and support personnel

4.13.3

Human Resources MIS

- provides effective control and use of information on scientists and support personnel
- enables accurate and efficient administration, management, and analysis of human resource positions

4.13.4

Functions Facilitated by HRMIS

- Administration
- Management
- Analysis

4.13.5

Personnel Management

Administration
- Recruitment
- Examinations
- Assignment
- Initial training
- In-service training
- Promotions
- Payroll
- Retirement pensions

Management
- Personnel strategies and policies
- Financial resources planning
- Management of institutions
- Retrenchment (downsizing)

Analysis
- Personnel profiles
- Deployment

4.13.6

HRMIS – Information Architecture

Information areas:
- research strategies and policies
- personnel time allocation and time sheets
- employment/personnel forms
- data on retirement benefits

4.13.7

Information for Planning

- Personal data
- Education data
- Activity data
- Employment data
- Training data

4.13.8

HRMIS – Systems Architecture

Responsible for maintaining data on research personnel policies, scientists, support personnel, and activities related to scientists

4.13.9

Databases

Databases facilitate proper management of information

- may contain large volumes of data
- are readily accessible
- can be implemented on computers of all sizes

4.13.10

Human Resource Information

- Research scientists
  - Biodata: Who are they ?
  - Researcher activity: What do they do?

4.13.11

HRI – Database

- Biographic data
- Time allocation
- Experiment titles & time allocated to
- SBA of a researcher

4.13.12

HRMIS – Technological Architecture

Defines the nature of the hardware, sofware, and communications technology required to support the information and systems architectures

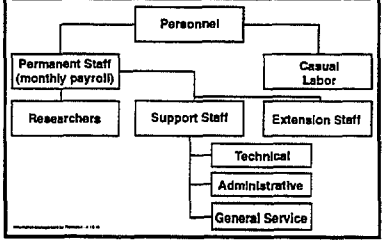
4.13.13

Elements of Technological Architecture

- Application-specific factors
- Use of "open systems architectures"
- Software portability

4.13.14

Types of Staff



4.13.15

Eastern and Southern African Management Institute

Management System for Human Resources[1]

by
Howard M. Shila

[1] Source: Shila, Howard M. 1995. End-user database processing using dBase. Designer Manual. Arusha, Tanzania: ESAMI.

Abstract

One of the key functions of a research organization is to develop and maintain a critical mass of well-qualified scientific and support personnel. However, the current emphasis in most countries in the region is increased productivity from work force, freezes on recruitment, short-term working and retrenchment. This requires more accurate and reliable information about the government's or organization's most important resource – people. In the context of a research organization, the people are the research scientists and support personnel. Information on human resources in this case will help determine the most appropriate manpower and personnel strategies and policies and allow them to be implemented effectively. This requires a technically reliable and efficient Human Resource Management Information System (HRMIS).

This paper develops a strategic framework for the network of systems required to support human resources management in a research organization. The strategy consists of:

- an information architecture;
- a system architecture; and
- a technological architecture.

The methodology used focuses on the business of functional processes within human resources management and the database.

1. Introduction

The importance of human resource management in agriculture and natural resources research in developing countries has become increasingly evident in the context of the emphasis on increased productivity from a small but efficient work force. An important element of human resource management has been to develop and implement computerized database systems of scientific and support personnel to support research activities. Such initiatives have formed important components of several workshops on database and information management in the region.

This paper addresses issues relating to MIS for human resources in agriculture and natural resources research for the Malawi national workshop on database and information management. The paper emphasizes the database technology approach in designing an effective and efficient Human Resources Management Information System (HRMIS).

2. The Need for Information Management

Human resources information is a fundamental resource of any research organization. It is essential to the operations and management of a research institution that is often justifiably referred to as the "life blood" of the research institution just like in living organisms. It is needed at many planning and decision functions at all levels – policy, institutional and station level.

Proper management of any resource involves making it available for the intended purpose and controlling its use so as to maintain its integrity, ensuring that it is used as intended and that it will be available for future use. Human resources information needs to be controlled and made available for various general personnel and research programming management and administrative functions. This requires an effective MIS for human resources to deliver the correct amount of sufficiently accurate and concise information required by research managers. Such a system must have a corporate database containing all data on research scientists and support personnel.

Database technology facilitates the proper management of information because it creates a shared database environment and enhancement of future data availability, evolvability and integrity. Specifically:

- Databases can store large volumes of corporate operational data such as human resources data.
- Databases can be queried on an ad hoc basis, making them the foundation for decision support systems. Data stored in a database can be readily accessed and processed in different forms for different processes, functions and users at different times.
- Databases can be implemented on computers of all sizes and processor architectures, making them feasible for almost any business or organization.

3. The Issue of Human Resources Management Information System

With a successful corporate human resource database, the NARS can research the past, organize the present, and plan for the future. HRMIS will provide the effective control and use of information on scientists and support personnel to enable accurate and efficient administration, management, and analysis of human resource position as indicated below:

- Administration:
  - Training and development
  - Compensation and benefits
  - Retirement benefits
  - Payments and incentives
  - Recruitment, termination and retrenchment processes
- Management:
  - Research personnel strategies and policies
  - Planning of research financial resources
  - Annual program planning and formulation (in particular resource allocation)
  - Management of research institutions
- Analysis:
  - Research personnel profiles – gender profile, discipline distribution, scientists' deployment by commodities/projects, age limits, qualification profiles, and activity profiles

4. The HRMIS – Information Architecture

The business processes grouping and information areas applicable to human resources management in research are as follows:

- Develop research strategies and policies
- Administer research personnel
- Manage research personnel
- Allocate resources
- Administer salaries, benefits, and allowances
- Administer retirements
- Manage research institutions

The information areas are:

- Research strategies and policies
- Personnel time allocation time sheets
- Employments/personnel forms
- Data on retirement benefits

5. The HRMIS – Systems Architecture

This group of systems is responsible for maintaining the data on the research personnel policies, scientists and support personnel, and the activities related to these scientists. This group of systems would consist of several interrelated modules, including:

- Research personnel information system which maintains:
  - Scientists biodata: Who are they? (Personal data, education data, training data, and employment data)
  - Activity data: Time allocation. What do they do? (Overall work-related activities: research management/administration, extension, teaching, or degree study; specific research activities: experiments or studies)
  - The support personnel on roll
- Salary Benefits and Allowances - SBA system which administers the salaries and related allowances
- The career planning and training modules that will assist in these aspects of HR management of research personnel in the NARS

The HRMIS interface with the projects and financial systems to form a complete integrated MIS for research.

6. The HRMIS – Technological Architecture

The technological architecture defines the nature of the hardware, software, and communications technology required to support the information and systems architectures. The components of a technological architecture include:

- The nature, size, and distribution of the computer-processing facilities and associated workstations
- The nature of the communications interconnections between the computer-processing facilities
- The nature and type of
  - Systems and applications development software
  - Database Management Software (DBMS)
  - Office support systems software
  - Special purpose software to support analytical or statistical capabilities, text management, desktop publishing, graphics, etc.

The technological architecture provides the basis for:

- selecting appropriate technology to support the systems architecture
- guiding acquisition of hardware, software, and communication facilities
- ensuring integration and compatibility of component elements of the architecture

7. Elements of Techological Architecture

The elements of the technological architecture will be country specific. Discussion here is restricted to the factors which need to be kept in mind while making technology choices.

7.1 Application-specific factors

Some of the application-specific factors that define the functional characteristics of the application system and determine the choice of information technology are (see Table 1):

- The volume of data to be handled and the sizes of the databases required to be maintained
- The volumes and rates of transactions that take place against the databases and the number of concurrent users of the system
- Centralized processing versus distributed processing to widely separated locations
- The type of the data handled by the system – primarily numeric or textual and whether it pertains to a given time slice or requires time series
- The nature of output facilities required by the system: desktop publishing, graphics, report writing, imaging, etc.
- The nature of analytical facilities required, e.g., modelling, statistical analysis tools, etc.
- Whether shell software packages are available to assist in the implementation of the system

Table 1. Application-specific factors determining the choice of information technology

Data volumes	Processing	Analytical models	Type of data handled	Output facilities	Package available
high	some distributed processing	some analytical capabilities	text management facilities	depot and application generator	available core requirements
low	periodic transfer of data to center	statistical	forms design facilities	graphics	

In general, the data volumes and transaction rates determine the computing power requirements at a particular node of the system and the degree of sophistication required in the database management software used. High transaction rate systems with a large number of concurrent users require sophisticated database management software. The data distribution profiles and the nature and frequency of information flows between component modules of the system or other modules of MIS for research network determine the nature of the telecommunications facilities that will be required. The frequency of information flows between the nodes of the network determine whether the telecom link needs to be active all the time or whether information at periodic intervals will suffice.

In general, it is advisable to opt for packaged software solutions where feasible. However, efforts should be made to ensure that the chosen software provides the core functionality required and is written in an environment (e.g. using fourth generation languages, application development tools and relation database management systems) that makes it easy to add to and change its features. The use of these tools also increases application development productivity and provides easy-to-use facilities for end-users.

7.2 Use of "open systems architectures"

The use of hardware/software that conform to open systems standards adds tremendous flexibility in technology choices.

7.3 Software portability

Portability of applications software to different hardware environments ensures that organizations are not locked into one proprietary line of hardware, and that applications that use this software can be scaled to different environments.

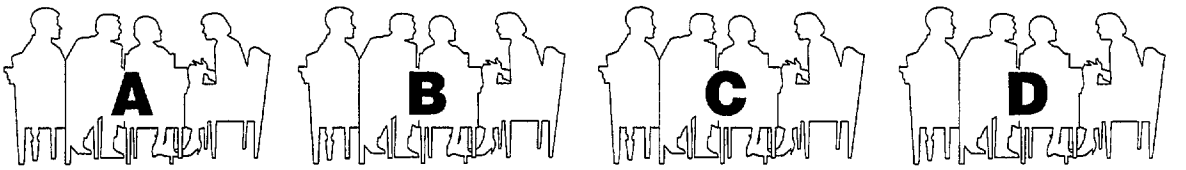
8. HRMIS Reports

With a successful database and a DBMS with a 4 GL environment, various reports of all kinds can be produced such as lists of scientists by their disciplines, qualifications, basic salaries, gender, station, date of birth, date of appointments, just to mention a few. The database can be queried to display a view of selected records meeting specified criteria or grouped by departments, discipline, commodity or station.

Exercise 13. Human resources MIS (group exercise)

Phase 1. Group work (20 minutes)

1. Form four groups, each electing a rapporteur.



2. Discuss and agree on the following items:
   a) Identify the information needs required for planning purposes at:
      - national level;
      - institute level;
      - station level.
   b) Identify the category of potential users of such information.
   c) Identify the information needs required for policymaking purposes.
   d) Identify the sources of data that can generate such information.
3. Identify the entities and corresponding attributes to be collected and stored in the database.

Phase 2. Computer practice (60 minutes)

4. Design a database structure required for setting up a HRMIS which can supply the information needs identified in phase 1.
5. Create the database file.
6. Create the data entry form and use it to enter 50 records.
7. Use the database to create various reports queries.

Phase 3. Reporting and discussion (55 minutes)

8. The rapporteur presents the summary of the group's work to the audience. Use a flipchart or overhead to facilitate your presentation.
9. The trainer will invite you to raise key questions about this session in the following open discussion.

Exercise 13. Worksheet

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day four**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day four**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instruction to trainers
   - visual aids
   - handouts
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY FIVE

Information Management for Research

DAY FIVE — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the establishment and development of an MIS: data analysis.
2. Discuss the normalization process (TNF Analysis).
3. Apply the logical data structuring technique.
4. Identify and practice composite logical data structure.

Handouts

5.14.1 Overview
5.14.2 Tentative Schedule
5.14.3 Establishment and Development of an MIS: Data Analysis (text)
5.14.4 Strategic Data Planning: Logical Data Structuring (text)
5.14.5 Exercise 14.1. Carrying out a Normalization Process
5.14.6 Exercise 14.1. Worksheet
5.14.7 Exercise 14.2. Developing a Logical Data Structure
5.14.8 Exercise 14.2. Worksheet
5.14.9 Strengths and Weaknesses
5.14.10 Guidelines to Provide Feedback on the Workshop
5.14.11 PAPA Form – First Stage

Information Management for Research

DAY FIVE — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 14. Establishment and Development of an MIS: Data Analysis** (Presentation and exercise 14.1 and 14.2)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 14. (Continued)**
13:00 – 14:00 Lunch	
14:00 – 15:30	**Session 14. (Continued)**
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 14. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY FIVE — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
5.14.1	Overview	❒	❒
5.14.2	Tentative Schedule	❒	❒
5.14.3	Establishment and Development of an MIS: Data Analysis (text)	❒	❒
5.14.4	Strategic Data Planning: Logical Data Structuring (text)	❒	❒
5.14.5	Exercise 14.1. Carrying out a Normalization Process	❒	❒
5.14.6	Exercise 14.1. Worksheet	❒	❒
5.14.7	Exercise 14.2. Developing a Logical Data Structure	❒	❒
5.14.8	Exercise 14.2. Worksheet	❒	❒
5.14.9	Strengths and Weaknesses	❒	❒
5.14.10	Guidelines to Provide Feedback on the Workshop	❒	❒
5.14.11	PAPA Form – First Stage	❒	❒

Overheads

5.14.1	Objectives of Day Five	❒	❒
5.14.2	Schedule of Day Five	❒	❒
5.14.3	Normalization	❒	❒
5.14.4	Benefits of Normalization	❒	❒
5.14.5	Relational Terminology	❒	❒
5.14.6	Types of Keys	❒	❒
5.14.7	Properties of a Relation	❒	❒
5.14.8	Steps in Normalization	❒	❒
5.14.9	Example of Normalization	❒	❒
5.14.10	Example of a Repeating Group	❒	❒
5.14.11	Example of a Non-Repeating Goup	❒	❒
5.14.12	Example of a Repeating Group (2)	❒	❒
5.14.13	Convert the Unnormalized Table to First Normal Form (1NF)	❒	❒
5.14.14	Convert 1NF Relation to 2NF	❒	❒
5.14.15	Convert 2NF Relation to 3NF	❒	❒
5.14.16	Synthesize 3NF Relations into a Data Model	❒	❒
5.14.17	Examples of Normal Forms	❒	❒
5.14.18	Example of a Second Normal Form (2NF)	❒	❒
5.14.19	Example of a Third Normal Form (3NF)	❒	❒

		Yes ✓	No ✓
5.14.20	Purpose of Logical Data Structuring Technique	☐	☐
5.14.21	Procedures for Logical Data Structuring Technique	☐	☐
5.14.22	Steps in DFD	☐	☐
		☐	☐

Materials

● Personal Computers	☐	☐
● Printers	☐	☐
● Diskettes	☐	☐
● Spare ink or toner for printers	☐	☐
● Overhead projector	☐	☐
● Spare bulbs for overhead projector	☐	☐
● Extension cords	☐	☐
● Projector screen	☐	☐
● Flipchart stands (minimum 2)	☐	☐
● Flipchart paper/pads (about 10 per day)	☐	☐
● Markers for writing on newsprint	☐	☐
● Markers for writing on transparencies	☐	☐
● Blank transparencies	☐	☐
● Stapler	☐	☐
● Tape (strong masking tape and regular tape)	☐	☐
● Push pins	☐	☐
● Glue	☐	☐
● Pencils/notepads/pens	☐	☐
● Pencil sharpeners	☐	☐
● Certificates	☐	☐
● Photocopying facilities	☐	☐
● Extra notepads and pens	☐	☐
● Scissors	☐	☐

DAY FIVE

Session 14
Establishment and Development of an MIS: Data Analysis

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Review of the previous day's activities.

- Summary of the evaluation of the previous day.

- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day five (handouts 5.14.1 and 5.14.2) to the participants. Review the objectives and schedule using overheads 5.14.1 and 5.14.2. Ask if clarifications are needed.(10 minutes)

SESSION 15

09:00 – 10:30 Session 14. Establishment and Development of an MIS: Data Analysis

10:30 – 10:45 Tea/Coffee Break

10:45 – 13:00 Session 14. (Continued)

13:00 – 14:00 Lunch

14:00 – 15:30 Session 14. (Continued)

15:30 – 15:45 Tea/Coffee Break

15:45 – 17:00 Session 14. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss the establishment and development of an MIS: data analysis.
- Discuss the normalization process (TNF analysis).

- Apply the logical data structuring technique.
- Identify and practice composite logical structure.

PROCEDURE

Training techniques: presentation, computer demonstration, group work.

PRESENTATION

(experience) Give a brief presentation on data analysis and the establishment of an MIS. You will find the information in handouts 5.14.3 and 5.14.4 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handouts 5.14.3 and 5.14.4 and be sure to ask participants if they have any comments or questions, or if they need clarification. (45 minutes)

EXERCISE 14.1

Exercise 14.1. Carrying out a normalization process. (2 hours)

1. Distribute handouts 5.14.5 and 5.14.6. Handout 5.14.5 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into the same four groups as in the previous session and ask them to elect a rapporteur.
3. *(experience)* Groups design a database on research projects using dBase IV. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (1 hour 20 minutes)

Phase 2. Reporting and discussion

4. Ask the rapporteurs to present the results of their group's work. Approximately five minutes are available for each presentation. (20 minutes).
5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

EXERCISE 14.2

Exercise 14.2 Developing a logical data structure. (3 hours 40 minutes)

1. Distribute handouts 5.14.7 and 5.14.8. Handout 5.14.7 gives clear instructions for the exercise. Go over the

instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. *(experience)* Groups design a database on research projects using dBase IV. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (2 hours 40 minutes)

Phase 2. Reporting and discussion

3. Ask the rapporteurs to present the results of their group's work. Approximately ten minutes are available for each presentation. (40 minutes).
4. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this

day on handout 5.14.9 and use handout 5.14.10 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 5.14.11. (15 minutes)

DAY FIVE

Session 14
Summary of Overheads

Objectives of Day Five

1. Discuss the establishment and development of an MIS: data analysis
2. Discuss the normalization process
3. Apply the logical data structuring technique
4. Identify and practice a composite logical data structure

5.14.1

Schedule of Day Five

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 14. Establishment and Development of an MIS: Data Analysis
	Tea/Coffee Break
10:45 – 13:00	Session 14. (Continued)
	Lunch
14:00 – 15:30	Session 14. (Continued)
	Tea/Coffee Break
15:45 – 17:00	Session 14. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

5.14.2

Normalization

- ▲ A technique examining dependencies between data items, so that data items which are found to be related in certain ways can be grouped together
- ▲ Ensures that any piece of information is represented only once in the organizational data model

5.14.3

Benefits of Normalization

- ✔ A fairly mechanical process for producing a data model
- ✔ Leads to identification of attributes overlooked in the data modelling process
- ✔ Leads to identification of entities overlooked in the data modelling process
- ✔ Is used to check E-R model produced by the data modelling process

5.14.4

Relational Terminology

Relation – two-dimensional table of data

Tuple – row in the table

Domain – column in the table

5.14.5

Types of Keys

Key	– domain or domains which uniquely distinguish all tuples in a table
Simple Key	– key requiring only a single domain to establish identity
Compound Key	– key where more than one domain is required to establish identity
Composite Key	– compound key in which at least one domain of the key is not a unique identifier and therefore needs to be linked with other domains

5.14.6

Properties of a Relation

1. Each domain must be a unique data item and have a unique name
2. No two tuples are identical
3. The sequence of tuples and domains should not be significant

5.14.7

Steps in Normalization

(1) Convert the document into an unnormalized form or UNF

(2) Convert the unformalized table to first normal form (1NF)

(3) Convert 1NF relations to second normal form (2NF)

(4) Convert 2NF relations to third normal form (3NF)

(5) Synthesize 3NF relations into a data model

(6) Check synthesized model is in 3NF

5.14.8

Example of Normalization

The Academic Database System of a University

The Unormalized Table

Student Code Number	STUDCODE
Name	STUDNAME
Address	ADDRESS
Sex	SEX
Course Code	CCODE
Course Title	CTITLE
Tutor Code Number	TUTCODE
Tutor Name	TUTNAME

5.14.9

Example of a Repeating Group

For students:

Student Number	F123654
Name	James Sanderson
Address	3 Beech Close, Warrington
	WR3 2BH
Sex	Male

Course Code	Course Title	Tutor Code	Tutor Name
4PDCS1	Computing	124	R.Webb
4PDRE1	Electronics	133	T.Parks
4PDMA	Mathematics	148	L.Williams

5.14.10

Example of a Non-Repeating Group

For staff:

	PERNO	SNAME	PERSEX	MARITAL	DOB	SEX	DOA	GRADE	SALARY
1	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000
2	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000
3	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000
4	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000

5.14.11

Example of a Repeating Group (2)

For staff:

	DEGREE	COLLEGE	YEAR	SUBJECT
1	BSC.	Cambridge	1980	Agriculture
2	MSC.	Harvard	1983	Entomology
3	MPHIL.	Harvard	1985	Technology
4	PHD.	Univ. of Mrv.	1990	Control

5.14.12

Convert the Unnormalized Table to First Normal Form (1NF)

1. Identify a key for the unnormalized table
2. Remove all repeating groups
3. Move the repeating group along with the original key
4. Identify and underline a new key for the new relation

Rule: a 1NF relation has no repeating group

5.14.13

Convert INF Relation to 2NF

1. Examine whether domains are dependent on the whole key or just part of it
2. If a particular domain depends more on part of the key than the whole key, then that domain with that part-key should be removed to a new relation
3. Pose the question for each non-key domain in turn to achieve this

Rule: In 2NF all non-key attributes are dependent on the whole key

5.14.14

Convert 2NF Relation to 3NF

1. For each pair of non-key domains in the region ask:

   "Does the domain depend more strongly on the other domain in the pairing than it does on the key?"
2. If the answer is yes, create a new relation

Rule: All non-keys attributes are independent of each other

5.14.15

Synthesize 3NF Relations into a Data Model

1. For each relation, draw a box and name it
2. Connect 1: Many relationships between with crows foot on:
   - box with a foreign key
   - box with co-linked keys

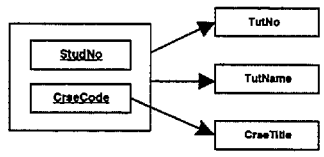
5.14.16

Examples of Normal Forms

1. Normal Form	2 Normal Form	3 Normal Form
STUDCODE	STUDCODE	STUDCODE
STUDNAME	STUDNAME	STUDNAME
ADDRESS	ADDRESS	ADDRESS
SEX	SEX	SEX
STUDCODE	STUDCODE	STUDCODE
CCODE	CCODE	CCODE
CTITLE	TUTCODE	TUTCODE
TUTCODE	TUTNAME	
TUTNAME		
	CCODE	CCODE
	CTITLE	CTITLE
		TUTCODE
		TUTNAME

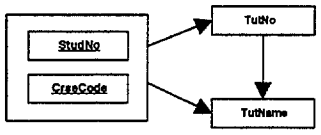
5.14.17

Example of a Second Normal Form (2NF)



5.14.18

Example of a Third Normal Form (3NF)



5.14.19

Purpose of Logical Data Structuring Technique

Provide an accurate model of the data structures of the organization which will act as a framework for development of new or enhanced systems

5.14.20

Procedures for Logical Data Structuring Technique

1. Select entities within the system environment
2. Investigate and record the associations between entities thereby creating an LDST grid
3. Convert the LDST grid into an LDST chart
4. Produce an LDS or dependence diagram
5. Identify keys for each entity and their relations
6. Add data to each entity
7. Validate the LDS against system requirements and TNF relations

5.14.21

Steps in DFD

1. Record the attributes or data elements, highlight the key identifier
2. Remove repeating attributes from their UNF relation, create a new relation for them
3. Remove any partial key dependent attributes from the FNF relation
4. Remove the non-dependent attributes or fields, which are not currently identified as keys

5.14.22

Handout — Overview of Day Five

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the establishment and development of an MIS: data analysis.
2. Discuss the normalization process (TNF Analysis).
3. Apply the logical data structuring technique.
4. Identify and practice composite logical data structure.

Handouts

5.14.1 Overview
5.14.2 Tentative Schedule
5.14.3 Establishment and Development of an MIS: Data Analysis (text)
5.14.4 Strategic Data Planning: Logical Data Structuring (text)
5.14.5 Exercise 14.1. Carrying out a Normalization Process
5.14.6 Exercise 14.1. Worksheet
5.14.7 Exercise 14.2. Developing a Logical Data Structure
5.14.8 Exercise 14.2. Worksheet
5.14.9 Strengths and Weaknesses
5.14.10 Guidelines to Provide Feedback on the Workshop
5.14.11 PAPA Form – First Stage

Handout — Tentative Schedule of Day Five

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 14. Establishment and Development of an MIS: Data Analysis** (Presentation and exercise 14.1 and 14.2)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 14. (Continued)**
13:00 – 14:00 Lunch	
14:00 – 15:30	**Session 14. (Continued)**
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 14. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Eastern and Southern African Management Institute

Establishment and Development of an MIS[1]:

Data Analysis

by
A.S. Sithole

[1]Sithole, A.S. 1995. Establishment and Development of an MIS. Arusha, Tanzania: ESAMI.

Normalization Process

Definition

Normalization is a technique for examining dependencies between data items, so that data items which are found to be related in certain ways can be grouped together.

Some Terminology

- **Relation**: a two dimensional table of data
- **Tuple**: a row in a table
- **Domain**: a column in a table
- **Key**: domain (b) which uniquely distinguish all tuples in a table
- **Simple Key**: requiring only single domain to establish identity
- **Compound Key**: more than one domain is required to established identity
- **Foreign Key**: a domain in one relation which is a key in other relation

A Relation

Product

Key ↓ Part-no	Description	Domain ↓ Quantity	Location
A133	incl bolt	20	Bin 1
A150	Washer	10	Bin 3
B222	nut	15	Bin 7
C750	Flange	5	Bin 9

Properties of a Relation

A table is said to be a relation if the following is true:

a) Each domain must be a unique data item and have a unique name

b) No two tuples are identical

c) The sequence of tuples and domains shall not be significant

Steps in Normalization

1. Convert the document into an unnormalized form (UNF)
2. Convert the unnormalized table to first normal form (1NF)
3. Convert 1NF relations to second normal form (2NF)
4. Convert 2NF relations to a third normal form (3NF)
5. Synthesize 3NF relation into a Data Model
6. Check synthesized model is in 3NF

Convert into an Unnormalized Table

Each attribute on the document becomes a domain in the UNF. Just list all attributes.

e.g. UNNORMALIZED SMB INVOICE

Invoice-No
Invoice-date
Order-no
Order-date
Cust-no
Cust-name
Address
Prod-code
Description
Uom
Qty del
Unit Cost

Convert Unnormalized Table to First Normal Form (1NF)

- Identify a key for the unnormalized table
- Remove all repeating groups. (A repeating group of domains or a domain that may occur with multiple values for a single occurrence of the key)

1NF

<u>Invoice-No</u>
Invoice-date
Order-no
Order-date
Cust-no
Cust-name
Cust-address

<u>Invoice No</u>

<u>Prod-code</u>
Description
Uom
Qty del
Unit-cost

Convert 1NF Relations to Second Normal Form (2NF)

- Examine whether domains are dependent on whole key or just part of it
- Applies only to INF relations with compound keys
  If a particular domain depends more on part of the key than the whole key, that domain with part key should be removed to a separate relation.

2NF

Invoice-no
Invoice date
Order-no
Order-date
Cust-no
Cust-name
Cust-address

Invoice-No
Prod-code
Qty-del

Product-code
Description
Uom
Unit-cost

Convert 2NF Relations to Third Normal Form (3NF)

- For each pair on non-key domains ask:
  - "Does the domain depend more strongly on the other domain in the pairing than it does on the key?"
- If the answer is yes, then a new relation is created.

In the invoice example, order-date depend more on order-no; Cust-name, Cust-address depend more on customer-no than on invoice-no.

3NF

Invoice-No	
Invoice-date	*Invoice-no
*Order-no	*Product-code
*Cust-no	Qty-del
Order-no	Product-code
Order-date	Description
	Uom
Cust-no	Unit-cost
Cust-name	
Cust-address	

Synthesize 3NF Relations Into a Data Model

- Identify relations whose keys are identical
- Create a composite relation out of domains from both relations

Check that Synthesized Data Model is in 3NF

Guidelines for Performing Normalization

a) Identifying data sources for normalization potential sources:

- documents used by the current system
- existing manual records
- existing computer transaction master and history files
- reports and screens

b) Aliases

- one domain with more than one name
- try use one name only

c) Processing codes

- data item which have no bearing on the data analysis, e.g. data codes, record counts, etc.
- ignore these in normalization

d) Calculated Fields

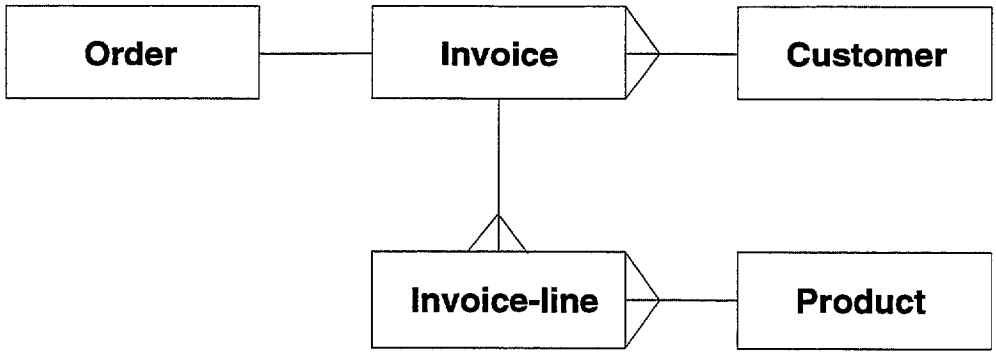
(e.g. totals and subtotals)
- ignore calculated fields

Drawing the Data Model

- Each relation becomes an entity
- A relationship is established between a foreign key and its counterpart entity
- Establish the degree of relationship

Benefits of Normalization

- A fairly mechanical process for producing a data model
- Identification of attributes overlooked in the data modeling process
- Possible identification of entities overlooked in the data modeling process
- Is used to check data models



Data Model for SBM Invoice

Another Example of Normalization

The Academic Database System of a University:

The Un-Normalized Table:

Student Code Number	STUDCODE
Name	STUDNAME
Address	ADDRESS
Sex	SEX
Course Code	CCODE
Course Title	CTITLE
Tutor Code Number	TUTCODE
Tutor Name	TUTNAME

Example of a Repeating Group

For students:

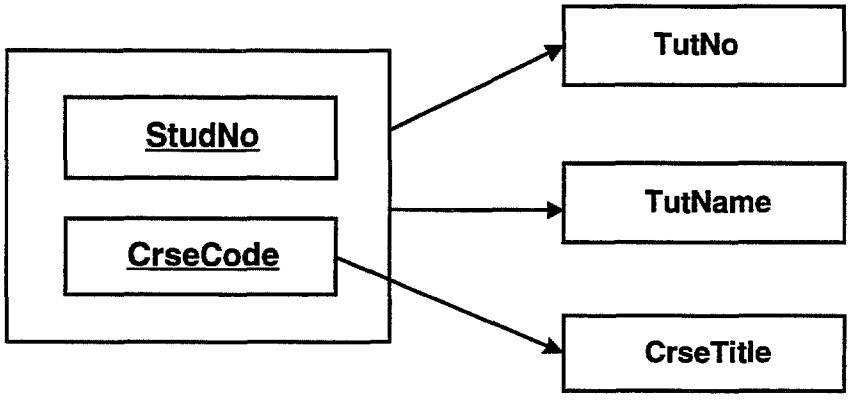
Student Number	F135654
Name	James Sanderson
Address	3 Beech Close, Warrington WR3 2BH
Sex	Male

Course Code	Course Title	Tutor Code	Tutor Name
4PDCS1	Computing	124	R.Watkin
4PDNE1	Electronics	133	T.Parks
4PDMA	Mathematics	146	L.Williams

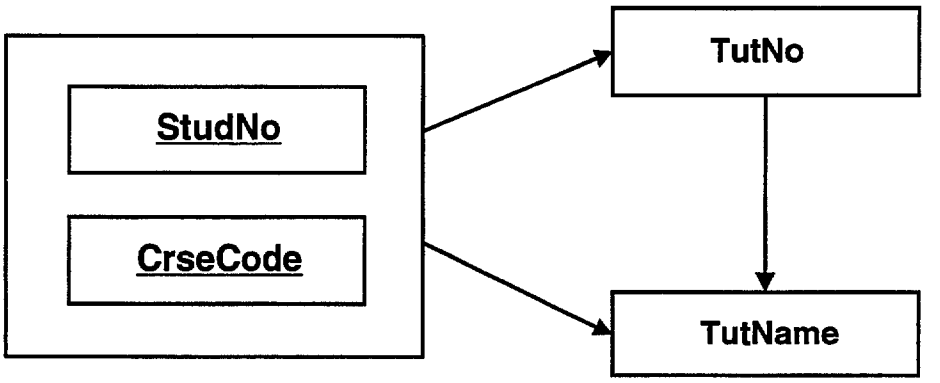
Examples of Normal Forms

1. Normal Form	2 Normal Form	3 Normal Form
STUDCODE	STUDCODE	STUDCODE
STUDNAME	STUDNAME	STUDNAME
ADDRESS	ADDRESS	ADDRESS
SEX	SEX	SEX
STUDCODE	STUDCODE	STUDCODE
CCODE	CCODE	CCODE
CTITLE	TUTCODE	TUTCODE
TUTCODE	TUTNAME	
TUTNAME		
	CCODE	CCODE
	CTITLE	CTITLE
		TUTCODE
		TUTNAME

Example of a Second Normal Form (2NF)



Example of a Third Normal Form (3NF)



Eastern and Southern African Management Institute

Strategic Data Planning[1]:

Logical Data Structuring

by
A.S. Sithole

[1]Source: Sithole, A.S. 1995. Establishment and Development of an MIS. Arusha, Tanzania: ESAMI.

Another example of Normalization

Logical Data Structuring Technique (LDST)

Purpose

To provide an accurate model of the data structures of the organization which will act as a framework for development of new or enhanced systems.

To provide a model independent of any data storage and access method, to allow objective decisions to be made about implementation techniques and co-existence with existing systems.

Basic conventions

- **Entity Name**

An entity of data group as represented by a rectangle and labeled as shown. The entity must be singular and shown in all capitals. Each identity must be uniquely identifiable, i.e. each occurrence of an entity must be separate and distinctly identifiable from all other instances of that type of entity.

- **Entity 1 - Entity 2**

A relationship is a significant association between two entities as shown here. The relationship between entities can be one to many as shown, or many to one, or many to many.

Procedure

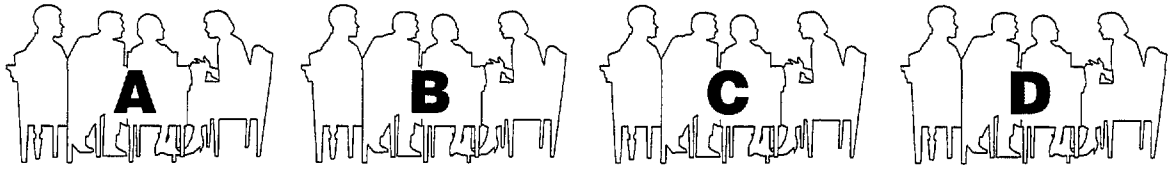
1. Select or identify entities or data groups within the system environment you are analyzing, i.e. ask the question "What things need to be individually identified and referred to?"
   A straightforward way of selecting data groups or entities, is to identify "notational keys" in the system or application environment:
   - customer number
   - product number
   - supplier number
   - purchase order number
   - sales order number
   - account number
   - policy number
2. Investigate and record the significant associations between the entities thereby creating an LDST grid.
3. Convert the LDST grid into an LDST chart showing the different relationship between entities.
4. Produce an LDS or dependence diagram showing the relationships.
5. Identify the keys for each of the entities and their relations.

6. For each entity add other data you may need to refer to, thereby forming your data architecture or model.
7. Validate the LDS against system requirements and TNF relations (optimized) thereby forming composite LDS from which you can build your data dictionary.

Exercise 14.1. Carrying out a normalization process (group work)

Phase 1. Group work (1 hour 20 minutes)

1. Form the same groups as in exercise 13 and elect a rapporteur.



2. From the human resource database structure that you developed earlier, select one of the entities.
3. Carry out a normalization process of the selected entity.
4. Use the handout as a guide for this exercise.
5. The rapporteur summarizes the group's work.

Phase 2. Reporting and discussion (35 minutes)

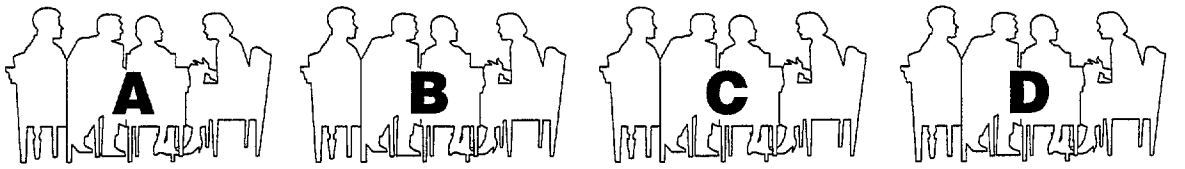
6. The rapporteurs present and discuss the results of the groups' work. They can use flipcharts or overheads to facilitate their reports.
7. The trainer provides feedback on the content of the presentations.

Exercise 14.1. Worksheet

Exercise 14.2. Developing a logical data structure (group work)

Phase 1. Group work (2 hours 40 minutes)

1. Form the same groups as before, each electing a rapporteur.



2. Develop a logical data structure (LDS) for human resources, using the procedures outlined in handout 5.14.5 as a guide.
3. The rapporteur summarizes the group's work.

Phase 2. Reporting and discussion (55 minutes)

4. The rapporteurs present and discuss the results of the groups' work. They can use flipcharts or overheads to facilitate their presentations.
5. The trainer provides feedback on the content of the presentations.

Exercise 14.2. Worksheet

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day five**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day five**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY SIX

Information Management for Research

DAY SIX — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Design a database structure.
2. Design data entry forms on the computer.
3. Discuss MIS project initiation.
4. Identify main steps in project planning.
5. Develop the logframe for an MIS project.

Handouts

6.15.1 Overview
6.15.2 Tentative Schedule
6.15.3 Designing a Database Structure (text)
6.15.4 Exercise 15. Designing Database Structures
6.15.5 Exercise 15. Worksheet
6.15.6 Data Analysis and Modeling (text)
6.16.1 Forms Design (text)
6.16.2 Exercise 16. Designing Forms
6.16.3 Exercise 16. Worksheet
6.17.1 MIS: Project Initiation and Planning (summary of presentation)
6.17.2 Logical Framework (text)
6.17.3 Exercise 17. Developing a Logical Framework
6.17.4 Strengths and Weaknesses
6.17.5 Guidelines to Provide Feedback on the Workshop
6.17.6 PAPA Form — First Stage

Information Management for Research

DAY SIX — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 15. Designing a Database Structure** (Presentation with demonstration and exercise 15)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 15. (Continued)**

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 16. Forms Design** (Presentation with demonstration and exercise 16)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 17. Management Information Systems (MIS): Project Initiation** (Presentation and exercise 17)
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY SIX — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
6.15.1	Overview	❒	❒
6.15.2	Tentative Schedule	❒	❒
6.15.3	Designing a Database Structure (text)	❒	❒
6.15.4	Exercise 15. Designing Database Structures	❒	❒
6.15.5	Exercise 15. Worksheet	❒	❒
6.15.6	Data Analysis and Modeling (text)	❒	❒
6.16.1	Forms Design (text)	❒	❒
6.16.2	Exercise 16. Designing Forms	❒	❒
6.16.3	Exercise 16. Worksheet	❒	❒
6.17.1	MIS: Project Initiation and Planning (summary of presentation)	❒	❒
6.17.2	Logical Framework (text)	❒	❒
6.17.3	Exercise 17. Developing a Logical Framework	❒	❒
6.17.4	Strengths and Weaknesses	❒	❒
6.17.5	Guidelines to Provide Feedback on the Workshop	❒	❒
6.17.6	PAPA Form — First Stage	❒	❒

Overheads

6.15.1	Objectives of Day Six	❒	❒
6.15.2	Schedule of Day Six	❒	❒
6.15.3	Objective of Session 15. Designing a Database Structure	❒	❒
6.15.4	Designing a Database File	❒	❒
6.15.5	Data Types	❒	❒
6.15.6	Database File Definition Form	❒	❒
6.16.1	Objective of Session 16. Forms Design	❒	❒
6.16.2	Designing Data Entry Screens (Forms) - I	❒	❒
6.16.3	Designing Data Entry Screens (Forms) - II	❒	❒
6.16.4	Template Characters	❒	❒
6.16.5	Picture Options and Edit Options	❒	❒
6.16.6	Designing Data Entry Screens (Forms) - III	❒	❒
6.16.7	Forms Design/Plan	❒	❒
6.17.1	Objectives of Session 17. MIS: Project Initiation	❒	❒

		Yes ✓	No ✓
6.17.2	The Management Cycle	☐	☐
6.17.3	Project Cycle	☐	☐
6.17.4	Project Step 1: Identify Objectives	☐	☐
6.17.5	Objectives Should Be	☐	☐
6.17.6	MIS Project	☐	☐
6.17.7	Uses of Project Proposal	☐	☐
6.17.8	Project Step 2: Prepare Proposal	☐	☐
6.17.9	The Project Proposal Contains	☐	☐
6.17.10	The Proposal Layout Should Include	☐	☐
6.17.11	The Logical Framework	☐	☐
6.17.12	Logical Framework Matrix (1)	☐	☐
6.17.13	Logical Framework Matrix (2)		

Materials

● Personal Computers	☐	☐
● Printers	☐	☐
● Diskettes	☐	☐
● Spare ink or toner for printers	☐	☐
● Overhead projector	☐	☐
● Spare bulbs for overhead projector	☐	☐
● Extension cords	☐	☐
● Projector screen	☐	☐
● Flipchart stands (minimum 2)	☐	☐
● Flipchart paper/pads (about 10 per day)	☐	☐
● Markers for writing on newsprint	☐	☐
● Markers for writing on transparencies	☐	☐
● Blank transparencies	☐	☐
● Stapler	☐	☐
● Tape (strong masking tape and regular tape)	☐	☐
● Push pins	☐	☐
● Glue	☐	☐
● Pencils/notepads/pens	☐	☐
● Pencil sharpeners	☐	☐
● Certificates	☐	☐
● Photocopying facilities	☐	☐
● Extra notepads and pens	☐	☐
● Scissors	☐	☐

DAY SIX

Session 15
Designing a Database Structure

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Review of the previous day's activities.

- Summary of the evaluation of the previous day.

- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day six (handouts 6.15.1 and 6.15.2) to the participants. Review the objectives and schedule using overheads 6.15.1 and 6.15.2. Ask if clarifications are needed. (10 minutes)

SESSION 15

09:00 – 10:30 Session 15. Designing a Database Structure

10:30 – 10:45 Tea/Coffee Break

10:45 – 13:00 Session 15. (Continued)

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Design a database structure.

PROCEDURE

Training techniques: presentation, computer demonstration, group work.

PRESENTATION

(experience) Distribute handout 6.15.3. Divide the participants into small groups and invite them to take their places at the computers. Ask each group to elect a rapporteur. Give a presentation on designing a database structure, following handout 6.15.3, demonstrating **step by step** how to create a first database file, etc. Invite the participants to repeat each step on their computers. Assist them carefully. This demonstration might be slow, but is necessary to prepare the participants for exercise 15. (1 hour 45 minutes)

EXERCISE 15

Exercise 15. Developing a database structure.
(1 hour 55 minutes)

1. Distribute handouts 6.15.4 and 6.15.5. Handout 6.15.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. *(experience)* Groups design a database on research projects using dBase IV. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (1 hour 15 minutes)

Phase 2. Reporting and discussion

3. Ask the rapporteurs to present the results of their group's work. Approximately five minutes are available for each presentation. (20 minutes).
4. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

13:00 – 14:00 Lunch

DAY SIX

Session 15
Summary of Overheads

Objectives of Day Six

1. Design a database structure
2. Design data entry forms on the computer
3. Discuss MIS project initiation
4. Identify main steps in project planning
5. Develop the logframe for an MIS Project

6.15.1

Schedule of Day Six

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 15. Designing a Database Structure
	Tea/Coffee Break
10:45 – 13:00	Session 15. (Continued)
	Lunch
14:00 – 15:30	Session 16. Forms Design
	Tea/Coffee Break
15:45 – 17:00	Session 17. Management Information Systems (MIS): Project Initiation
17:00 – 17:30	Feedback on the Day's Activities and PAPA

6.15.2

Objective of Session 15. Designing a Database Structure

1. Design a database structure

6.15.3

Designing a Database File

Create a database file:

1. define the fields
   - primary keys
   - field names
   - field data types
   - field width (lengths)
   - decimal places for numeric fields
   - indexing fields
2. create the database structure
   - enter the fields
3. save the database structure

6.15.4

Data Types

- Numeric type – N or NUM

  Fields containing numeric values, e.g., money amounts or quantities to be used in calculations

- Character or alphanumeric type – C or CHAR

  A field which may contain text, or a mixture of text, symbols, or numbers

- Date type – D

  A field may be used to represent a date in the form dd/mm/yy or mm/dd/yy, etc. Date type fields enable the database to compare dates held in records with a specific date

- Logical type – L

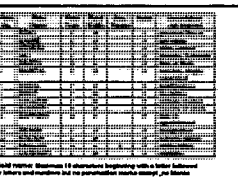
  This type of field allows the entry of two possible values, indicated by T (true) or F (false). Sometimes, Y(es) and N(o), respectively may be used instead

- Memo fields

  Very large volume of text

6.15.5

Database File Definition Form



6.15.6

BEST AVAILABLE COPY

Handout — Overview of Day Six

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Design a database structure.
2. Design data entry forms on the computer.
3. Discuss MIS project initiation.
4. Identify main steps in project planning.
5. Develop the logframe for an MIS project.

Handouts

6.15.1 Overview
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6.16.3 Exercise 16. Worksheet
6.17.1 MIS: Project Initiation and Planning (summary of presentation)
6.17.2 Logical Framework (text)
6.17.3 Exercise 17. Developing a Logical Framework
6.17.4 Strengths and Weaknesses
6.17.5 Guidelines to Provide Feedback on the Workshop
6.17.6 PAPA Form — First Stage

Handout — Tentative Schedule of Day Six

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 15. Designing a Database Structure** (Presentation with demonstration and exercise 15)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 15. (Continued)**

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 16. Forms Design** (Presentation with demonstration and exercise 16)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 17. Management Information Systems (MIS): Project Initiation** (Presentation and exercise 17)
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

End-user Database Processing

Designing a Database Structure[1]

[1] Extract from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

1. Creating Your First Database File

1.1 Creating database catalog

To help you organize your files, dBase IV enables you to group them into catalogs. We shall create a catalog called **RESEARCH** to help you organize your first database file. The general steps are as follows:

1) Press **F10** to move to the menu bar.
2) Choose **Catalog** (usually it is the first highlighted menu).
3) Choose **Use different Catalog**. A submenu appears on the upper-right hand corner.
4) Choose **<Create>**. You will see this prompt: **Enter name for Catalog:-**
5) Type the new catalog name: **RESEARCH**.
6) Press the **ENTER** key.

NOTE: Most of the names of the files you create must follow the rules below:

- The name can be no more than eight characters long.
- The name can contain numbers 0 to 9 **BUT** cannot contain blank spaces or punctuation marks such as (? * . $: ; .). The only special symbols allowed are the underline score (_) and hyphen (-).
- You can use upper or lowercase letters, but lowercase letters are automatically converted to upper case.

At this point your screen should look like the one in Figure 1 below and it should be empty in the panels except the label **<Create>** at the top of each panel. The current catalog is now named **C:\DBASE\RESEARCH.CAT**. dBase automatically adds the file extension **.CAT**.

In the next section you will be introduced to the process of designing a database file, defining the fields, creating the database structure using the dBase IV Control Center, and saving your completed database structure.

Catalog Tools Exit 4:30:15 pm

DBASE IV CONTROL CENTER

CATALOG: C:\DBASE\RESEARCH.CAT

Data	Queries	Forms	Reports	Labels	Applications
<create>	<create>	<create>	<create>	<create>	<create>
HRMIS PROGDB FINADB PHYRDB	PATH OVER55 SAL ENTOM PHD MSC	HRF PRGOF FINF RESF	HR1 HR2 PROG1 PROG2		HRAP1 HRAP2 PROGAP FINAP

File: Newfile
Description: Press ENTER on <create> to create a new file

Help: F1 Use: Data F2 Design: Shift-F2 Quick Report: Shift-F9 Menus: F10

Figure 1. dBase IV Control Center.

KEY	RESULT
F1 HELP	Display on-screen help
F2 DATA	Switch between Browse or Edit screen
F3 Previous	Move cursor to previous field (Browse/Edit), object (queries design screen)
F4 Next	Move to next field (Browse/Edit), (queries design screen)
F5	Add or modify field layout surface; add or remove field from view skeleton
F6 Extended select	Select contiguous text and fields
F7 Move	Move selected text and fields
F8 Copy	Copy selected text and fields
F9 Zoom	Enlarge/Shrink memo fields, condition boxes, some data fill-ins, and skeletons, show/hide files in DOS utilities directory tree
F10 Menus	Access Menu for current screen
Shift + F1 Pick list	Display list of items available for current fill-in
Shift + F2 Design	Display the design screens
Shift + F3 Find previous	Locate previous occurrence of search string
Shift + F4 Find next	Locate next occurrence of search string
Shift + F6 Replace	Replace search string with another string
Shift + F7 Size	Change the length and width of the frames that enclose an object
Shift + F8 Ditto	Copy data from corresponding field of previous record into current field
Shift + F9 Quick report	Print a quick report of data
Shift + F10	Access macros prompt

Figure 2. Summary of dBase IV's function key assignments.

2. Designing a Database File

2.1 Defining the fields

Define the fields you want to use in your records by specifying the following options:

- **Field name**: Assign unique field names to each field. For example: Last Name may be named **LNAME** and Date of birth **DBIRTH**, etc.
- **Field Data Types**: select field types – Character-**C**, Numeric-**N**, Float-**F**, Date-**D**, Logical-**L**, and Memo-**M**.
- **Field Width**: Specify the maximum width for each – letters, digits and characters.

- **Decimal places**: For numeric field types, you must specify the number of decimal places that the field requires if any.
- **Indexing a file**: Indicate the field(s) to be used for indexing your database by **Y-yes or N-no**.

We shall now use the database file definition form as shown below (Figure 3), to define the database structure (**Schema**) for the Human Resources database file for RESEARCH.

Data type	Description	Examples
Character	Any textual information that has no true numeric value and has maximum length of 254 characters	Lwandala AA30
Numeric	Any true numeric value on which you may want to perform arithmetic operations; usually used for quantities and prices	120, -150, 1505.56
Float	Basically the same as Numeric, with some minor technical differences	10.0, 160.67
Date	Any date stored in the format mm/dd/yy	12/04/94
Logical	Contains either true **.T.** or false **.F.** value and no other information; for example, you could create a field named **Paid** as the logical data type, with **.T.** meaning tuition fee has been paid and **.F.** for tuition fee not paid.	**.T.** or **T** **.F.** or **F**
Memo	Very large volume of text perhaps including several paragraphs	Abstracts, comments, lengthy descriptions

Figure 3. Sample database file definition form.

Field No.	Field Name	Field Type	Field Width	Dec. Places	Index	Description not entered
1	PFNO	C	10		Y	personal file no
2	LNAME	C	15		N	last name
3	OTHERS	C	15		N	other names
4	SEX	C	1		N	M=male, F=female
5	DBIRTH	D	8		N	date of birth
6	MARITAL	C	15		N	married, single etc.
7	HQUAL	C	15		N	qualification
8	DISCP	C	20		N	discipline
9	COLLEGE	C	20		N	college studied
10	COUNTRY	C	15		N	country of study
11	DAPPOINT	D	8		N	date of appointment
12	DESIGN	C	15		N	designation
13	STATION	C	20		N	current station
14	BSALARY	N	8	2	N	basic salary
15	CATEGORY	C	20		N	category

Notes:
Field Name: Maximum 10 characters beginning with a letter followed by letters and numbers but no punctuation marks except _ and no blanks.
Field Type: **C**=Character, **N**=Numeric, **D**=Date, **L**=Logical, **M**=Memo.
Field Width: Maximum for Character=**254**, Numeric=**20**. Others supplied by dBase.
Dec. Places: Number of digits after the decimal point (at least 2 less than the width).
Index: **Y for Yes, N for No.**

Figure 4. Sample database file definition form.

2.2 Creating the database structure

We shall now use dBase IV's **Control Center** to create our database structure. The following steps will guide you:

1) Use arrow keys to move the highlight to the **DATA** panel.

2) Select **<Create>**.

3) Press **ENTER** key.

4) dBase will display a **database design screen** like the one below (Figure 5).

Layout Organize Append Go To Exit 12:15:00
bytes remaining: 3000

Num	Field Name	Field Type	Width	Dec	Index
1	PFNO	Character	10		Y

Database C:\dbase\<new> Filed 1/1

Enter the field name: Insert/Delete field: **Ctrl-N/Ctrl-U**
Field Names begin with a letter and may contain letters, digits and underscores.

Figure 5. Sample database design screen.

2.3 Entering fields

Make sure that the blinking cursor is in the Field Name column on the screen. The status at the line at the bottom should show "1/1" meaning that you are working with Field 1. Now type each field name and press **ENTER** follow these steps:

1) Type **LNAME** and press **ENTER** key to move cursor to **Field Type**.

2) Press **C** for character data type, the cursor moves to **Width**.

3) Type **10**, the width and press **ENTER** key to move to **Index**.

4) Type **Y** to index the **LNAME** field.

The number "**2**" appears in the Num column of the next line, indicating that dBase IV is ready for you to enter the information for a second field.

Repeat steps 2.3.1 through 2.3.4 to enter information for fields 2 through 15.

Some general instructions

In the **Field Name** column you type each field name and press **ENTER** key, while in the **Field type** column, depending on the data type, you should simply press: **C** for character data type; **N** for numeric data type; **D** for date data type; **L** for logical data type; **M** for memo data type.

NOTE that when you press **C, N, D, L,** or **M** the cursor moves to **Width** column so you don't need to press the **ENTER** key in this case. BUT in the **Width** column you simply type the value of the field width and press the **ENTER** key. In the **Index** column you just press **ENTER** or **N**. Unless you want to create an index on the field you have just entered then you should enter **Y**.

2.4 Saving a database structure

When you have added all the fields as they appear in the database file definition form, you need to save your structure. Press **Ctrl+End** and you will be asked to type the name of the file you want to save. Type **HRDB** or any other file name you want to use for your database file, and press **ENTER.** Otherwise use the menu as follows:

1) Press **F10**.

2) Select **Save this Database structure.**

3) When you see the prompt "Save as:" type **HRDB** and press **ENTER.**

4) You can exit now, OTHERWISE you will be asked whether you wish to enter data records by this prompt "Do you want to enter new records, **Y/N ?"** or **"Add new records, Y/N ?"**. You simply press **Y** to respond to "yes" for you to enter new records or **N** to return to Control Center. See the completed structure below.

Layout Organize Append Go To Exit 12:15:00
bytes remaining: 3000

Num	Field Name	Field Type	Width	Dec	Index
1	PFNO	Character	10		Y
2	LNAME	Character	15		N
3	OTHERS	Character	15		N
4	SEX	Character	1		N
5	DBIRTH	Date	8		N
6	MARITAL	Character	15		N
7	HQUAL	Character	15		N
8	DISCP	Character	20		N
9	COLLEGE	Character	20		N
10	COUNTRY	Character	15		N
11	DAPPOINT	Date	8		N
12	DESIGN	Character	15		N
13	STATION	Character	20		N
14	BSALARY	Numeric	8	2	N
15	CATEGORY	Character	20		N

Database C:\dbase\<new> Filed 1/1

Enter the field name: Insert/Delete field: **Ctrl-N/Ctrl-U**
Field Names begin with a letter and may contain letters, digits and underscores

Figure 6. Sample completed database structure.

Normally dBase IV creates on the disk a file such as **HRDB in this case**, with the extension **.dbf** which will contain your actual data records; a file on the disk with the extension **.mdx** which will contain the production master index; a file with extension **.dbt** which will contain data entered into the MEMO fields.

2.5 Returning to the control center

To leave the Database Design screen and return to the Control Center do the following:

1) Press **F10** (or press **Ctrl+End** shortcut).

2) Choose **Exit** menu.

3) Choose **Save Changes and Exit.**

Notice that the HRDB database file is now listed in the Data panel.

C O N G R A T U L A T I O N S !

You can now exit and take a short break: Open the **Exit** menu, select **Quit to Dos.**

3. Summary

3.1 To create a database catalog

1) Press **F10**.
2) Select **Catalog** menu.
3) Select **Use Different Catalog**.
4) Select **<Create>.**
5) Type catalog name and press **ENTER**.

3.2 To create a database structure

1) At the Control Center's Data Panel select **<Create>** and **ENTER**.
2) Enter field names, data types, widths, decimal places, and index for each field in the database design screen.

3.3 To save a completed database structure

1) Press **F10**.
2) Select **Save this file structure**.
3) Type a valid file name for the database.
4) Press **ENTER**.

   Notice that to Save and Exit select **Exit**.
5) Select **Save changes and Exit** or simply press **Ctrl+End**.

3.4 Modifying the database structure

1) In the Data Panel, select the file you want to modify.
2) Choose **Modify Structure**.
3) Make your changes in the structure accordingly.
4) Press **ALT-E** and select **Exit** to quit.

The next chapters deal with opening your file, adding and changing information.

You are most welcome!

4. Opening a Database File

4.1 Selecting a database file

Any single catalog may contain several database files. Therefore, before you start entering information into a database you need to tell dBase IV which database file you want to use.

4.2 Opening a database file

At the Control Center:

1) Move the highlight to the Data Panel.
2) Highlight the database file name.
3) Press **ENTER.**
4) Select **USE this file.**

   Note: The database file name is placed in the create area and appears in the File Description.

4.3 Adding more records

1) OPEN THE FILE (if not opened).
2) Press **F2.**
3) Press **F10.**
4) Choose **Records.**
5) Select **Add Records.**
6) SAVE YOUR WORK.

To save your work and return to the Control Center:

1) Press **F10** or (Alt + E).
2) Choose **EXIT.**
3) Select **Save changes and EXIT.**

4.4 Sorting a database through an index

1) Press **F2** to go to the browse menu screen.
2) Select **Organize.**
3) Select create **NEW INDEX.**
4) Select **Name of Index.**
5) Type in an index name using characters.
6) Press **ENTER.**
7) Select **Index Expression.**
8) Type in an index expression or build me using the Expression Builder (**SHIFT+F1**).
9) Select **Order of Index.**
10) Choose between Ascending and Descending Order by pressing the **Space Bar.**
11) Press **CTRL+END.**

4.5 Sorting by PFNO or (MANNO)

1) Choose **Organize.**
2) Select **Create New Index.**
3) Select **Name of Index.**
4) Type **PFNO** or **MNO** and press **ENTER.**
5) Select **INDEX Expression.**

OR

1) Press **SHIFT+F1** to access the expression Builder.
2) Move the highlight to the PFNO or MNO field.
3) Press **ENTER.**
4) Press **ENTER** to complete the selection.
5) Press CTRL+END.

   Overwrite if necessary.

4.6 Activating an index

1) Choose **Organize.**
2) Select **Order Records by Index.**
3) Select the name of the index you want to use or Natural Order if you want to view your records in their original (unsorted) order.
4) Select PFNO or MNO.

Records are displayed in alphabetical order by PFNO.

NOTICE that dBase will automatically keep all indexes up to date, even if you add, change, or delete database records.

4.7 Modifying an index

Let us modify the PFNO index so that it displays employees names sorted by PFNO or MNO and by Last Name—LNAME.

Assuming you are at the browse screen:

1) Choose **Organize.**
2) Select **Modify Existing Index.**
3) Select PFNO or MNO as index to modify.
4) Select Index Expression.
5) Press **SHIFT+F1** to call up the Expression Builder menu.
6) Highlight the + Operator and press **ENTER.**
7) Press **SHIFT+F1** again to call up the Expression Builder.

8) Highlight **LNAME** and press **ENTER**.

9) The index expression now reads **PFNO+LNAME**.

10) Press **ENTER** to complete the change.

11) Press **CTRL+END** to finish the process.

4.8 Sorting a database file

Let us sort the **HRDB** file in date of appointment—ascending order.

If you are currently at the Control Center, move the highlight to HRDB and Press **F2**, until you get to the BROWSE Screen. Then:

1) Choose **Organize**.

2) Select **Sort Database on Field List**.

3) Press **SHIFT+F1** to display fields.

4) Highlight **DAPPOINT** — Press **ENTER**.

5) Press **ENTER** to complete the entry.

6) Select Ascending ASCII — **ENTER**.

7) Press **CTRL+END**.

8) Type any valid filename at the prompt "**ENTER name of sorted database file**" — **HRSORT** and Press **ENTER** twice.

NOTICE: The sorted records are in the database file named **HRSORT** or the file you entered. **EXIT**.

The sorted file appears in the Control Center's Data Panel.

4.9 To view the sorted database file

1) Highlight HRSORT.

2) Press **F2**: Data.

The browse screen appears. When you are done, choose **EXIT** to Control Center.

4.10 To delete a file

For example, to delete HRSORT at the Control Center's Date Panel

1) Close the file if in use.

2) Highlight the HRSORT file name in the Data Panel.

3) Press **F10**.

4) Choose **Catalog**.

5) Select **Remove Highlighted filename** in the Data Panel.

6) Message "**Are you sure you want to remove the file from the Catalog?**" appears.

7) The message "**Do you want to delete this file from the disk?**" appears.

8) Select "**Yes**"

HRSORT does not exist anymore.

4.11 Retrieving the data

Three primary ways of getting information out of your database and onto your screen.

- Displaying everything in the database — **BROWSE — F2.**
- Search for a specific record based on information you enter, such as Employee number. **This is called SEARCHING.**
- You can request to see only those records that meet specific conditions. **This process is called QUERYING the database.**

4.12 Listing only certain records: searching the database

4.12.1 Basic searches

a) Searching by record number — RECORD POINTER

- The GO TO option
- TOP RECORDS — Moves the edit screen or browse highlight to top of record
- LAST RECORD — Moves the edit screen or browse highlight to the bottom record
- RECORD NUMBER — Moves the edit screen or browse highlight to a particular record based on its position = in the database
- SKIP — Moves the edit screen or browse highlight a certain number of records from its current position

The ALT + First letter of the MENU is the shortcut for opening menus.

b) Searching a field for specific information — FORWARD SEARCH AND BACKWARD SEARCH

These commands look through the field designated by the CURSOR, beginning with the current record number, for whatever data you specify. You may want to find information such as employee's address or grade. To use the **Forward** and **Backward Search** options in the **Go To** menu, you first position the highlighter on the field that you want to search in the database.

You then pull down the **Go To** menu and select either **Forward** to search forward from the current record, or **Backward Search** to Search backward from the current record. After dBase finds the first record that matches the search requirements, you can use the **Find Next Key (SHIFT-F4)** or **Find Previous Key (SHIFT-F3)** to search forward or backward for other matching records. If no match is found, dBase displays the message "Not Found".

4.13 Using uppercase & lowercase

4.13.1 Lowercase

Suppose that you were searching for a name but were not sure whether it was spelled **Shila** or **Shilla** or **Shillah; a search for Shila would not locate other spellings. dBase** offers several techniques that you can use to add flexibility to your database search.

4.13.2 Wild card searches

a) matching capitalization

This is set to either **YES** or **NO**

If it is set to **YES**, a forward or backward search is case sensitive; the **Upper** and **Lower case** letters in the search string must match those in the database.

If it is set to **NO**, **Upper** and **Lower case** designation does not matter.

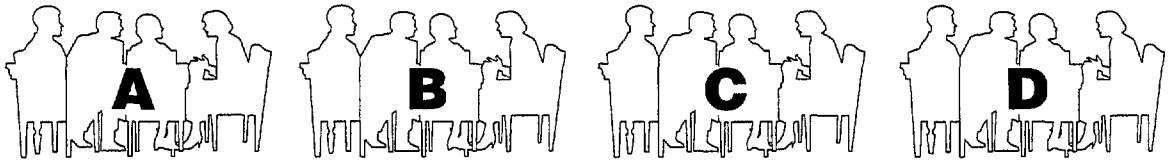
Examples: If match capitalization is set to **NO**: then a search for **Shila** locates **Shila, SHILA**. However if it is set to **YES**, then a search for **SHILA** finds only **SHILA** *not* **Shila** or **shila**.

b) wild card searches

Exercise 15. Designing database structures (group work)

Phase 1. Group work (1 hour 15 minutes)

1. Form four groups, each electing a rapporteur.



2. These attributes have been identified to be useful in the collection of data on research projects:

Project title	**Budget year**	**Starting date**
Expected completion date	**Objectives**	**Keywords**
Lead scientist	**Other scientists**	**Sources of funds**

The sources of funds are classified as:

1. Government funds

2. Donor funds

3. Internal funds

Provide appropriate field names and design the corresponding database structure of this application. Long fields may be appropriately placed in **MEMO** fields.

Note, however, that for administrative purposes, all projects need to be identified with an identity number.

3. Do you think your database is adequately normalized? Support your answer(s) with complete appropriate normalization concepts or techniques.

4. Use dBase IV database management system to do the following:

   a) Create your database and save it by the name **PROJ1**.

   b) Enter 20 records from your station.

Phase 2. Reporting and discussion (35 minutes)

5. The rapporteurs present and discuss the results of the groups' work. They can use flipcharts or overheads to facilitate their presentations.

6. The trainer provides feedback on the content of the presentations.

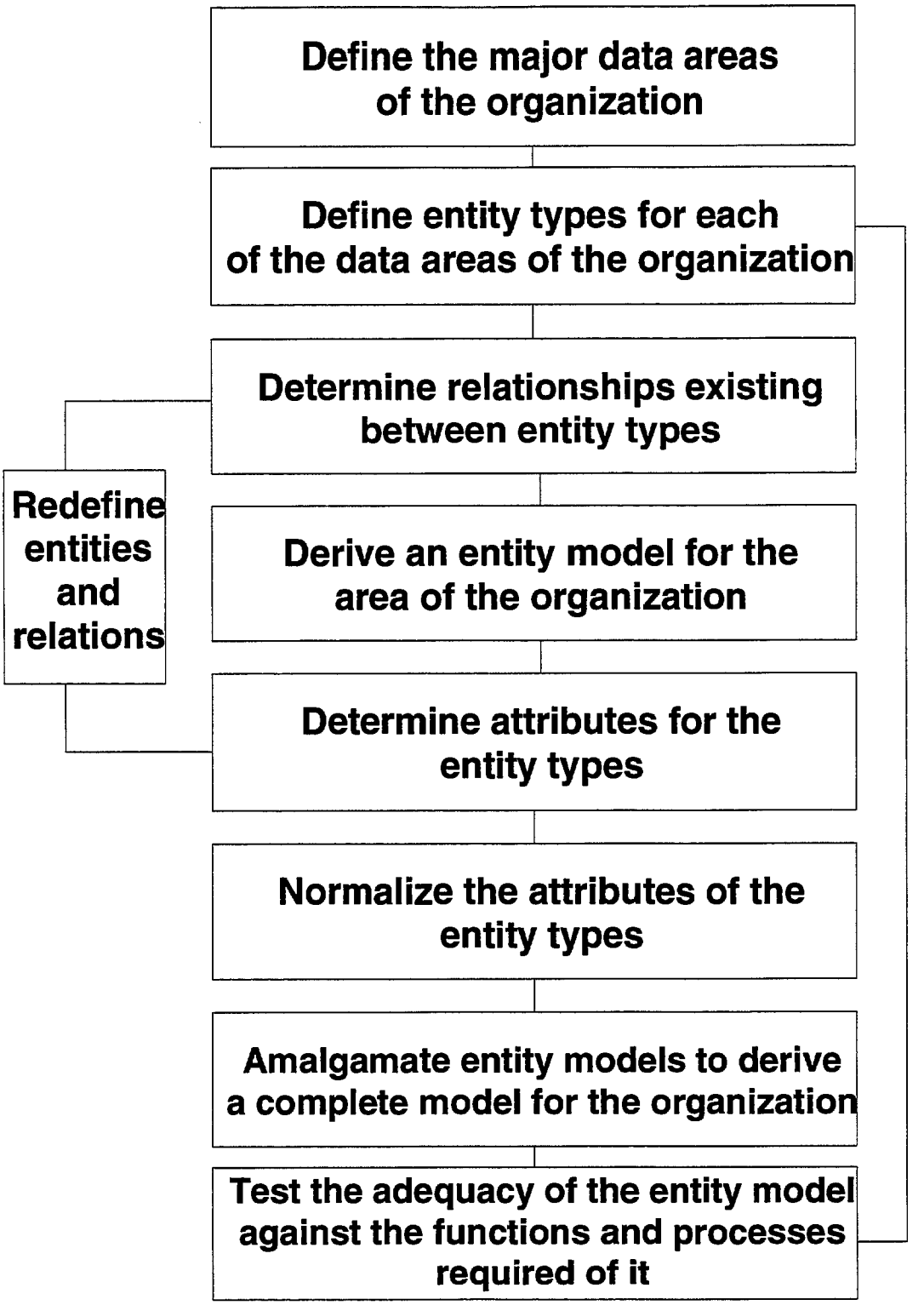
Exercise 15. Worksheet

Design of Database Structures

Data Analysis and Modeling[1]

[1] Extract from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

Data Analysis Methodology



Entity Dictionary Page_____of_____					
Entity Name		Entity Content		Entity Purpose	
Prepared by:		Date Prepared:		Version no.:	

Attribute Dictionary				Page_____of_____	
Attribute Name		Used in Entity	Type	Attribute Purpose	
Prepared by:		Date Prepared:		Version no.:	

Association Dictionary Page_____of_____					
Related Entities	Association Name	Association		Entity Purpose	
		Degree	Nature		
Prepared by:		Date Prepared:		Version no.:	

APPROACHES TO DATA MODELLING

TOP - DOWN VERSUS BOTTOM - UP

1. A Bottom-Up Approach

This approach involves extracting data fields as indicated on the document description forms. These are the forms the analyst uses to specify the data content of existing documents within the system. Any extra data that might be required as inputs to processes that are new to the system are then added.

1.1 Records

These data elements are then grouped into records. It is quite likely that each of the original documents within the manual system gives rise to a record. These records form the basis for files and databases. The system is developed from the basic building blocks - the data fields, upwards through records and files, hence, Bottom-Up method.

The Bottom-Up approach is adequate if small systems that require little or no internal integration are to be designed. However, if there are large numbers of fields which are shown between many applications, it becomes increasingly difficult to design the system without repeating the same data fields unnecessarily.

Example

Let us consider the example of a Stock File System used by two departments, Stores and Sales Department

Stores	**Sales**
Department	**Department**
Item number	Item number
Item description	Item description
Quantity held	Price
Stock file	**Catalogue file**

Now each time a new item is entered on the stock file it needs to be entered on the catalogue file and each time a description is altered on the other. A piecemeal solution would be to design a program that will take the contents of the one file and reconcile them with the other.

A deeper problem with this approach is that substantial redesign of the system is required. Here, the existing documentation is not a good guide to the final data store contents. It is difficult to decide on the fields required at the outset and the extent to which they are to be shown between applications.

What is needed is a way of developing the data store for the organization so that it does not suffer from the limitation of the "Bottom-Up" approach.

Data analysis using Top-Down Data Modeling achieves this.

1.2 Top-Down: Logical Structure

The approach first considers the type of objects on which the organization would wish to keep data and relationships between them. Then, it considers the kinds of data to be kept on these objects and only at a later stage how this is to be physically stored within the computer.

The functions for which data are used in an organization are likely to change over time, though the structure of data itself may remain constant. The functions depend on the data structure. It seems more sensible to design the data store in such a way that it mirrors or models the structure of the objects and relationships within the organization and also with the data held on these.

2. Basic Principles

This section introduces and defines the terminology, and some of the documentation used in data modeling.

2.1 An Entity or Data Entity

An Entity can be an object (person, place, thing), event, or abstract concept within the scope of interest about which data is collected. It is the object of decisions and actions within an organization.

An Entity represents something which is capable of an independent existence on which an organization may wish to hold data.

Examples include EMPLOYEE, CUSTOMER, PROGRAMME, VEHICLE, SUPPLIER, ITEM, ETC. These are things an organization would like to keep data on.

2.1.1 Entity Inclusion

The criteria for including (or excluding) entity instances from a defined class of entities. The condition for membership in the class.

Does the EMPLOYEE entity class include managers, technicians, job applicants, those re-trenched or who quit, or employees on definite or indefinite leave?

2.2 An Attribute

An Attribute is a piece of information that describes the Entity. It may be referred to as a data item. Attributes are the particulars we want to collect about an Entity.

Example: Data attributes of an entity Employee could be employee number, employee name, basic salary, designation. The term attribute refers to the logical representation of data. The terms data field, data items or data elements are used to refer to its physical representation. A group of related attributes form an ENTITY. A group of related data items form a RECORD.

2.3 Data Associations/Relationships

A relationship is a correspondence or association between entities. Entities are related in the real world and they define a database. A relationship is defined between two (and perhaps more) entity classes or types, which is between two entities or records.

A data association indicates that a relationship exists between two ENTITIES. For example, a CUSTOMER-ORDER association may exist between a Customer entity occurrence and Specific Order entity occurrence. The term ASSOCIATION refers to the logical connection between two entities while the term RELATIONSHIP refers to the physical connection between records.

2.4 Common Communication Media

To represent the fundamental data needed in an organization and show strategies established to manage that organization we use the building blocks-DATA ENTITIES, DATA ATTRIBUTES, and ASSOCIATIONS. They provide the DATA PLAN commonly known as the DATA MODEL. The Data Model provides a common communication medium, viewed from the different perspectives through the organization. It also provides the Conceptual Schema, the Logical Database design essential to DBAs for development of the databases and information systems. It also provides a definition of knowledge bases and expert rules for subsequent generation of business systems.

3. The Data Model

Two pieces of documentation are produced by data analysis and modeling which represent the data used by an organization. These are the **Entity List** and the **Data Map** - collectively referred to as the Data Model.

3.1 The Entity List

In this document, the data entities and their attributes are using form representation. It establishes an agreed standard terminology to be used by the organization.

3.2 The Data Map

The DATA MAP schematically documents data entities and associations.

4. The Key Attributes

What distinguishes one occurrence of an entity from other occurrences?

4.1 The Primary Keys

The attribute which identifies different entity occurrences is called a Primary Key. For example the employee number or participants number. A key is a group of one or more attributes that uniquely identify an entity.

4.2 Candidate Keys

Several attributes may identify an entity, these are called candidate keys.

4.3 Foreign Keys

Taking the example of an Order-Customer, the order number identifies the order placed by the customer. The customer number identifies the customer who placed an order. Order number is a primary key attribute together with the customer number. The customer number is the foreign key.

4.4 Compound Keys

Primary keys must uniquely identify each entity occurrence. However, in some cases, we may not be able to establish a unique primary key. For example in the order-product, we may need both the order number and the product number to determine correctly the quantity ordered. Uniqueness is only established by using both key attributes as the primary key. This is called a Compound Primary Key, referred to as a Compound Key. Alternatively we could define another key attribute, order-line number, to uniquely identify each line in the order. In this case, the Compound Key would be order number and order-line number, with product number as a foreign key.

5. Non-Key Attributes

Non-key attributes do not uniquely identify an entity, rather, they tell us something about an entity.

5.1 Selection Attributes (Selection Keys)

Some non-key attributes may be used to select certain entity occurrences. For example to select all participants or customers with a certain address or from a certain city.

However, as many participants or customers may be coming from the same area or city, address and city are not unique and so cannot be identified as primary keys. We simply call them Selection Keys.

5.2 Group Attributes

Some of the attributes may be grouped into a single name, such as address = post number, street name, city, telephone number, and name = last name, middle name, first name. In this case the attributes address and name are called group attributes. The group attribute is made of detailed attributes.

5.3 Repeating Groups

The order considered above may comprise a request for a certain quantity of only one product, or may include a number of requests for different products. A training program may consist of one or many applicants. For each product ordered, therefore, we may need product number, product name, and quantity ordered. For each applicant we may need applicant's name, designation and qualification. Although these also represent group attributes, they are different from group attributes; we call them Repeating Groups. Each occurrence of the repeating group records each separate participant's number, name, designation, and qualification.

6. Entity List Documentation

Data Analysis and Modeling concentrates on identifying ENTITIES and ATTRIBUTES that comprise those entities. Normalization is used for progressive attribute identification. The Entity List documents, for each entity, the Primary Key or Compound Key attributes, Non-Key (data) attributes, Secondary Keys (selection attributes), Group Attributes, Repeating Groups and Foreign Keys. Information Engineering uses a specific list documentation conversion to represent the various components comprising an entity. This documentation allows convenient differentiation of attribute types when manually documenting entities. The conventions can also be used by software to capture entity and attribute definitions.

DAY SIX

Session 16
Forms Design

Instructions to Trainers

SESSION 16

14:00 – 15:30 Session 16. Forms Design

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Design data entry forms on the computer.

PROCEDURE

Training techniques: presentation, computer demonstration, group work.

PRESENTATION

(experience) Distribute handout 6.16.1. Divide the participants into small groups and invite them to take their places at the computers. Ask each group to elect a rapporteur. Give a presentation on forms design, following handout 6.16.1, demonstrating **step by step** how to design forms. Invite the participants to repeat each step on their computers. Assist them carefully. (15 minutes)

EXERCISE 16

Exercise 16. Designing forms. (1 hour 10 minutes)

1. Distribute handouts 6.16.2 and 6.16.3. Handout 6.16.2 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. *(experience)* Using dBase IV, groups design a data entry form based on the database they designed in the previous exercise. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (40 minutes)

Phase 2. Reporting and discussion

3. Ask the rapporteurs to present the results of their group's work. Approximately three minutes are available for each presentation. (15 minutes).

4. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (5 minutes)

5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing

this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

15:30 – 15:45 Tea/coffee break

DAY SIX

Session 16
Summary of Overheads

Objective of Session 16. Forms Design

2. Design data entry forms on the computer

6.16.1

Designing Data Entry Screens (Forms) - I

1. create the database file
2. plan for the form layout
   - note that you should use only row 1 through 21 for DBase IV and a form can be as wide as columns 0 - 79
   - the top row of the screen (row 0) will display the menu bar and rows 22, 23, and 24 at the bottom of the screen will display the status bar and other messages
3. design elements on a form
   - text such as form headings and field titles
   - boxes
   - lines
   - fields from an underlying database or view
   - new calculated fields not already in the database file or view

6.16.2

Designing Data Entry Screens (Forms) - II

4. controlling input
   - there are three ways that you can control what is actually entered into a field on the form so you can trap errors as they occur, before they are actually stored in the database
   - you can control input using Template Characters, Picture Functions, and Edit Options

6.16.3

Template Characters

A field template marks the place where actual data will appear. The template types for different data types are:

NUMERIC – 9999999.99

CHARACTER – XXXXXXXX

DATE – MM/DD/YY

LOGICAL – L

Template characters control the individual characters that are typed into a field

6.16.4

Picture Options and Edit Options

Picture functions affect the entire field

Edit options allow you to set or define:

- different editing options
- default values
- maximum and minimum values allowed in some fields
- range of values
- logical formula that determines whether a value can be entered into a field
- unaccepted messages

6.16.5

Designing Data Entry Screens (Forms) - III

4. multiple page forms
   - use the PgDn and PgUp keys to scroll though additional pages on the forms design screen

6.16.6

Forms Design/Plan

Agriculture Research Information System
Human Resources Databases
Data Entry Screen

Personal Number: XXXX

Surname: XXXXXX Other Names: XXXXXX

Date of Birth: DD/MM/YY Sex: X

Date of Appointment: DD/MM/YY

Station: XXXXXXX Basic Salary: 99999.99

6.16.7

BEST AVAILABLE COPY

Design of Database Structures

Forms Design[1]

[1] Extract from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

DESIGNING DATA ENTRY FORMS

1. Introduction

This section discusses the techniques for designing custom forms for entering and editing data. By designing a custom form you can arrange the fields on the screen, add boxes or lines for emphasis, omit certain fields to simplify the display, or calculate fields.

2. Forms files

Each different Edit screen you design can be stored as a form. The names of all the file forms in your current catalog appear in the Forms Panel of the Control Center. Each form can be stored through different file types. The files with extension:

- **.scr** contain original forms design from the Forms Design Screen
- **.fmt** contain dBase IV's code
- **.fmo** are compiled versions of the fmt files

When you use the Forms Design Screen, the form that is created respects the current settings for **TALK, STATUS,** and **DISPLAY**.

3. General instructions for creating a form

1) Open the database you want to design the form
2) Move the highlight to Forms Panel
3) Choose **<create>**
4) Press **ENTER**

The Form Design Screen is displayed with a menu and work surface.

4. Designing a form

1) Open the database file at the Control Center's Data Panel
2) Highlight the file and press **ENTER**
3) Choose **<Use this file>** and Press **ENTER**
4) Move the highlight to **Forms Panel**
5) Highlight **<create>**
6) Press **ENTER**

The Form Design Screen is displayed. The form screen has menus, work surface, and a status bar. The status bar displays the following information:

- The design screen name: FORM
- The current Path: C:\DBASE\<New>
- The form name: NEW
- The current and column position of the cursor, e.g. Row 0 Column 0
- The Database File in use, e.g. HRDB

5. The design elements on a form

You can place five design elements on the work surface:

- FIELDS from an underlying database file or view
- New calculated fields not already in the database file or view
- Text such as Form Heading and Field titles
- Boxes
- Lines

This is illustrated by the following Form Plan:

Records Organize Go to Exit

Agricultural Research Information System
Enter/Edit Human Resources Information

Personal File Number:_____

Last Name:_____ **Other Names:**_____

Date of Birth:_____ **Sex:**_____

Date of Appointment:_____ **Basic Salary:**_____

5.1 Placing texts: form headings

1) Move the cursor to Row 2 Column 6.
2) type **"Agricultural Research Information System"**
3) Press **Enter** Twice
4) Move the cursor to Row 5 column 6.
5) Type: **"Enter/Edit Human Resources Information"**
6) Press **ENTER** Twice

5.2 Placing texts: field titles and adding fields

1) Move the cursor to the appropriate position according to the form plan to place the Field text (title)
2) Type the Field title: e.g. **Personal File Number**
3) Press the Add Field key (F5); a list of fields is displayed alphabetically
4) Highlight the Field which corresponds to the field title you have just typed
5) Press ENTER
6) Modify the Field Template if necessary, otherwise
7) Press CTRL+END to place the field in the work surface
8) Repeat steps until all the field texts (titles) and fields are placed on the work surface as per form plan

NOTE that the order in the form need not necessarily follow that of the Database Structure. You can choose your own convenient order; for example, LNAME might be followed by design and date of appointment immediately.

6. Adding boxes and lines

Let's add a double line box around the form title. Options for drawing boxes and lines are on the Layout pulldown menu.

1) Move the cursor to Row 1, Column 0, the upper left corner of the box you will draw
2) Press F10
3) Choose Layout
4) Select Box
5) Select Double Line

   dBase displays the instructions "POSITION upper left of box with cursor keys, complete with ENTER"
6) Position the cursor if you haven't done so; otherwise
7) Press ENTER at Row 1, Column 0
8) The instructions now read "Stretch box with cursor keys, complete with ENTER"
9) Stretch the box to surround the whole Form title and Press ENTER

   You will see a double line box around the form title in the form. You can draw a Box likewise to surround everything.

7. Saving your form

1) Press **F10**

2) Select **Layout**

3) Select **Save this Form**

4) Type the form file name, e.g. **HRFORM**

5) Press **ENTER**

To exit:

1) Select **EXIT**

2) Choose **Save changes and EXIT**

8. Using a form to add data/browse

At the Control Data Panel,

1) Open the Database file

2) Move the Forms Panel

3) Highlight the Forms Panel

4) Press **ENTER**

5) Press F2 - **Data**

6) If the Browse screen is displayed, press **F2** to get back to the custom form

7) Press **F10**

8) Choose **Records**

9) Select **Add New Records**

10) dBase displays the form with most of Fields empty

11) Enter your new records accordingly

9. Modifying a form

1) Open the appropriate database file

2) Move to Forms Panel

3) Highlight the Form file name you want

4) Press **ENTER**

5) Select **Modify Layout**

Use the same technique to create the form. When you are done making changes:

6) Press **F10**

7) Choose **EXIT**

8) Select **Save changes and exit**

If you prefer not to save any changes, choose **Exit, Abandon changes,** and **Exit** instead.

10. Template characters vs. picture functions

Template characters control the individual characters that are typed into a field. Picture Functions affect the entire field.

Symbol	Description
A	Accepts only alphabetic characters A-Z and a-z and no numbers, spaces, or punctuation
N	Accepts alphabetic and numeric characters A-Z, a-z, and 0-9, but no spaces or punctuation
Y	Accepts either Y or N
#	Accepts numeric digits 0-9, spaces, periods (.), and plus (+) and minus (-) signs
L	Accepts T, F, Y, and N
X	Accepts any character
!	Accepts any character and converts letters to uppercase
9	Accepts real numbers only, including plus and minus signs
Other	Any other characters are literal characters and are actually stored in the database

Examples:

XXXXX	Accepts any characters but automatically capitalizes them, e.g. Shila produces SHILA, peter produces PETER
AAAAA	Accepts only letters, such as Shila or SHILA but would not accept 144'CD90 or Anthony - Phiri because of numbers and space
(999)99-9	Accepts any numbers 0-9 and automatically adds parentheses and hyphens, e.g. 255055 would produce (255)05-5
!-!!!	Accepts any characters, but converts letters to uppercase and inserts a hyphen, e.g. alj4 produces A1-J4
!-999	Accepts any characters followed by any through numbers, converting the characters to uppercase, e.g. x555 produces X-555, but alj4 would be rejected because j appears at the number field.

11. Changing field templates

1) Highlight the field template
2) Press **F5 - Add Field Key**
3) Make Changes
4) Press **CTRL+END** - Accept Key when done

OR

1) Press **F10**

2) Choose **Fields**

3) Select **Modify Field**

4) Make changes

5) Press **CTRL+END** - Accept Key

Example: Let's change the Last Name (LNAME field template)

1) Move the cursor to the LNAME field template

2) Press **F5**

3) Select **Template** from the sub-menu of options

4) A list of template characters appears and is ready to make changes

5) Press **Home** to move the cursor to the first characters in the template

6) Type **!** and

7) Press **ENTER**

8) Press **CTRL+END** to save the change

The template for the last name appears like this:

!XXXXXXXXX

12. Picture functions

Picture Functions affect the entire field. To assign Picture Functions:

1) Highlight the field

2) Press **F5 - Add Field Key**

3) Select **Picture functions**

4) Select the functions you want

Function	Effect
A	Accepts alphabetical characters only (entire field)
!	Accepts any data but converts all letters to upper case
R	Removes lateral characters from entry before storing them on the database
M	Allows multiple choice options to be displayed in a form and selected by pressing ENTER
T	Removes leading and trailing blank spaces
J	Right-aligns data in the field template
I	Centers data in the field template

Let's assign the ! (upper case) function to the LNAME field in the current form.

1) Move the cursor to the LNAME field template

2) Press **F5**

3) Select **Picture Functions**

4) Highlight **Upper-case conversion**

5) Press the space bar to turn the options **ON**

6) Press **CTRL+END** - accept to leave the menu

7) The picture functions is displayed as {!}

8) Press **CTRL+END** to save the changes.

NOTE: Picture Functions do not appear on the field template.

13. Controlling edit options

Edit Option	Effect
Editing Allowed	If YES, field contents can be changed; if NO field contents can be viewed but not changed
Permit Edit If	Allows you to enter a logical formula to determine when a field can be changed
Message	Lets you near a message that is displayed at the bottom of the screen when the field is highlighted
Carry Forward	If YES, data entered into one record is automatically carried over to the next record when you add new records (only data for the current field is carried)
Default Value	Lets you automatically plan a suggested value into a field, which can be accepted or changed, when you actually enter data
Smaller Allowed Value	Specifies the smallest allowed value for the field
Larger Allowed Value	Specifies the largest allowed value for the field
Range must always	If YES, data must be entered into the field and must fall within the to be met specified smallest and largest allowed range value; if NO, the field can be left blank by pressing ENTER during Data Entry, however any data entry entered into the field must fall with the specified value range
Accepted Value When	Lets you define a logical formula that determines whether a value can be entered into a field
Value must be Always	If YES, data must be entered into other field, and must meet the be Valid accept value when requirements. If NO, the field can be left blank by pressing ENTER during data entry.
UNACCEPTED Message	Lets you define a message that is displayed in the screen if an unacceptable value is entered into a field.

14. Edit options

Let's use some Edit Options on the current form. We will use the Default Value Options to display the amount Highest Qualification, the HQVAL field. The Message options display a message when a field is highlighted.

1) Move the cursor to the HQUAL template
2) Press **F5**
3) Select **Edit Options**
4) Select **Message** and type
5) Press **ENTER** to accept suggested Qualification, or type in a new Qualification
6) Press **ENTER** after typing the entire message
7) Select **Default Value**
8) Type **MSc.**
9) Press **ENTER**
10) Press **CTRL+END** to leave menu
11) Press **CTRL+END** to save changes

15. More options

15.1 Picture Functions

- Alphabetic characters only
- Upper case conversion
- Laterals not part of data
- Scroll within display width
- Multiple choice - married, single, separated
- trim, right align, center align

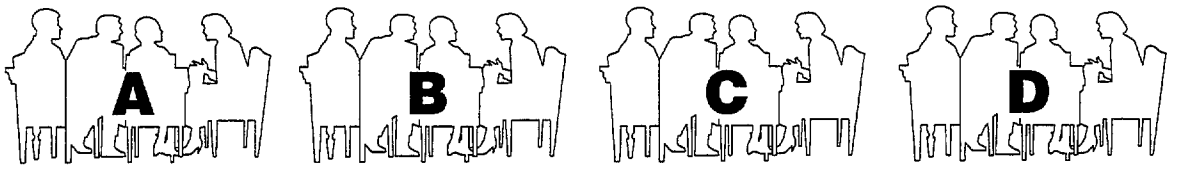
15.2 Edit options

- Editing allowed
- Permit EDIT
- MESSAGE
- CARRY FORWARD
- DEFAULT VALUE
- SMALLEST AND LARGEST ALLOWED VALUE
- RANGE MUST ALWAYS BE MET
- ACCESS VALUE WHEN
- UNACCEPTED MESSAGE

Exercise 16. Designing forms (group work)

Phase 1. Group work (45 minutes)

1. Form four groups, each electing a rapporteur.



2. Use dBase IV to design a data entry form for the database you designed in the previous exercise (**PROJ1**).
3. Save this form as **FORMP**.

Phase 2. Reporting and discussion (25 minutes)

4. The rapporteurs present and discuss the results of the groups' work. They can use flipcharts or overheads to facilitate their presentation.
5. The trainer provides feedback on the content of the presentations.

Exercise 16. Worksheet

DAY SIX

Session 17
Management Information Systems (MIS): Project Initiation

Instructions to Trainers

SESSION 17

15:45 – 17:00 Session 17. Management Information Systems (MIS): Project Initiation

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss MIS project initiation.
- Identify main steps in project planning.
- Develop the logframe for an MIS project.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Give a brief presentation on project initiation and MIS. You will find the information in handout 6.17.1 very useful to support your ideas. Use the overheads to facilitate understanding and learning of the content. At the end of the presentation distribute handouts 6.17.1 and 6.17.2 and be sure to ask participants if they have any comments or questions, or if they need clarification. (15 minutes)

EXERCISE 17

Exercise 17. MIS: Project initiation using the Logical Framework. (50 minutes)

1. Distribute handout 6.17.3, which gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into four groups and ask them to elect a rapporteur.
3. *(experience)* The participants develop a logical framework for an MIS project. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (30 minutes)

Phase 2. Reporting and discussion

4. Ask the rapporteurs to present the results of their group's work.

5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)

6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 6.17.4 and use handout 6.17.5 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 6.17.6. (15 minutes)

DAY SIX

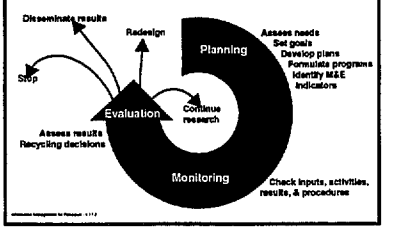
Session 17
Summary of Overheads

Objectives of Session 17. MIS: Project Initiation

3. Discuss MIS project initiation
4. Identify main steps in project planning
5. Develop the logframe for an MIS project

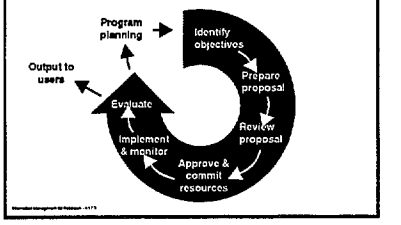
6.17.1

The Management Cycle



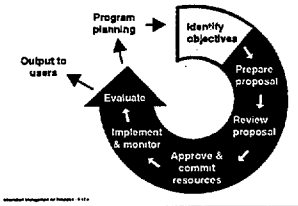
6.17.2

Project Cycle



6.17.3

Project Step 1: Identify Objectives



6.17.4

Objectives Should Be:

- Clear
- Logical
- Realistic
- Attainable
- Problem-oriented
- Measurable

6.17.5

MIS Project

- Represents a constraint and path to solve it
- Is a coherent set of activities with:
  - Rationale
  - Goal
  - Objectives
  - Outputs
  - Action plan
  - Beneficiaries
  - Limited time frame
  - Budget

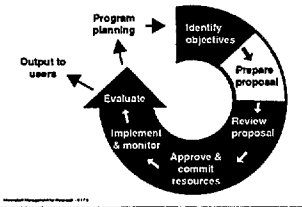
6.17.6

Uses of Project Proposal

- First document about project
- Lays out basis for M&E
- States clearly objectives, methods, resources & management
- Defines relationship of project to program
- Ensures effective & efficient implementation

6.17.7

Project Step 2: Prepare Proposal



6.17.8

The Project Proposal Contains:

- Objectives
- Justification/rationale
- Expected outputs
- Methodology
- Resources and time schedule
- M&E methods

6.17.9

The Proposal Layout Should Include:

- Abstract
- General information
- Technical description
- Annual work plan
- Budget
- Personnel
- M&E method

6.17.10

The Logical Framework

A tool to aid in:

- Planning
- Monitoring
- Evaluation

of MIS project

6.17.11

Logical Framework Matrix (1)

	Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal				
Purpose				
Outputs				
Activities				

6.17.12

Logical Framework Matrix (2)

	Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal		Measures of goal achievement	Sources of information Methods used	Assumptions affecting the purpose-goal linkage
Purpose		End of project status	Sources of information Methods used	Assumptions affecting the purpose-goal linkage
Outputs		Magnitudes of outputs Planned completion date	Sources of information Planned completion date	Assumptions affecting the logic-output-purpose linkage
Activities		Nature and level of resources Necessary and Planned starting date	Sources of information	Initial assumption about the project

6.17.13

BEST AVAILABLE COPY

Special Task

At the end of day six activities, distribute handout 9.23.1 (exercise 23) of Day 9, Session 23, which provides the participants with guidelines to **develop a database using data from individual research organizations.**

Explain the exercise carefully and make sure that the participants understand properly.

Follow up this assignment during the coming days.

MIS Project Initiation and Planning (summary of presentation)

1. An MIS project is a coherent set of activities with its own:

   - rationale (why it is needed)
   - goal (what it hopes to achieve)
   - objectives (specific measurable outputs)
   - plan of action to achieve the objectives
   - beneficiaries (who will receive the output)
   - limited time frame for execution
   - budget, defining the human, financial, and physical resources needed

2. The MIS project will focus on specific information constraints in agricultural research management:

   - it will be responsive to national agricultural research goals
   - it will have longer-term, somewhat continuous objectives
   - it will comprise several activities, which are complementary and address the project objectives

3. The project initiation involves getting the most out of project team members and all those concerned. It is especially important in problem identification and constraints analysis, and project design.

   We all have blindspots (technical, sociological, etc.). Involving the right people in problem identification and analysis can reduce the risk of an individual misunderstanding important aspects of a problem or potential solution.

4. Project management is a framework for translating project objectives into individual activities, monitoring their progress during implementation, evaluating their output after completion, and communicating these results to the appropriate user.

5. A systematic project-level planning, monitoring, and evaluation scheme will provide information that managers and MIS officers need to improve the project implementation, i.e., to facilitate the most effective and efficient use of limited resources. To clarify, effectiveness is "doing the right thing"; efficiency is "doing this right".

6. MIS project planning, monitoring, and evaluation takes place in distinct steps, which together make up the project cycle. The cycle includes information such as rationale and more general project objectives (the latter can be thought of as the project goal). The six steps in a typical project cycle are the following:

   - identifying project areas and objectives
   - preparing the project proposal
   - reviewing the project proposal
   - approving the project and committing resources

- implementing and monitoring the ongoing project
- evaluating the completed project

Please note that "evaluation" means *communicating* results to appropriate people.

7. In practice, these steps follow a logical progression of activities but they are interactive. Some steps may be indistinct; their relative importance may vary because of their iterative nature.

Setting MIS Project Objectives

1. Project objectives become the input for the next step in the project cycle, the preparation of research proposals.

2. The project objectives are later grouped into coherent sets of related activities.

3. Each project objective should have a clearly specified and measurable indicator of output, so that the people monitoring and evaluating the project at a later date can accurately determine whether the objective has been achieved or not.

4. Besides being clear and logical, the objectives should be realistic and attainable, considering available resources and methods to be used.

Preparing an MIS Project Proposal

1. Preparation of the project proposal is the second step in the project cycle. The proposal is important because it is the first document about a project and it lays out the basis for monitoring and evaluating it later.

2. The proposal should contain written statements about the rationale for the project, its goals, objectives, methods, resources required, the way it will be managed during implementation, and M&E methods. This is the first document in the life of the project, linking project objectives, planned activities, and resources. It is also an important guide for monitoring a project while it is being implemented, and for evaluating a project's performance after its completion.

3. The use of a standardized format in preparing the proposal helps in gathering all relevant data, helps managers aggregate all activities related to the project, guides monitoring of the project during implementation, and evaluation after completion. It may also help secure project funding by a competitive grant!

4. However, note that various donors/financiers use their own different reporting formats. These may need to be filled in separately, but at least if you have a good standardized format in-house, the proposal will contain all the information you need to satisfy the donors.

The Logical Framework

1. The logical framework (logframe) is one example of a tool that can help managers to plan, monitor, and evaluate MIS projects. The logframe consists of a 4 x 4 matrix where the rows represent different levels of objectives and the activities necessary to achieve them (the vertical logic), and the columns show how the achievement of these objectives can be verified (the horizontal logic).

2. The logframe structure allows project planners and evaluators to specify the key elements of their MIS project and to identify the logical linkages between a set of means and a set of ends.

3. The key concept is one of cause and effect. If a series of activities are carried out, then outputs will be obtained; if the outputs (the results or deliverables) are obtained then the purpose will be achieved; and if the purpose (project impact) is achieved then the project will contribute to achieve the goal (the higher order objective).

4. The logframe defines different levels of the project objectives (outputs, purpose, and goal) and the activities necessary to achieve them. It also considers the external environment of the project, by identifying the external factors that could affect implementation of the activities and the achievement of objectives.

5. A complete logframe also specifies indicators of achievement for the different levels of objectives and the means to verify them. The indicators become measures by which managers and a project team can monitor progress and evaluate results. Indicators should be targeted. That is, they should be measurable in terms of quantity, quality, and time.

Logical Framework

Beatriz Uribe and Douglas Horton

The logical framework (logframe) is a tool for planning, monitoring and evaluating projects in the broader context of programs and national goals. It can be used to clarify the logical links between project inputs and objectives: project activities and outputs, broader purposes, and the ultimate goal. Research managers can use the logframe to identify the indicators by which a project's progress is monitored and evaluated and the conditions necessary for the project to achieve the expected results.

What is the Logical Framework?

The logical framework (logframe) is a tool for the preparation, monitoring, and evaluation of projects. It is also useful for analyzing the components of a project and the logical linkages between means and ends.

Originally developed by the US Department of Defense, the logframe approach was adopted by the US Agency for International Development (USAID) in the late 1960s. Since then, it has been adopted and further developed by the Overseas Development Administration (ODA) in the UK, International Fund for Agricultural Development (IFAD), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) in Germany, United Nations Development Programme (UNDP), Organisation for Economic Co-operation and Development (OECD), and many other development agencies. Several agencies now use participatory planning and evaluation procedures based on the logical framework.

Usefulness for NARS

The logframe can be used by researchers and managers to design projects and programs, to review progress, and to check that objectives are being achieved. It is particularly useful for realistic planning of the activities, resources, and inputs required to meet project objectives. It is also useful for planning M&E activities.

The logframe may appear to be quite simple, but its use requires an understanding of some basic concepts, as well as their application. As with all planning and evaluation frameworks, the logframe should not be applied mechanically - project managers need to be able to learn as they implement plans and to adjust to changing circumstances.

It can provide a useful framework for participatory planning and review of a project, involving the project teams as well as expected beneficiaries and other interested parties. One advantage of the logframe is that it can act as a framework for other planning, monitoring, and evaluation techniques, such as cost-benefit analysis, checklists, or external reviews.

Using the Logframe

A project logframe usually consists of a 4-by-4 matrix (table 1). The rows correspond to the project's activities and three levels of objectives: direct project outputs, the broader purposes of the project, and the ultimate goal. The columns are used to describe the purposes, activities, inputs, and outputs of the project; to define indicators for measuring them and means of verification; and to specify the main assumptions on which the project design is based. A logframe should be prepared before implementation begins, and it should be regularly reviewed and updated.

The basic steps involved in developing a project logframe are listed below:

- *Begin with the narrative summary*: project inputs, outputs, purposes, and overall goals.
- *Define the critical assumptions* for delivering inputs and achieving objectives at each level.
- *Verify the vertical logic.*
- *Define the indicators* by which research progress can be monitored and evaluated.
- *Define the means of verifying* what has taken place at each level: data to be gathered, sources, and techniques for data collection and analysis.
- *Review the logframe periodically* in light of research progress and changing circumstances.

Narrative Summary

The narrative summary is a brief statement of each of the project's goals, purposes, outputs, and activities and inputs. The *goal* is the ultimate objective of a program and is usually something like increasing farm incomes. A portfolio of projects normally shares a common goal. The *purpose* is a statement of the purpose or purposes of the project. It describes the desired impact of the project, such as increasing production. The *outputs* are what the project aims to accomplish - the specific results for which the project manager can be held directly accountable, such as release of a maize variety or training of a group of farmers. *Activities* are the actions necessary to achieve each output. *Inputs* define what is needed for implementing the project, including personnel, funds, facilities, and management procedures.

The Vertical Logic

From a project's inputs to its ultimate goal there are *three causal links:* one between activities and outputs, one between outputs and purposes, and one between purposes and the ultimate goal. In the design of a logframe, the inputs of the project should be both necessary and sufficient to achieve the outputs. Outputs should also be necessary to achieve the purpose, and achievement of the purpose should be necessary to achieve the goal. However, a project's outputs by themselves are seldom sufficient to achieve broad purposes and goals; other, complementary, projects and programs may be needed. Purposes and goals may also be affected by institutional factors and by external conditions beyond the direct control of the project.

Indicators

In the second column of the logframe, *indicators* specify what evidence could indicate that objectives have been achieved. For example, in table 1, under *Purpose* in the second row, the measurable indicator for development of striga-resistant maize varieties is an increase in maize yield in striga-infested research areas. Indicators should be defined in the same degree of detail as the objectives in the narrative summary column. They should be stated in terms of quantity, quality, and time (and sometimes also in terms of place and cost).

Means of Verification

The means of verification specify how the indicators can be measured and how the desired information may be obtained. For example, in table 1, seed company records are listed as one of the means for verifying that goal number 2 under outputs has been achieved.

Assumptions

Assumptions are statements about uncontrolled factors that can influence the achievement of objectives. Some examples of important assumptions are that farmers will use recommended cultivation methods, that inputs will be available, or that there will be good weather. If the assumptions are not met, the project may not achieve its objectives.

Examples

Bolivia. The logframe is used mainly by development agencies to plan and evaluate large-scale projects. In recent years, some agricultural research organizations have begun to use the logframe in planning and evaluating research programs and projects. For example, in 1989 the Bolivian national potato program used the logframe for a participatory planning exercise. In 1991 the program's logframe provided the basis for an external review. The same year, the logframe approach was applied to other research programs in the Instituto Boliviano de Tecnología Agropecuaria (IBTA).

Ghana. The logframe was recently used in planning a research system in Ghana. It was very successful in bringing researchers and extensionists together and in providing the basis for a structured discussion of the goals of the plan and the measurable indicators and means for verification.

The Instituto Nacional de Tecnología Agropecuaria in Argentina uses the logframe approach for project planning. The logframe has also been used for planning and evaluating the SADC/ISNAR project for in-service agricultural research management training in sub-Saharan Africa.

Table 1. *Sample Logframe*

Project Name: *Maize Research Project*

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal: 1 Agencies use new maize varieties in striga-infested areas of sub-Saharan Africa.	1.1 10 projects using new varieties and extension service recommendations by 12/1996. 1.2 Average yields increased by 20% compared to non-striga projects by 1998.	1.1 Documentation, extension bulletins, national agricultural surveys.	1 Price policies, infrastructure, and extension support spread use of technology.
Purpose: 1 Striga-resistant maize varieties created for use in sub-Saharan Africa.	1.1 Production of maize in striga- infested research areas increased by 40% by 12/1994.	1.1 On-farm research studies; End-of- Project research reports.	(Purpose to Goal) 1 Funds and mechanisms available to adapt maize varieties for local production. 2 Farm inputs, including tools & fertilizers, available on local market.
Outputs: 1. Striga-resistant maize varieties identified.	1.1 2 hybrid, 2 composite, and 4 open varieties identified by 12/1992.	1.1 Research reports, peer review, publications.	(Output to Purpose) 1 Research approach remains most feasible means of reducing losses from striga infestation.
2 Seed multiplication; capacity of selected sub-Saharan seed companies increased.	2.1 National seed company producing 200 mt of certified maize annually by 12/1994.	2.1 Seed company records, monitoring mission reports.	2 Research program is well managed and provides peer review.
3 Striga research capacity of selected sub-Saharan research institutes increased.	3.1 2 maize breeders, 2 weed scientists, 1 agronomist, and 1 plant biochemist trained by 2/1995.	3.1 Project progress reports training records, institute personnel records.	3 National seed company functioning at 80% capacity.
4 Information network for striga researchers established.	4.1 Research methods/ results disseminated through semiannual network reports & conferences from 1994-1996.	4.1 Network newsletters and mailing lists, reports on conferences.	4 Trained staff continue to work for research project.

Sources of Further Information

TEAMTechnologies, Inc.
3810 Concorde Parkway, Suite 1600
Chantilly, Virginia 22021, USA

Developers of PClogFRAME R&D, an easy-to-use computer program (created jointly with the World Bank) for project design using the logical framework. The manual contains step-by-step suggestions for preparing a project framework, gives examples, and provides a checklist for evaluating a project design.

Overseas Development Group
School of Development Studies
University of East Anglia
Norwich NR4 7TJ, UK

Organizers of a three-month course on monitoring and evaluation. Course materials contain a detailed and comprehensive review of the logical framework. Students are provided with a thorough description of an integrated rural-development project in Malawi and are requested to prepare a logical framework for the project.

Center for Development Information and Evaluation (CDIE), United States Agency for International Development (USAID) SA-18 220 B Washington, DC 20523-1082, USA	Carries out evaluations and works to improve M&E of USAID-supported activities. Can provide many methodological pieces on various topics, including the logical framework.
Dirección Asistente de Control y Evaluación, Instituto Nacional de Tecnología Agropecuaria (INTA) Rivadavia 1439 (1033) Buenos Aires, Argentina	INTA's monitoring and evaluation unit has issued a number of Spanish-language training documents on the use of the logical framework. They can also provide guidance in their use.

Table 1. (*continued*)

Project Name: *Maize Research Project* (continued)

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Activities: 1.1 Obtain IITA hybrid lines. 1.2 Plant test plots. 1.3 Harvest & measure yields. 1.4 Analyze & report results. 2.1 Institutional assessment. 2.2 Define equipment needs. 2.3 Procure & install equipment. 3.1 Training assessment. 3.2 Identify trainees. 3.3 Conduct training. 4.1 Form secretariat. 4.2 Establish membership. 4.3 Produce newsletter. 4.4 Conduct conferences. 4.5 Publish findings.	Inputs/Resources: Project Budget (million US$) Technical assist. researchers 4.5 prog. leadership 0.6 network coord. 0.2 peer reviewers 0.4 Equip./supplies 2.3 Operating funds 0.9 *Total* *8.9*	1.1 Research proposals, peer review plan, project disbursement records. 2.1 Project planning documents & disbursement records. 3.1 (same as above) 4.1 (same as above)	(Activity to Output) 1 Constraints have been adequately analyzed and researchable problems identified. 2 Peer reviewers competent and process is timely. 3 Results from requisite research available. 4 Research program funding is for 8-10 years. 5 Seed company continues to have good management. 6 Qualified researchers available for advanced training. 7 Striga researchers willing to join cooperative network.

Source: TEAMTechnologies, Inc.

Key References

Coleman, G. (1987) Logical framework approach to the monitoring and evaluation of agricultural and rural development projects. *Project Appraisal* 2, 251-259.

Concise statement of the principles and basic structure of the logical framework and its use.

McLean, D. (1988) *The logical framework in research planning and evaluation.* ISNAR Working Paper 12. International Service for National Agricultural Research, The Hague.

Describes the logical framework, with examples from agricultural research in developing countries.

Schubert, B., Nagel, U.J., Denning, G.L. and Pingali, P.L. (1991) *A logical framework for planning agricultural research programs.* International Rice Research Institute, Los Baños, Philippines.

Describes how the logframe approach was adapted and used by scientists to develop IRRI's work plan for 1990-1994.

USAID (1975) *AID evaluation handbook. Appendix 3E.* US Agency for International Development, Washington, DC.

Statement of the basic structure of the logical framework as originally designed.

Exercise 17. Developing a logical framework (group work)

1. Develop a logical framework for an MIS project for your institution, indicating clearly the different levels of objectives, activities, and other components of the 4x4 matrix for your project.

Logical Framework Matrix

	Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification (MOV)	Important Assumptions
Goal				
Purpose				
Outputs				
Activities				

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day six**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day six**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

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_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY SEVEN

Information Management for Research

DAY SEVEN — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the concept and types of queries in a database.
2. Practice the general steps in the process of queries design in the computer.
3. Discuss creating professional-looking reports.
4. Practice dBase IV reports.

Handouts

7.18.1 Overview
7.18.2 Tentative Schedule
7.18.3 Queries Design (text)
7.18.4 Exercise 18. Designing Queries
7.18.5 Exercise 18. Worksheet
7.19.1 Reports Design (text)
7.19.2 Exercise 19. Database Report Design
7.19.3 Exercise 19. Worksheet
7.19.4 Strengths and Weaknesses
7.19.5 Guidelines to Provide Feedback on the Workshop
7.19.6 PAPA Form — First Stage

Information Management for Research

DAY SEVEN — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 18. Database Queries Design** (Presentation and exercise 18)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 18. (Continued)**

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 19. Database Reports Design** (Presentation with demonstration and exercise 19)
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 19. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY SEVEN — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
7.18.1	Overview	❒	❒
7.18.2	Tentative Schedule	❒	❒
7.18.3	Queries Design (text)	❒	❒
7.18.4	Exercise 18. Designing Queries	❒	❒
7.18.5	Exercise 18. Worksheet	❒	❒
7.19.1	Reports Design (text)	❒	❒
7.19.2	Exercise 19. Database Report Design	❒	❒
7.19.3	Exercise 19. Worksheet	❒	❒
7.19.4	Strengths and Weaknesses	❒	❒
7.19.5	Guidelines to Provide Feedback on the Workshop	❒	❒
7.19.6	PAPA Form — First Stage	❒	❒

Overheads

7.18.1	Objectives of Day Seven	❒	❒
7.18.2	Schedule of Day Seven	❒	❒
7.18.3	Objectives of Session 18. Database Queries Design	❒	❒
7.18.4	Database Queries Design	❒	❒
7.18.5	Querying a Database	❒	❒
7.18.6	Query Design Screen	❒	❒
7.18.7	View Skeleton	❒	❒
7.18.8	Filter Conditions	❒	❒
7.18.9	Combining Search Conditions	❒	❒
7.18.10	Working with Dates in dBase IV (1)	❒	❒
7.18.11	Working with Dates in dBase IV (2)	❒	❒
7.18.12	Examples of Dates by Country	❒	❒
7.18.13	Date Functions	❒	❒
7.18.14	Dates in Queries	❒	❒
7.18.15	Condition Box	❒	❒
7.18.16	Calculated Fields	❒	❒
7.18.17	Calculated Fields (continued)	❒	❒
7.18.18	Using Functions	❒	❒
7.18.19	Using Functions (continued)	❒	❒

		Yes ✓	No ✓
7.19.1	Objectives of Session 19. Database Reports Design	❒	❒
7.19.2	Database Reports Design	❒	❒
7.19.3	Reports	❒	❒
7.19.4	Report Bands	❒	❒
7.19.5	Types of Report Bands	❒	❒
7.19.6	Types of Report Bands (continued)	❒	❒
7.19.7	Report Design Screen – An Example	❒	❒
7.19.8	Group Bands in Report – An Example	❒	❒
7.19.9	Grouping Reports	❒	❒

Materials

● Personal Computers	❒	❒
● Printers	❒	❒
● Diskettes	❒	❒
● Spare ink or toner for printers	❒	❒
● Overhead projector	❒	❒
● Spare bulbs for overhead projector	❒	❒
● Extension cords	❒	❒
● Projector screen	❒	❒
● Flipchart stands (minimum 2)	❒	❒
● Flipchart paper/pads (about 10 per day)	❒	❒
● Markers for writing on newsprint	❒	❒
● Markers for writing on transparencies	❒	❒
● Blank transparencies	❒	❒
● Stapler	❒	❒
● Tape (strong masking tape and regular tape)	❒	❒
● Push pins	❒	❒
● Glue	❒	❒
● Pencils/notepads/pens	❒	❒
● Pencil sharpeners	❒	❒
● Certificates	❒	❒
● Photocopying facilities	❒	❒
● Extra notepads and pens	❒	❒
● Scissors	❒	❒

DAY SEVEN

Session 18
Database Queries Design

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Review of the previous day's activities.

- Summary of the evaluation of the previous day.

- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day seven (handouts 7.18.1 and 7.18.2) to the participants. Review the objectives and schedule using overheads 7.18.1 and 7.18.2. Ask if clarifications are needed. (10 minutes)

SESSION 18

09:00 – 10:30 Session 18. Database Queries Design

10:30 – 10:45 Tea/Coffee Break

10:45 – 13:00 Session 18. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss the concept and types of queries in a database.
- Practice the general steps in the process of queries design in the computer.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Distribute handout 7.18.3. Divide the participants into small groups and invite them to take their places at the computers. Ask each group to elect a rapporteur. Give a presentation, following the handout, demonstrating **step by step** how to design database queries. Invite the participants to repeat each step on their computers. Assist them carefully. (60 minutes)

EXERCISE 18

Exercise 18. Database queries design.
(2 hours 40 minutes)

1. Distribute handouts 7.18.4 and 7.18.5. Handout 7.18.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. *(experience)* Using dBase IV, groups design queries based on the database they designed in previous exercises. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (2 hours)

Phase 2. Reporting and discussion

3. Ask the rapporteurs to present the results of their group's work. Approximately five minutes are available for each presentation. (20 minutes).

4. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)

5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the next session.

13:00 – 14:00 Lunch

DAY SEVEN

Session 18
Summary of Overheads

Objectives of Day Seven

1. Discuss concept and types of queries in a database
2. Practice general steps in the process of queries design in the computer
3. Discuss creating professional-looking reports
4. Practice dBase IV reports

7.18.1

Schedule of Day Seven

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 18. Database Queries Design
Tea/Coffee Break	
10:45 – 13:00	Session 18. (Continued)
Lunch	
14:00 – 15:30	Session 19. Database Reports Design
Tea/Coffee Break	
15:45 – 17:00	Session 19. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

7.18.2

Objectives of Session 18. Database Queries Design

1. Discuss concept and types of queries in a database
2. Practice general steps in the process of queries design in the computer

7.18.3

Database Queries Design

7.18.4

Querying a Database

Process of selecting specific records in a database

Queries design screen

EMP.DBF	PFNO	SNAME	OTHERS	DOB	SEX	DOA	BSAL

File Skeleton

Calculated Field

View Skeleton

NEW	PFNO	LNAME	DOB				

7.18.5

Query Design Screen

The File Skeleton displays the database structure as you created it

- set the CRITERIA or FILTERS

This technique is called: *Query by Example* (QBE)

7.18.6

View Skeleton

Indicates the fields you want to see and in what order

Keys:

F5 - adds field to the view skeleton
- deletes fields in the view skeleton

F4 - next skeleton

F3 - previous skeleton

Tab - next field

ShiftTab - previous field

7.18.7

Filter Conditions

List only records that meet specified conditions,

e.g.:

Employees who have doctoral degree

in the File Skeleton use field HQUAL "PHD"

7.18.8

Combining Search Conditions

=	Equal to
<=	Less than or equal to
<	Less than
>	Greater than
>=	Greater than or equal to
#or<>	Not equal to

Relational operators/Logical operators

.AND.	"PHD",	<"40"
.OR.	"PHD"	=<"40"
.NOT.		#"40"

7.18.9

Working with Dates in dBase IV (1)

In the control center select:

Tool
Settings
Options

Century OFF ——> YY

ON ——> YYYY

Date Order

D/M/Y
M/D/Y
Y/M/D

7.18.10

Working with Dates in dBase IV (2)

Date separators:

Slash	/
Period	.
Hypen	-

7.18.11

Examples of Dates by Country

Dates:

American	mm/dd/yy
USA	mm-dd-yy
ANSI	yy.mm.dd
British	dd/mm/yy
French	dd/mm/yy
German	dd.mm.yy
Italian	dd-mm-yy

7.18.12

Date Functions

Date()	Current system date
Year()	Year 1994
(Month()	Month in characters - March
Month()	Month in numbers 1-12
Day()	Day of month (03)
(Dow()	Day of the week in characters
Dow()	Day of the week in numbers

7.18.13

Dates in Queries

Use curl brackets { }

<{01/01/50} research scientists who were born before 1950

<{01/01/55}, >{01/01/50} born after 1950 but before 1955

7.18.14

Condition Box

Suppose you want to *Query* for anyone with discipline of

PATHOLOGY, or *ENTOMOLOGY*

and stationed in either TAFORI or TAFIRI

"PATHOLOGY"
"ENTOMOLOGY"

STATION = "TAFORI". = OR.STATION = "TAFIRI"

7.18.15

Calculated Fields

- Create the field
- Add it to the view F5

example:

Suppose that there is an increase in the basic salary of 10% across the board

New salary = 10% basic salary + BPay
NS = B*10% + B(1+0.1)
= B*1.1

To display data for Employee, Name, Basic Salary and New Basic Salary

	Emp.NAME	Basic Pay	New Pay
1:	xxxxxxx	9999	9999
2:	xxxxxxx	9999	9999

7.18.16

Calculated Fields (continued)

How many research scientists are over 45 yrs today?

- Create a query with a condition box that reads:

DATE( ) - DBIRTH> = 45x365days

The command tells DBase to display records for which today's date minus the DBIRTH=Date of Birth is equal to or greater than 45 yrs (45x365days)

Note: Date calculations are in number of days

or

(DATE()-DBIRTH)/365>=45 (years)

7.18.17

Using Functions

1. Grouping by expression

by -) field value e.g. SURNAME
-) expression value
-) record count

Functions used in grouping:

Functions	Returns	Data type
C MONTH ( )	The month of a date	date
YEAR ( )	The year of a date	date
C DOW ( )	The days of the week	date
LEFT ( )	Left most characters	character

7.18.18

Using Functions (continued)

2. Grouping by first letter

LEFT (SNAME,1)

- the 1 indicates that only the first letter is to be used
- for breaking groups, records must be put into alphabetical order
- any index expression such as surname and others

3. Grouping by month

C MONTH ( )
C MONTH (DOA)
INDEX ON DOA OR
SNAME + DTOS (DOA)

7.18.19

Handout — Overview of Day Seven

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the concept and types of queries in a database.
2. Practice the general steps in the process of queries design in the computer.
3. Discuss creating professional-looking reports.
4. Practice dBase IV reports.

Handouts

7.18.1 Overview
7.18.2 Tentative Schedule
7.18.3 Queries Design (text)
7.18.4 Exercise 18. Designing Queries
7.18.5 Exercise 18. Worksheet
7.19.1 Reports Design (text)
7.19.2 Exercise 19. Database Report Design
7.19.3 Exercise 19. Worksheet
7.19.4 Strengths and Weaknesses
7.19.5 Guidelines to Provide Feedback on the Workshop
7.19.6 PAPA Form - First Stage

Handout — Tentative Schedule of Day Seven

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 18. Database Queries Design** (Presentation and exercise 18)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 18. (Continued)**

13:00 - 14:00 Lunch

14:00 – 15:30	**Session 19. Database Reports Design** (Presentation with demonstration and exercise 19)
15:30 - 15:45	Tea/Coffee break
15:45 - 17:00	**Session 19. (Continued)**
17:00 - 17:30	**Feedback on the Day's Activities and PAPA**

End-user Processing

Queries Design[1]

[1]Extract from Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

1. Introduction

1.1 Queries

The searches discussed earlier help you to locate a particular item of information in a database. In some situations, you may instead want to isolate or **filter** some type of information that meets a certain criteria. For example, in the Human Resources database, you might want to isolate records that have PHD in the Qualification field, filtering out all other records. The process of selecting specific records is called **querying** the database, because you query (ask) dBase for some information and dBase answers by displaying only records that meet your requirements. Queries are handled via the Query Design Screen. The Query Design Screen has unique tools to help you RETRIEVE, ORGANIZE, EDIT, and DISPLAY data.

The technique that you use to construct queries is called Query By Example – QBE.

1.2 Types of queries

There are generally two types of queries:

1.2.1 View Queries

"View" lets you select certain records, display only specified fields, or combine data from more than one database file.

1.2.2 Update Queries

"Update" lets you change selected fields and records, giving you a fast and powerful way to modify your data. Each update query modifies a single and specified database file.

Update queries can use one of the four operations APPEND, REPLACE, MARK, UNMARK. These are similar to dBase commands, APPEND, REPLACE, DELETE, RECALL.

NOTE that when you create an update query, nothing happens to your data until you perform the query.

2. Queries Design

2.1 General steps

1) Open the database file that you want to query
2) Move the highlight to **Queries** panel
3) Select **<Create>**

2.2 Queries design work surface

The Queries design screen (work surface) has the following components: A menu bar, a status bar, and a navigation line at the bottom of the screen. The query screen also includes the skeletons.

2.2.1 File skeleton

This is near the top of the screen and is a graphical representation of a database file. It displays the database structure as you created it. Here you set the CRITERIA or FILTERS. It is a model of database input to the querying design process.

2.2.2 View skeleton

This is near the bottom of the screen and is a graphical representation of the fields that will be in the view created by the view query. It indicates the fields you want to see and in what order. It represents the output.

2.2.3 Calculated field skeleton

This shows any calculated fields created for the current view.

2.2.4 Condition box

This makes it easy to enter complicated filter conditions that involve several fields or several skeletons. Query files are saved on your disk with a .qbe extension.

2.3 Navigation keys

F3	Previous skeleton
F4	Next skeleton
F5	Add field to view skeleton
	Remove field from the view skeleton
TAB	Next Field
Shift+Tab	Previous Field

3. The Design Process

Essentially when you access the view design screen, all the fields of the database are in the view skeleton and the cursor is positioned on the Database file name at the left of the file skeleton.

Press **F5** to remove all fields in the view skeleton.

3.1 Adding fields to the view skeleton

To add a field to the view skeleton:

1) Position the cursor in the fields column of the database file skeleton or calculated field skeleton.

2) Press **F5** – Field to place the field in the view skeleton.

3.2 Removing fields from the view skeleton

1) Place the cursor either under the field's name in the file skeleton, or over the field's name in the view skeleton.

2) Press **F5** – Field. The image of the field disappears from the view skeleton.

3.3 Moving fields in the view skeleton

To change the order of the fields:

1) Press **F6** to select fields in the view skeleton.

2) Press **ENTER.**

3) Press **F7** – Move.

4) Press left or right arrow to move the field (or fields) where you want them.

5) Press **ENTER** to complete the move.

4. Delimiters Used with Queries

Datatype	Delimiter	**Example**
Character	" "	"PHD"
Date type	{ }	{12/31/91}
Logical Data	. .	.T. .F.
Numerical or Float	None	1300.75

5. Relational Operations in Queries

Operator	**Meaning**
>	greater than
<	less than
=	equals
>=	greater than or equal to
<=	less than or equal to
<> or #	not equal
$	contains
Like	pattern match using wild cards
Sounds like	Soundex match for words that sound alike

6. Combining Search Conditions: The .AND. and .OR.

The queries design surface provides two ways to combine conditions:

6.1 .AND.

When you place two or more conditions in the **same row** of a file skeleton. In this case all conditions must be met for a record to be included in the view of update.

6.2 .OR.

When you place two or more conditions in **different rows** of a file skeleton. Only one of the conditions must be met for a record to be included in the view or update.

7. The Range Situation

>"8000, <16000

>={11/15/92}, <={12/15/92}

8. Saving a Query

1) Press **F10**
2) Choose **Layout**
3) Select **Save This Query**
4) Type a valid DOS file name
5) Press **ENTER**

HQUAL		DBIRTH
.AND.	"PHD"	<40 years
.OR.	"PHD"	<40 years
.NOT		#40

9. Creating Calculated Fields

1) Create the query for the appropriate database
2) Press **F10**
3) Choose **Fields**
4) Select **Create Calculated Field**
5) Enter the expression (formula) required to perform the calculations, using database field names and arithmetic operations – Use **SHIFT+F1** – expression builder
6) Press **F5** to include the calculated field in the view skeleton so its results will be displayed
7) When prompted, type a field name for the calculated field
8) Press **F2** — **Data** to see results

10. The Condition Box

The Condition Box is optional and appears in the lowest right corner of the screen. It is used to enter a condition that involves fields for more than one file skeleton or complex conditions.

Example:

To query for any scientist with disciplines of **Pathology** OR **Entomology** who is stationed in either **DAR** or **FRIM**:

On the File Skeleton you enter the following:

.OR. condition under discipline field – **DISCP**

"PATHOLOGY"

"ENTOMOLOGY"

In the **CONDITION BOX** you enter in the field **STATION**, the following condition:

STATION = "DAR" .OR. STATION = "FRIM"

Press **F2** to view the data.

11. Summarizing Records

You can summarize the values in certain fields and then display the results in a view. You can ask dBase to find the **SUM, AVERAGE, MINIMUM, MAXIMUM,** or **COUNT** for a collection of records.

To include a **summary operator** in a query, enter the abbreviations **SUM, AVG, MIN, MAX,** or **CNT** in the column of the field to which you want it applied.

Type of Field	**Summary operator**
Numeric	AVG, SUM, MIN, MAX, COUNT
Float Character	MIN, MAX, COUNT
Date	MIN, MAX, COUNT
Logical	COUNT
MEMO	= NONE

12. Groups and Subtotals

Records can be grouped into a specified number of records, or whenever the field data changes, or by a dBase expression. For example, Every Region records, or putting all disciplines together, or Grouping by highest qualification or station.

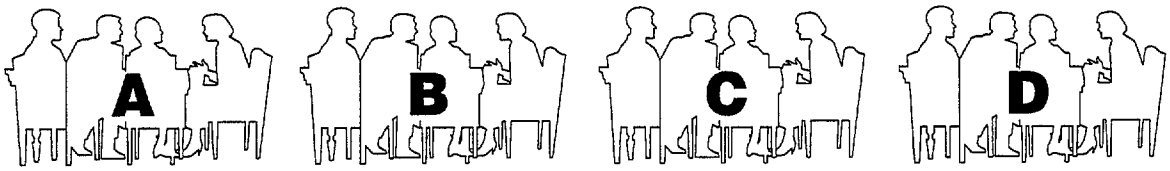
There may be times when you want to apply summary operators to records that have been organized into groups. **The Group By operator** organizes records into groups that contain the same value for some fields. The summary operators are then applied to the values in each group of records.

The Group By operator must be accompanied by the **Aggregate Operator** (**Summary**).

Exercise 18. Designing queries (group work)

Phase 1. Group work (2 hours)

1. Form four groups, each electing a rapporteur.



2. Use dBase IV database management system to design queries for the database you designed in the previous exercises (**PROJ1**).
3. Save your queries.

Phase 2. Reporting and discussion (35 minutes)

4. The rapporteurs present and discuss the results of the groups' work. They can use flipcharts or overheads to facilitate their presentations.
5. The trainer provides feedback on the content of the presentations.

Exercise 18. Worksheet

DAY SEVEN

Session 19
Database Reports Design

Instructions to Trainers

SESSION 19

14:00 – 15:30 Session 19. Database Reports Design

15:30 – 15:45 Tea/Coffee Break

15:45 – 17:00 Session 19. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss creating professional-looking reports.
- Practice dBase IV reports.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Distribute handout 7.19.1. Divide the participants into small groups and invite them to take their places at the computers. Ask each group to elect a rapporteur. Give a presentation, following the handout, demonstrating **step by step** how to design database reports. Invite the participants to repeat each step on their computers. Assist them carefully. (30 minutes)

EXERCISE 19

Exercise 19. Database reports design.
(1 hour 15 minutes)

1. Distribute handouts 7.19.2 and 7.19.3. Handout 7.19.2 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. *(experience)* Using dBase IV, groups design database reports based on the database they designed in previous exercises. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (1 hour 20 minutes)

Phase 2. Reporting and discussion

3. Ask the rapporteurs to present the results of their group's work. Approximately three minutes are available for each presentation. (15 minutes).

4. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (25 minutes)

5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 7.19.4 and use handout 7.19.5 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 7.19.6. (15 minutes)

DAY SEVEN

Session 19
Summary of Overheads

Objectives of Session 19. Database Reports Design

3. Discuss creating professional-looking reports
4. Practice dBase IV reports

7.19.1

Database Reports Design

7.19.2

Reports

A printout of selected data

arithmetic operations, headers, footers, and page numbers can be added on the page

Two different reports:

1. Quick Report
2. Custom Report

7.19.3

Report Bands

Printout of selected data, consisting of bands.

Bands: areas that control specific sections of the report

examples are:
- report intro band
- page header band
- page footer band
- report detailed band
- report summary band

7.19.4

Types of Report Bands

1. Page Header
   - the space at the top of each page that typically contains information such as page number, date and column titles of your data
   - printed once at the top of each page
2. Report Introduction
   - contains materials that appear at the beginning of the report
   - printed once, it can be a cover letter explaining the data that follows

7.19.5

Types of Report Bands (continued)

3. Report Detailed (body)
   - shows the data from the records in the database file or view of the body of the report
4. Report Summary
   - contains information that appears at the end of the report
   - concluding remarks, totals are included here
5. Page Footer
   - contains running titles for the report at the bottom

7.19.6

Report Design Screen – An Example

Page Header Band		
HRM: List of employees		
Surname	Other names	Salary
Report Intro Band		
Detail Band		
xxxxxxxx	xxxxxxxx	99999.99
Summary Band		
Number of Employees: 9999	Total: 99999.99	
Page Footer Band		

7.19.7

Group Bands in Report – An Example

Page Header Band		
Surname	Other names	Basic Salary
Report Intro Band		
Group 1 Intro Band		
Department: xxxxxxxx		
Detail Band		
xxxxxxxx	xxxxxxxx	99999.99
Group 1 Summary Band		
Total Department Staff: 9999		Salary: 99999.99
Report Summary Band		
Total Employees: 9999		Salary: 99999.99
Page Footer Band		

7.19.8

Grouping Reports

- adding calculated fields
- subtotals using group bands

groups by:
- specified number of records
- whenever the field data changes
- by a dBase expression

examples:
- every zone records
- putting all disciplines together
- grouping by PHDS

7.19.9

BEST AVAILABLE COPY

End-user Database Processing

Reports Design[1]

[1] Extract from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

Creating Professional Looking Reports

1. Introduction

dBase IV report capabilities allow you to create reports which:

- group similar or related data together;
- perform arithmetic operations such as calculating subtotals;
- add headings, footings, and page numbers to each page;
- print field data exactly where you want it on a page;
- insert field data into other text such as a form letter.

dBase IV provides two basic types of reports: **Quick Reports** and **Custom Reports**. Custom Reports can be saved for re-use, whereas Quick Reports cannot be saved and don't have to be.

2. Components of a Report

Before we continue, let us look at some of the basic components of a standard report. Usually, a report must have the following components:

2.1 Report introduction

Contains material that appears at the beginning of the report. It could be a cover letter or memo explaining the data that follows.

2.2 Page header

The space at the top of each page that normally contains information such as the page number, date, and title of the report.

2.3 Detail (body)

The bulk of the report; contents are reported for each report.

2.4 Report summary

Contains information that appears at the end of the report. This is the place to add concluding remarks or final totals.

2.5 The page footer

Similar to the Header, but the Footer appears at the bottom of the page instead of the top. You could place information such as your name, department or a running title for the report at the end of each page.

2.6 Report bands in dBase IV

Corresponding to each of the above components, each dBase IV report has five components called BANDS. Each Band consists of the band (which is highlighted) and the next solid horizontal line. The five Bands are the Page Header, Page Footer, Report Intro, Report Detailed and Report Summary Band.

3. Reports Design Screen

To access the Reports Design Screen, at the Control Center:

1) Open the database file you want to use
2) Move the pointer to **Reports Panel**
3) Choose **<create>**

   OR

   Press **SHIFT+F2**. The Reports Design Screen appears

4. General Techniques for Designing Reports

4.1 Report formats

dBase IV offers three general report layouts:

- Column layout – Data is printed in even-size columns. A report that presents data as a list or that includes totals and subtotals would likely use a column layout.
- Form layout – Data is not presented in even columns, but is instead stacked or arranged in some other free-form format.
- Mail merge layout – This layout is usually used to combine a large body of text with information from a database. This is the layout used to create form letters.

4.2 General techniques

Following are some of the most important techniques that will be used.

4.2.1 Adding and deleting text

You can place text, such as words, punctuation marks, and blank spaces anywhere in a report or label format.

a) Inserting new text

   To insert new text into a report or label format:

   1) Move the cursor to where you want the start of the new text to appear
   2) Press the Ins or Insert key, to put the **INSERT MODE ON**
   3) Type your new text (you can also press **ENTER** to move to text line)

b) Changing existing text

   1) Move cursor using same basic step above, but press the Ins or Insert key to turn the **INSERT MODE OFF**
   2) New text that you type will overwrite existing text

c) Deleting text

   1) Move the cursor to the left-most character that you want to delete
   2) Press Del (Delete) key until all text is deleted

NOTE: Don't delete any field templates.

d) Adding and deleting text lines

To insert a blank line

1) Move the cursor to the appropriate position:

   To place a new blank line above all other lines in the band, move the cursor to the beginning of the line (line: 0 column: 0) of the report band.

   To insert a new blank row between two existing rows, move the cursor to the left edge (Column 0) of the bottom of those two rows.

   To insert a blank row at the bottom of the report band (below all current rows), move the cursor to the end of the last line in the report band.

2) Press the Ins or Insert key to turn the insert mode to **ON** if not turned on.

3) Press **F10**.

4) Choose **ADD LINE**.

5) The line is inserted.

To delete a line

1) Move the cursor to the start of the line you want to delete.

2) Press **F10**.

3) Choose **REMOVE LINE**.

4.2.2 Adding and deleting field templates

A field template indicates the place where contents of a field will be displayed in the final printed report.

a) Adding field templates from the database

1) Move the cursor to where you want the field to start on your report

   OR

   Press **F5 – Add field** key.

2) Move the highlight to the name of the field and press **ENTER.**

3) Press Accept (**Ctrl+End**).

4) The field template is placed immediately on the screen.

b) Deleting a field template

1) Move the into the field template that you want to delete.

2) Press the Del (**Delete**) key.

4.2.3 Moving, copying and deleting blocks

A block is any section within a report band – be it text, field template, or any combination of text and field templates.

1) For the field template, move the cursor into the template

   OR

   For the block move the cursor to the corner of that block.

2) Press Select (**F6**) key.

3) Use the arrow keys to extend the highlight over the entire block you wish to move, copy or delete.

4) Press **ENTER** to complete the selection.

5) Press (**F7**) to move or (**F8**) to copy the block.

6) Use arrow keys to move the image to where you want the highlighted area moved or copied.

NOTE: If it is overlapping existing text and field templates, you will see the message "Delete covered text and fields? (Y/N)".

7) If it is okay to delete text and field templates that are covered by that image, Press **ENTER**.

   OR

   If it is NOT okay to delete the covered text and field templates, reposition the image to a new location, then Press **ENTER** to complete the move or copy.

   Please save your work!

5. Adding the Page Number and Date Fields in the Page Header

5.1 Page number

1) Place the cursor in Line: 0 Col: 0 in the Page Header Band.

2) Type "Page Number".

3) Press **F5** (Add Field) key.

4) Move the highlight to **PREDEFINED** column.

5) Move the highlight to "Page no" field and press **ENTER**.

6) Press **CTRL+END** to place the field on the work surface.

The page number field format 999 appears.

5.2 Date field

1) Place the cursor in Line: 1 Col: 0 (you can Press **ENTER**).

2) Type "Date:".

3) Press **F5** (Add Field) key.

4) Move the highlight to **PREDEFINED** column.

5) Select Date and Press **ENTER**.

6) Press **CTRL+END**.

The Date field format (MM/DD/YY) appears on the work surface.

NOTE: The page number and date will appear on the top of each page of your report.

5.3 Page header titles

Suppose that in the Human Resources database file HRDB a list of employees is required by date of appointment, discipline, and basic salary.

Suppose the total monthly basic salary is also required for all employees, the required page header title to be in the form shown below:

Employee List by Discipline and Salary

EMPLOYEE NAME	APPOINTMENT DATE	DISCIPLINE	BASIC SALARY
xxxxxxxxxxxxxx	dd/mm/yyyy	xxxxxxxxxx	999999999.99

The following steps will add the above page titles:

1) Press the **ENTER** key twice.
2) Press the **TAB** key twice.
3) Press the **CAPS** LOCK.
4) Press the **TAB** key twice.
5) Type "**EMPLOYEE LIST BY DISCIPLINE AND BASIC SALARY**".
6) Press **ENTER** twice to move the cursor to line: 7 Col: 0.
7) Type "**EMPLOYEE NAME:**".
8) Move the cursor to line: 7 Col: 26.
9) Type "**APPOINTMENT DATE**".
10) Move the cursor to Line: 7 Col: 65.
11) Type "**DISCIPLINE**".
12) Move the cursor to Line: 7 Col: 56.
13) Type "**BASIC SALARY**".

We have completed setting up the page Header titles in the Page Header Band.

Save your work!

6. Detailed Band Fields

The following steps will add the detailed band fields:

1) Move the cursor down to the Detail Band Line: 0 Col: 0. Press **ENTER**.
2) Press **F5** (Add Field).
3) Move the highlight to LNAME and press **ENTER**.
4) Press **CTRL+END** key to place the field template in the work area.

5) Move the cursor two columns to the right.

6) Press **F5** (Add field).

7) Select the **OTHERS** field, press **ENTER**.

8) Press **CTRL+END**.

This completes the employee name field templates.

9) Press **TAB** key.

10) Press **F5** (Add field).

11) Select the **DAPP** field and Press **ENTER**.

12) Press **CTRL+END** to place the Date of **APPOINTMENT** field template.

13) Press **TAB** key.

14) Press **F5** (Add field).

15) Select the **DISCP** field and Press **ENTER**.

16) Press **CTRL+END** to place the discipline field template on the work surface.

17) Press **TAB** key.

18) Press **F5** (Add field).

19) Select the **BSALARY** field and Press **ENTER**.

20) Press **CTRL+END** to place the Basic Salary field template in the work surface area.

Save your work!

7. Viewing the Report

To view the report on screen press **F10**, choose **Print**, select **View Report on Screen**, press **ENTER** – wait for a few seconds for your report to be displayed on the screen.

Notice the page number and date on the top left of the screen. To view more records press the space bar.

If you entered 50 records, you should be able to view about 4 pages in double spacing.

Take a break!

Next, you will cover:

Report Summary Band,

Page Footer Band, and

Grouping Records.

8. Adding the Report Summary and Band Fields

First you must open the Employee database file HRDB (or whatever name you used).

Now suppose that the total number of employees and total basic salary for all employees are required at the end of the report. The titles should be as shown below:

Total Number of Employees =

Total Salary =

The following steps will put the above titles and field templates on the work surface of the Report Design Screen.

1) If you are at the Control Center, move the highlight to **Reports** panel.
2) Select the **EMPLIST** file and press **ENTER**.
3) Select **Modify Layout**. You will be taken to the Report Design together with our report layout you created in the last session.
4) Move the cursor to the Report Summary Band Line: 0 Col: 0.
5) Press **ENTER** twice.
6) Press **TAB** key.
7) Type "Total Number of Employees =".
8) Press **F5** (Add field).
9) Move the highlight to Summary Column.
10) Select count as operation – press **ENTER**.
11) Press **CTRL+END** to place the Count field template on the work surface.
12) Press **ENTER** twice.
13) Move the cursor to line: 4 Col: 21 and type "Total Salary =", press **space bar** once.
14) Press **F5** (Add field).
15) Move the highlight to summary field, Select Sum and press **ENTER**.
16) Press **ENTER** and type STOTAL, press **ENTER**.
17) Press **down arrow key** once to move the highlight to "DESCRIPTION".
18) Press **ENTER** and type "Total Salary =", Press **ENTER**.
19) Press the **down arrow key** twice to move the highlight to "Field to Summarize on", Press **ENTER**. A list of fields is displayed.
20) Select the field **BSALARY** and press **ENTER**.
21) Press **CTRL+END** to place the template on the work surface.

Save and view the report on the screen.

You should be able to see the summary figures at the end of the report, e.g:

Total Number of Employees = 30

Total Salary = 58000.55

9. The Page Footer Band

The Page Footer Band is the space at the bottom of the page that normally contains the name of your department, your name, or even a page number. To add the Page Footer Band:

1) Move the cursor to the Page Footer Band to Line: 0 Col: 0, press **ENTER**.

2) Type "Report prepared by:", press **space bar** twice, type your name and your department.

Save and view the report.

Notice that you can put any running title in the Page Footer including the page number.

C O N G R A T U L A T I O N S !

What else? Grouping records in a report, calculated fields, such as taxes?

10. Creating a Cover Page – the Report Intro Band

Normally dBase IV prints text from the page header and page footer bands in the Report Intro band, on the first page of the report.

In some cases, however, you might want to use the Report Intro band as an independent cover sheet or cover letter. To set up the first page of a report as a cover page follow the steps below:

1) Open the database file, and move the highlight to Reports; select your report file such as EMPLIST and select **Modify Layout**.

2) Press **F10**.

3) Choose **Bands**.

4) Select **Page Heading** in **Report Intro**.

5) Press **ENTER** to change the option to NO (the menu also disappears).

6) Type "RESEARCH EMPLOYEE DATABASE".

7) Press **ENTER**.

8) Press **F10**.

9) Choose **Words**.

10) Select **Insert Page Break**. You will see a dotted line across the bottom of the Report Intro band, which indicates that when you print a report, dBase IV will start printing the remaining bands on next page.

11. Group Bands

In this session we are going to set up subtotals using Group Bands.

dBase IV can calculate subtotals on any numerical field. For example, it can calculate the total salary just for research scientists, or technical staff, or general support staff. You can also group all employees from the same department or station and perform the salary calculations, and so on.

When you specify subtotalling, you indicate which records will be grouped together for the various subtotal calculations. You do this by telling dBase which fields to look at to find records that have something in common.

Grouping is performed using a special kind of band called a **group band**. Group bands can subdivide your records in three ways. You can create groups:

- by a specified number of records – for example every 10 records;
- whenever the field data changes, for example, putting all Pathologists together;
- by a dBase expression to group records, for example, grouping all employees with the same qualifications or category.

Each group band contains two sections. The first part is the heading, which might indicate what each grouping is about. The second part is the summary field that holds the field data.

The field we want to group on is CATEGORY since we want all researchers together, administration together, technicians together, etc. Within each grouping, we then want to have salary subtotals.

The following steps will add the fields to display the subtotals:

1) Open the Database file and move the highlight to Report panel; select **EMPLIST** and press **ENTER**, choose **Modify Layout** to open the Report Design Screen.

   NOTICE that we want to group the records that appear in the detail section of the report.

2) Move the cursor to **Report Intro Band** and place the cursor on the word **Report**.

3) Press **F10**.

4) Choose **Bands**.

5) Choose **Add Group Band.**

6) Choose **Field Value** and press **ENTER**. A list of fields appears.

7) Highlight **CATEGORY** field and press **ENTER**.

   Two band lines are added: Group 1 Intro Band and Group 1 Summary Band. The old Detail Band is between these two.

8) In the Group 1 Intro band Type "This is another Category". This message will appear just above each grouping of records.

Adding the Subtotal Field

9) Move the cursor to Group 1 Summary Band – Row: 0 Col: 0.

   type "**** Subtotals for this group:".

10) Move the cursor to Line: 0 Col: 36.

11) Press **F5** (Add field).

12) Move the highlight to Fourth column – SUMMARY.

13) Select **Sum** and press **ENTER**.

14) Press **ENTER** and type SUBTOT, press **ENTER**.

15) Press **down arrow** to Description, press **ENTER**.

16) Type "Group Salary Subtotal", press **ENTER**.

17) Press the **down arrow** to field to summarize on, Press **ENTER**.

18) Select **BSALARY** – press **ENTER**.

19) Press **CTRL+END**.

SAVE! VIEW IT. CONGRATULATIONS!

12. Printing

dBASE IV offers you several ways to send data to your printer. You can print:

- Quick Report to quickly show the data from each field of a database file or view
- Custom reports to group, summarize and present data to your specifications
- Form letters, to combine repeating text with individualized data
- Data from specific records
- Mailing labels

12.1 Reaching a Print menu from the Control Center

From the Control Center, you can reach a **Print** menu by:

- pressing **ENTER** on the name of a file in the **Reports** or **Label** panels; if the panel prompt box appears, select **Print Report** or **Print Label**;
- selecting the **Print** menu when designing a report, label, or program;
- pressing **Shift-F9 Quick Report** when the cursor is on the name of a file in any Control Center panel except **Applications**;
- pressing **Shift F9 Quick Report** from the Browse/Edit screen or the queries design screen (this works only if you arrived at these screens directly from the Control Center or dot prompt).

12.2 Printing the structure of a database file

After designing a database file, you may want to have a printed copy of its structure. Choose the **Print database structure** option from the **Layout** menu on the database design screen. When you choose this option, the **Print** menu is displayed, and you can change printing attributes before printing the database structure.

12.3 Print menu

Beginning Printing	
	Eject page now View report on screen
	Use print form Save settings to print form
>	Destination
>	Control of printer
>	Output options
>	Page dimensions

12.3.1 Beginning printing

This options tells dBase IV to start printing. If the settings of the menu are the ones you want, this is the only option you need to choose.

You can halt the printer in two ways:

- Press **Ctrl-S** to pause printing temporarily.
- Press **Esc** to stop printing entirely.

If you are using a print buffer, the printer may not stop immediately after you press either of these keys. This is because the data still in the buffer may have to print out first.

12.3.2 Eject page now

This menu option makes the printer a page. This helps you start and end pages at their perforations. You can also eject a page automatically by selecting the **New Page** option from the **Control of Printer** submenu.

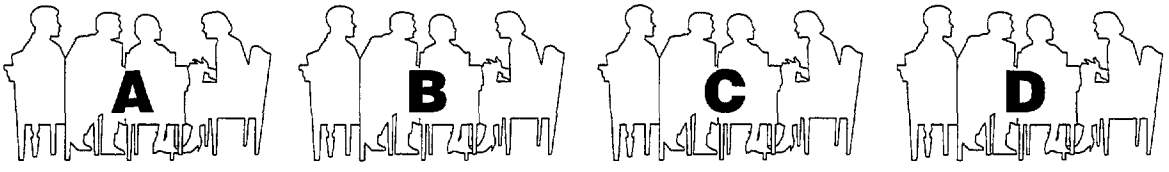
12.3.3 View the report on screen/view labels on screen

This menu options helps you see what your report or labels look like when printed. You can also check that all fields are properly defined. When you select this option, the report or labels are shown on the screen in the same format as they are printed. Reports and labels are shown one screen at a time. If they are wider than your screen, the text wraps to the next line.

Exercise 19. Database report design (group work)

Phase 1. Group work (1 hour 20 minutes)

1. Form four groups, each electing a rapporteur.



2. Use dBase IV database management system to design reports for the database you designed in the previous exercises (**PROJ1**).
3. Save your reports.

Phase 2. Reporting and discussion (45 minutes)

4. The rapporteurs present and discuss the results of the groups' work. They can use flipcharts or overheads to facilitate their presentations.
5. The trainer provides feedback on the content of the presentations.

Exercise 19. Worksheet

Strengths and Weaknesses

- **Please list what you consider to be three strengths of day seven**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day seven**

1.
2.
3.

- **Suggestions for improvements**

Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

DAY EIGHT

Information Management for Research

DAY EIGHT — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss database management: security, recovery, and integrity.
2. Know how to use a spreadsheet.
3. Appreciate the use of spreadsheets.
4. Be aware of additional features available with some of the spreadsheet packages.

Handouts

8.20.1 Overview
8.20.2 Tentative Schedule
8.20.3 Exercise 20. Discussing Database Management Issues
8.20.4 Database Management: Security, Recovery, and Integrity (text)
8.20.5 Security and Controls (text)
8.20.6 Key Concepts and Issues (text)
8.21.1 Introduction to Lotus 1–2–3 (text)
8.21.2 Exercise 21.a. Human Resource Management
8.21.3 Exercise 21.b. Budgeting
8.21.4 Exercise 21.c. Critical Review of Outturn
8.21.5 Exercise 21. Worksheet
8.21.6 Strengths and Weaknesses
8.21.7 Guidelines to Provide Feedback on the Workshop
8.21.8 PAPA Form - First Stage

Information Management for Research

DAY EIGHT — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 20. Database Management: Security, Recovery, and Integrity** (Presentation and exercise 20)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:00	**Session 20. (Continued)**
11:00 – 13:00	**Session 21. Introduction to Lotus 1–2–3** (Presentation and exercise 21)

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 21. (Continued)**
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 21. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Information Management for Research

DAY EIGHT — Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
8.20.1	Overview	❒	❒
8.20.2	Tentative Schedule	❒	❒
8.20.3	Exercise 20. Discussing Database Management Issues	❒	❒
8.20.4	Database Management: Security, Recovery, and Integrity (text)	❒	❒
8.20.5	Security and Controls (text)	❒	❒
8.20.6	Key Concepts and Isssues (text)	❒	❒
8.21.1	Introduction to Lotus 1–2–3 (text)	❒	❒
8.21.2	Exercise 21.a. Human Resource Management	❒	❒
8.21.3	Exercise 21.b. Budgeting	❒	❒
8.21.4	Exercise 21.c. Critical Review of Outturn	❒	❒
8.21.5	Exercise 21. Worksheet	❒	❒
8.21.6	Strengths and Weaknesses	❒	❒
8.21.7	Guidelines to Provide Feedback on the Workshop	❒	❒
8.21.8	PAPA Form – First Stage	❒	❒

Overheads

8.20.1	Objectives of Day Eight	❒	❒
8.20.2	Schedule of Day Eight	❒	❒
8.20.3	Objective of Session 20. Database Management: Security, Recovery, and Integrity	❒	❒
8.20.4	Database Administration and Management	❒	❒
8.20.5	Success Factors for Database Management	❒	❒
8.20.6	Database Integrity Threats	❒	❒
8.20.7	Threats and Their Usual Defences	❒	❒
8.20.8	Facets of Database Integrity	❒	❒
8.20.9	Database Integrity	❒	❒
8.20.10	The Process of Backup and Recovery	❒	❒
8.20.11	The Process of Backup and Recovery (continued)	❒	❒
8.20.12	Bringing Back or Roll Forward	❒	❒
8.20.13	Bringing Back or Roll Forward (continued)	❒	❒
8.20.14	Backup Strategies	❒	❒
8.20.15	Backup Strategies (continued)	❒	❒

		Yes ✓	No ✓
8.20.16	Backup Procedure in a Database Environment	☐	☐
8.20.17	Quality Control and Concurrent Update	☐	☐
8.20.18	Database Quality Control	☐	☐
8.20.19	Access Control and Encryption	☐	☐
8.20.20	Threats to Data Security	☐	☐
8.20.21	Shareability	☐	☐
8.20.22	Direct Accesss Control (Logical Access System)	☐	☐
8.20.23	Indirect Access Involves	☐	☐
8.20.24	Encryption/Decryption	☐	☐
8.20.25	Total Computer Security Programs	☐	☐
8.21.1	Objectives of Session 21. Introduction to Lotus 1-2-3	☐	☐
8.21.2	Spreadsheet	☐	☐
8.21.3	Example of a Spreadsheet	☐	☐

Materials

● Personal Computers	☐	☐
● Printers	☐	☐
● Diskettes	☐	☐
● Spare ink or toner for printers	☐	☐
● Overhead projector	☐	☐
● Spare bulbs for overhead projector	☐	☐
● Extension cords	☐	☐
● Projector screen	☐	☐
● Flipchart stands (minimum 2)	☐	☐
● Flipchart paper/pads (about 10 per day)	☐	☐
● Markers for writing on newsprint	☐	☐
● Markers for writing on transparencies	☐	☐
● Blank transparencies	☐	☐
● Stapler	☐	☐
● Tape (strong masking tape and regular tape)	☐	☐
● Push pins	☐	☐
● Glue	☐	☐
● Pencils/notepads/pens	☐	☐
● Pencil sharpeners	☐	☐
● Certificates	☐	☐
● Photocopying facilities	☐	☐
● Extra notepads and pens	☐	☐
● Scissors	☐	☐

DAY EIGHT

Session 20
Database Management: Security, Recovery, and Integrity

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Review of the previous day's activities.

- Summary of the evaluation of the previous day.

- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day eight (handouts 8.20.1 and 8.20.2) to the participants. Review the objectives and schedule using overheads 8.20.1 and 8.20.2. Ask if clarifications are needed. (10 minutes)

SESSION 20

09:00 – 10:30 Session 20. Database Management: Security, Recovery, and Integrity

10:30 – 10:45 Tea/Coffee Break

10:45 – 11:00 Session 20. (Continued)

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Discuss database management: security, recovery, and integrity.

PROCEDURE

Training techniques: presentation, discussion.

PRESENTATION

(experience) Distribute handout 8.20.3. Give a brief presentation on database management. You will find the information in handout 8.20.4 very useful to support your ideas. Use the overheads to facilitate understanding and learning the content. At the end of the presentation distribute handouts 8.20.4 to 8.20.6. Be sure to ask participants if they have any comments or questions, or if they need clarification. (40 minutes)

EXERCISE 20

Exercise 20. Discussing database management issues. (60 minutes)

1. Invite the group to participate in a discussion on the presentation, getting the participants to talk about personal experiences and examples.
2. Record key ideas on the flipchart or overhead to facilitate discussion and analysis of information.
3. Finally, provide your views on the results of the exercise.

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

DAY EIGHT

Session 20
Summary of Overheads

Objectives of Day Eight

1. Discuss database management: security, recovery, and integrity
2. Know how to use a spreadsheet
3. Appreciate the use of spreadsheets
4. Be aware of additional features available with some of the spreadsheet packages

8.20.1

Schedule of Day Eight

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 20. Database Management: Security, Recovery, and Integrity
	Tea/Coffee Break
10:45 – 11:00	Session 20. (Continued)
11:00 - 13:00	Session 21. Introduction to Lotus 1-2-3
	Lunch
14:00 – 15:30	Session 21. (Continued)
	Tea/Coffee Break
15:45 – 17:00	Session 21. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

8.20.2

Objective of Session 20. Database Management: Security, Recovery, and Integrity

1. Discuss database management: security, recovery, and integrity

8.20.3

Database Administration and Management

Objective:

Ensure that data is administered to provide a focal point for defining, manipulating, and controlling all elements of the database system

8.20.4

Success Factors for Database Management

- Top-level management commitment
- Data and information requirements planning
- Authority vested in database administrator
- Proper selection of staff
- Realistic, flexible view of DEIVIS and DBA
- Use of action-oriented and results-oriented approach
- Improved information to users

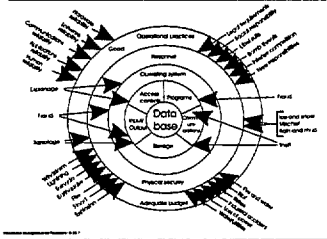
8.20.5

Database Integrity Threats

- Lack of privacy/confidentiality
- Damage to database
- Inaccuracy and inconsistency of data

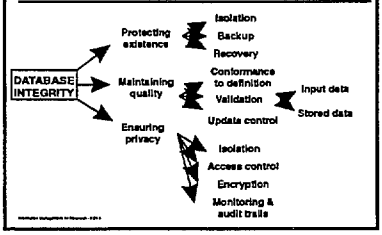
8.20.6

Threats and Their Usual Defenses



8.20.7

Facets of Database Integrity



8.20.8

Database Integrity

Integrity

Quality of the state of being complete

... unimpaired; wholeness; soundness; perfect condition

8.20.9

The Process of Backup and Recovery

Backup seeks to protect the existence of the physical database and to re-create the data whenever loss or destruction occurs.

Backup is the process of maintaining an historical record of any of the following:

1. Past states of the database DUMP
2. Changes to the database IMAGE LOG
3. Transaction which caused a change in the state of the database TRANSACTION LOG

8.20.10

The Process of Backup and Recovery (continued)

Backup enables reconstruction of all parts of the database in the event of loss or destruction of the data.

Reconstruction or RECOVERY of a database can take one of two forms:

1. RECOVERING the lost current state of the database: BRINGING FORWARD
2. RECOVERING a valid prior state of the database: PULLING BACK

8.20.11

Bringing Back or Roll Forward

ROLL FORWARD involves bringing forward a valid prior state of the database by redoing or reinstating the update processing since recording (dumping) the prior state.

The extent of damage may entail restoration of the entire database.

8.20.12

Bringing Back or Roll Forward (continued)

ROLL BACK is necessitated by the unsuccessful completion of or erroneous action of an update process. This involves roll back from the current erroneous (contaminated or otherwise unstable) state of the database by undoing or recovering the changes back to the point where the update processing began.

For maximum protection, the backup data should be stored immediately on permanent storage media remote from the database.

8.20.13

Backup Strategies

1. Dual recording of DATA - simultaneous on-line recording of all updates

   Useful when recovery must be accomplished in a very short time

2. Periodic dumping of DATA

   i.e. making a copy of the entire database

8.20.14

Backup Strategies (continued)

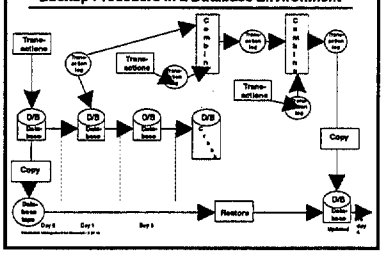
3. Logging input transactions

   Logging before and/or after images of all changes made to the database

4. Logging transactions which cause change to the database

8.20.15

Backup Procedure in a Database Environment



8.20.16

Quality Control and Concurrent Update

Data quality refers to data being:

1. Accurate
2. Current – stored data is up-to-date
3. Complete – knowing what data is relevant and should be collected

8.20.17

Database Quality Control

Accomplished by the following functions:

1. data validation
2. update authorization
3. concurrent update control
4. update synchronization

8.20.18

Access Control and Encryption

- Prevent unauthorized or inadvertent disclosure of information
- Contribute to data security – the protection of data from unauthorized disclosure, alteration, or destruction
- Seek to prevent unauthorized access and update, including destruction

Access = retrieval and modification

8.20.19

Threats to Data Security

Data may be:

- Inaccurate, falsified, disclosed, or lost before, during, or after processing
- Threats to data security can be intentional or accidental. People can exploit loopholes, abuse privileges to intentionally, or maliciously gain access to confidential data
- Accidental disclosures can result from hardware, software, or human failures, or natural disasters

8.20.20

Shareability

demands:

some mechanism to control

WHO does
WHAT
to WHAT Data

8.20.21

Direct Access Control (Logical Access System)

3 Stages:

1. Identification of the user usually through the ID code
2. Authentication to verify a user's purported identification, usually through the use of a password
3. Authorization of certain actions on certain data objects: defining access privileges, table set up

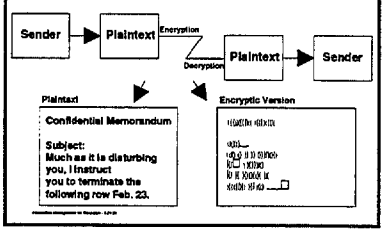
8.20.22

Indirect Access Involves

1. Flow controls on data movement from one place to another
2. Influence controls on statistical outputs from confidential data on individuals
3. Encryption of transmitted or stored data
4. Monitoring of system activities and user interactions

8.20.23

Encryption/Decryption



8.20.24

Total Computer Security Programs Involve Control External to the Computer System

(Physical and Administrative)

- Physical access controls
- Personnel screening on hiring
- Application program control
- Fire and flood detectors and inhibitors
- UPS
- Fences, perimeter surveillance system
- Locks on computer centers
- OS control

8.20.25

BEST AVAILABLE COPY

Handout — Overview of Day Eight

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss database management: security, recovery, and integrity.
2. Know how to use a spreadsheet.
3. Appreciate the use of spreadsheets.
4. Be aware of additional features available with some of the spreadsheet packages.

Handouts

8.20.1 Overview
8.20.2 Tentative Schedule
8.20.3 Exercise 20. Discussing Database Management Issues
8.20.4 Database Management: Security, Recovery, and Integrity (text)
8.20.5 Security and Controls (text)
8.20.6 Key Concepts and Issues (text)
8.21.1 Introduction to Lotus 1–2–3 (text)
8.21.2 Exercise 21.a. Human Resource Management
8.21.3 Exercise 21.b. Budgeting
8.21.4 Exercise 21.c. Critical Review of Outturn
8.21.5 Exercise 21. Worksheet
8.21.6 Strengths and Weaknesses
8.21.7 Guidelines to Provide Feedback on the Workshop
8.21.8 PAPA Form – First Stage

Handout — Tentative Schedule of Day Eight

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 20. Database Management: Security, Recovery, and Integrity** (Presentation and exercise 20)
10:30 – 10:45	Tea/Coffee Break
10:45 – 11:00	**Session 20. (Continued)**
11:00 – 13:00	**Session 21. Introduction to Lotus 1–2–3** (Presentation and exercise 21)

13:00 – 14:00 Lunch

14:00 – 15:30	**Session 21. (Continued)**
15:30 – 15:45	Tea/Coffee break
15:45 – 17:00	**Session 21. (Continued)**
17:00 – 17:30	**Feedback on the Day's Activities and PAPA**

Exercise 20. Discussing database management issues (plenary discussion)

1. Take notes of major issues presented by the trainer.
2. Formulate questions and comments to discuss in plenary. Use examples from your personal experiences and knowledge.

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Database Management[1]:

Security, Recovery, and Integrity

[1] Extract from: Sithole, A.S. 1994. Database Management. Arusha, Tanzania: ESAMI.

A DBMS must furnish a mechanism to ensure that only authorized users can access the database.

By Phillip J. Pratt & Joseph J. Adamski

A DBMS must furnish a mechanism for recovering the database in the event that the database is damaged in any way.

By Phillip J. Pratt & Joseph J. Adamski

A DBMS must furnish a mechanism to ensure that both the data in the database and changes to the data follow certain rules.

By Phillip J. Pratt & Joseph J. Adamski

Database Management

Objective of database administration and management

To ensure that data is administered to provide a focal point for defining, manipulating, and controlling all elements of the database system.

Critical success factors for database management

1. Top-level management commitment and involvement

- Data and information recognized as key resources of an organization (see corporate plan)
- Educate itself
- Communicate belief on DBMS to rest of organization

2. Data & information requirements planning

- Top management to oversee the creation of plan that documents information needs of organization (framework for subsequent application development)
- Initiate, review, and approve plan
- Make certain that plans are kept current (to accommodate changes)

3. Authority vested in Database Administrator (DBA)

- Institute standards and procedures (enforce)

4. Proper selection of staff

- DBA placement OR positioning in the organization

5. Realistic, flexible view of DEIVIS and DBA

- Weigh cost against benefits

6. Use of action-oriented and results-oriented approach

- Use appropriate productivity tools (4 GL's) and take advantage of phototyping to ensure accurate requirements definition

7. Improved information to users

- Communicate information in a cost-effective manner to users

Database management functions

1. Education and training
2. Selection and evaluation of DBMS based on organization requests
3. Policy formulation (standards and procedures)
4. Database dictionary management
5. Overall coordination
6. Initial loading of data in DB for new applications

Database Security, Recovery, and Integrity Threats

1. Lack of privacy/confidentiality due to:

a) unauthorized user attempts to bypass control of the DBMS

b) deficiencies in the security facilities of the DBMS

- users view data they are not supposed to (Read/Retrieve, output on transit, etc.)
- users modify data they are not supposed to
- users insert data they are not supposed to
- users delete data they are not supposed to

2. Damage to database caused by:

a) programs aborting

b) programs behaving incorrectly

c) disks where database reside having problems, e.g. crashing

d) hardware failure as the database is being updated

3. Inaccuracy and inconsistency of data within databases due to:

a) databases being updated in such a way that the resulting data within them violates some conditions

b) certain types of processing occurring when the databases are in certain states prior to updates

Database Security, Recovery and Integrity Measures

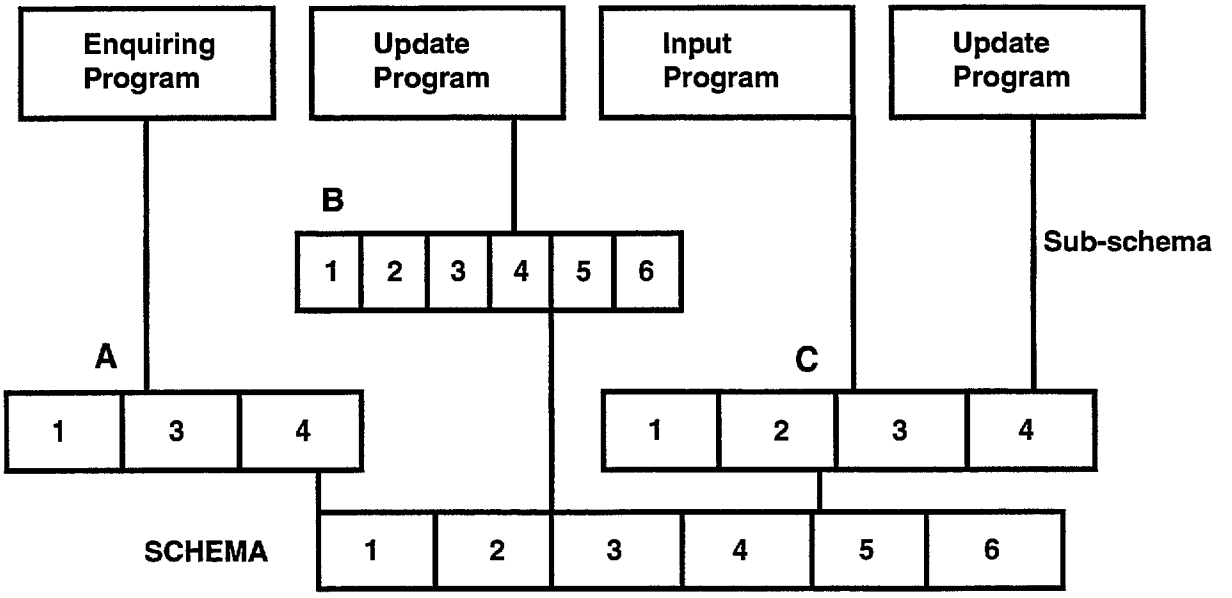
1. Law and/or organizational policy to cover

a) Storing encrypted data

b) Using schema and sub-schema facility

A **schema** is a chart of the types of data that exist within the database. It gives the names of the entities and attributes, and specifies the relationships between them. Also termed the logical database description.

A **sub-schema** refers to a user or system interface view of the data. Many different sub-schemas may be derived from a single schema.



Index:

1. Name
2. Address (home)
3. Title
4. Department
5. Basic salary
6. Qualifications

c) Use of authorization rules which indicate the following:

SUBJECT	who?
ACTION	is allowed to do what?
OBJECT	to what?
CONSTRAINT	under what condition or limitation?

d) Development and use of user-defined procedures

2. To minimize the impact of damage to databases the following measures are employed:

a) Regular backups of the databases. These copies will be used to recover the databases if the active copies of the databases are destroyed.

b) The keeping of logs of all activities that update the databases. The information kept about the updates would include transaction ID's, date/time, record of old (before) image, record of new (after) image, and start & end of transaction commitment.

c) Forward and backward recovery of damaged databases. Forward recovery gets the most recent backup copy and copies all the after images of the log. Backward recovery "undoes" the database by copying before images (roll-back databases).

3. To prevent, avoid, etc. database integrity violations, the following measures need to be employed:

a) Validation checks, i.e type, (range, size, length), limit, correspondence, duplicate, and other

b) Link/relationship

Security and Controls

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Security and Controls

It is important that data is guarded like any other valuable item. Organizations often lose on-line data because they fail to take into consideration even the most fundamental security and control tasks.

Data controls are routine procedures that detect, correct, and reduce errors in information management. They include making sure that computer users follow designated rules in naming files, saving data, checking for viruses and generally reducing the risks of loss or corruption of data.

Security risks can be found at nearly all levels of data management from the computer programmer to the data entry specialist. Users of databases must guard against the following:

- security of diskettes, software and hardware
- protection of computer equipment from dirt, mishandling and other damage that may lead to a loss of data
- violation of confidential data
- overwriting or mistakes in saving files
- corruption of files and software through computer viruses

For further information, the following reference on security and controls for computers and information management is recommended:

Security and Controls. 1993. Published by BPP Publishing Limited, Aldine House, Aldine Place, London, United Kingdom, W12 SAW.

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Key Concepts and Issues in System Security

If the computer hardware, software, and data accumulated by an organization are to be protected, careful consideration of an adequate system security is required.

Computer *fraud* is the term used to describe intentional mishandling of equipment and data in the system. This breach of security may range from theft of computer hardware or software to the illegal access to or altering of computer files.

Ensuring the *confidentiality* of computer systems must be a major concern for system operators and managers. Only through ensuring an adequate security system for your computer equipment and data can you protect your work, your reputation and your organization.

For further information, the following reference on security systems for computers and information management is recommended:

Security and Controls. 1993. Published by BPP Publishing Limited, Aldine House, Aldine Place, London, United Kingdom, W12 SAW.

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DAY EIGHT

Session 21
Introduction to Lotus 1-2-3

Instructions to Trainers

SESSION 21

11:00 – 13:00 Session 21. Introduction to Lotus 1-2-3

13:00 – 14:00 Lunch

14:00 – 15:30 Session 21. (Continued)

15:30 – 15:45 Tea/Coffee Break

15:45 – 17:00 Session 21. (Continued)

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Know how to use a spreadsheet.
- Appreciate the use of spreadsheets.
- Be aware of additional features available with some of the spreadsheet packages.

PROCEDURE

Training techniques: presentation, group work.

PRESENTATION

(experience) Distribute handout 8.21.1. Divide the participants into small groups and invite them to take their places at the computers. Ask each group to elect a rapporteur. Give a presentation, following the handout, introducing Lotus 1-2-3. Invite the participants to repeat the steps on their computers. Assist them carefully. (45 minutes)

EXERCISE 21

Exercise 21. Introduction to Spreadsheets.
(3 hours 45 minutes)

1. Distribute handouts 8.21.2, 8.21.3, 8.21.4, and 8.21.5. Handouts 8.21.2 – 8.21.4 give clear instructions for the exercises. Go over the instructions with the participants step by step. Emphasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. *(experience)* Groups create worksheets. As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (3 hours 5 minutes)

Phase 2. Reporting and discussion

3. Ask the rapporteurs to present the results of their group's work. Approximately five minutes are available for each presentation. (20 minutes).
4. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
5. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the last session.

17:00 – 17:30 Feedback on the Day's Activities and PAPA

OBJECTIVES

By the end of this session participants will be able to do the following:

- Provide feedback on the day's activities.
- Consider possible actions they would like to implement in their own organizations.

PROCEDURE

Training technique: individual exercise.

Highlight positive and negative points of the day. Note areas that may need additional attention in the workshop. Participants can describe some strengths and weaknesses of this day on handout 8.21.6 and use handout 8.21.7 to facilitate their task. (15 minutes)

PAPA

(application) Ask the participants to take some time to jot down some "action ideas" they may have for themselves as a result of today's activities. They can use handout 8.21.8. (15 minutes)

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DAY EIGHT

Session 21
Summary of Overheads

Objectives of Session 21.
Introduction to Lotus 1-2-3

2. Know how to use a spreadsheet
3. Appreciate the use of spreadsheets
4. Be aware of additional features available with some of the spreadsheet packages

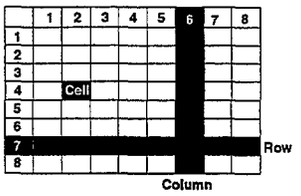
8.21.1

Spreadsheet

- A tool for organizing, manipulating, and analyzing data
- It is set up as a grid of rows and columns
- Each piece of information is stored in a cell: a space one row high and one column wide

8.21.2

Example of a Spreadsheet



8.21.3

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Introduction to Lotus 1-2-3[1]

[1] Extract from: Shila, Howard M. 1995. End-user database processing using dBase. Designer's Manual. Arusha, Tanzania: ESAMI.

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What is a spreadsheet?

A spreadsheet is a type of software package for financial modeling. The computer's VDU monitor displays a sheet divided into rows and columns, and figures or text can be inserted into the boxes on the sheet. Examples of spreadsheets are Supercalc, Lotus 1-2-3, and Excel.

Uses of spreadsheets

Some of the more common uses of spreadsheets are:

(a) cash flow analysis/forecasting;

(b) inventory records;

(c) job costs estimates;

(d) market share analysis and planning;

(e) profit projections;

(f) tax estimation.

What all these uses have in common is that they all involve data processing with:

(a) numerical data;

(b) repetitive, time-consuming calculations;

(c) a logical processing structure.

The great value of spreadsheets derives from their simple format of rows and columns of data, and the ability of users to have direct access themselves to their spreadsheet models via their own PCs. For example, an accountant can construct a cash flow model with a spreadsheet package on a PC in his or her office: he or she can create the model, input the data, manipulate the data and read or print the output directly. He or she will also have access to the model whenever it is needed.

Lotus 1-2-3

Lotus 1-2-3 is an electronic spreadsheet. An electronic spreadsheet is an electronic replacement for traditional, financial modelling tools, such as the accountant's columnar pad, pencil, and calculator.

Lotus 1-2-3 was first introduced in 1983. It was one of the first integrated office management programs. It combines three of the most popular business applications – electronic spreadsheet, business graphics and database management – into one sophisticated program.

The 1-2-3 spreadsheet

- The letters A, B, C,..... represent the columns.
- The numbers 1,2,3,..... present the rows.
- The area where the column and the row meet is called a cell. The cell name or address is determined by column letter and row number. For example in the spreadsheet below:

  8 is in cell B2
  K is in cell E4

	A	B	C	D	E	F	G	H	I	J
1										
2		8								
3										
4					K					
5										
6										
7										

- In the cell you can enter or type the following:
  - Data (numeric characters)
  - Formulas, operators and functions
  - Labels (Alphabetic characters)
- Lotus 1-2-3 consists of 8,192 rows and 256 columns, this works to 2,097,152 cells.

Entering numbers

The rules for entering numbers are as follows:

- A number cannot begin with any character except:
  - 0 (zero) through 9
  - a decimal point (.)
  - a minus sign (-)
  - a plus sign (+)
  - a dollar sign ($)
  - parentheses ()
- The number can end with a percentage sign (%), which tells Lotus 1-2-3 to divide the number that precedes the sign by 100.
- A number cannot have more than one decimal point.
- A number can be in scientific notation (1.234E+06).

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Entering formulas

A formula is a combination of a number of cell addresses that are separated by arithmetic (+, -, *, /, ^) operators. The formula must begin with one of the following characters:

0 1 2 3 4 5 6 7 8 9 . + - (@ # $

A formula must begin with a plus (+) sign if the formula starts with a cell address, otherwise the formula will be treated as a label. For example, if B3=2; C3=3; D3=4

Formula	Evaluation	Answer
+C3-D3/B3	3-(4/2)	1
(C3-D3)/B3	(3-4)/2	-0.5
=D3*C3-B3^C3	(4*3)-(2 3)	4

Control panel

The control panel is the area above the reverse-video border. This area has three lines, each with a special purpose. The first line contains all information about the current cell. The information includes cell address, cell format, and actual contents of the cell. The second line in the control panel contains the characters that are being entered or edited. The third line in the control panel contains explanations of the current command menu.

Mode indicators

One of Lotus 1-2-3's different modes is always in effect, depending on what you are doing. The mode indicator, located in the upper right corner of the screen always shows which mode 1-2-3 is on. Mode indicators and descriptions are shown in Table 1.

Lock key indicators

Most IBM compatible microcomputers have the "lock" keys Num Lock, Caps Lock, and Scroll Lock. 1-2-3 has a special area on the screen that shows when the "locks" are on. Each key has its own reverse-video indicator that appears in the lower right corner of the screen when the key has been activated. A part from the lock key indicators, there are other indicators, which display the status of certain keys and special situations. They are listed in Table 2.

Functions

Some common and/or complex mathematical formulas and special tasks are pre-programmed. They are referred to as functions. The function consist of three parts: the @ sign, function name, and an argument or range. The @ sign signals to Lotus 1-2-3 that a function is coming; the name indicates which function is being used; the argument or range is the data required by Lotus 1-2-3 to perform the function. The argument is always placed in parentheses.

For example,

+B1+B2+B3+B4+B5+B6+B7+B8+B9

can also be written as

@sum(b1..b9).

Or, the average of the contents of cells shown above

(B1+B2+B3+B4+B5+B6+B7+B8+B9)/9

can also be written as

@avg(b1..b9).

Entering labels

Labels are strings of alphabetic characters. They are used for row and column headings. Labels can have a prefix, depending on where you want the label to be displayed.

Label Prefix	Action
'	Left-justifies
^	Centers
"	Right-justifies
\	Repeats

Lotus 1-2-3 screen display

The main 1-2-3 display is divided into two parts: the control panel at the top of the screen and the worksheet area itself. A reverse-video border separates the two areas. This border contains the letters and numbers that mark columns and rows.

Other important areas of the screen are:

- the mode indicator (upper right corner)
- the lock key indicator (lower right corner)
- the message area in the lower left corner – normally shows the date and time, but will show an error message when certain kinds of errors are made

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Table 1. Mode Indicators and Descriptions

MODE	DESCRIPTION
READY	1-2-3 is waiting for you to enter a command or make a cell entry.
VALUE	A number or formula is being entered.
LABEL	A label is being entered.
POINT	A range is being pointed to.
EDIT	A cell entry is being edited.
FILES	1-2-3 is waiting for you to select a file name from the list of file names.
NAMES	1-2-3 is waiting for you to select a range name from the list of range names.
MENU	A menu item is being selected.
HELP	1-2-3 is displaying a help screen.
ERROR	An error has occurred and 1-2-3 is waiting for you to press ESC or ENTER to acknowledge the error.
WAIT	1-2-3 is in the middle of a command and cannot respond to other commands. Flashes on and off.
FIND	1-2-3 is in the middle of a Data Query operation and cannot respond to commands.
STAT	1-2-3 is displaying the status of your worksheet.

Table 2. Status Indicators and Descriptions

INDICATOR	DESCRIPTION
NUM	The Num Lock key has been pressed. Pressing the number keys on the numeric keypad will produce numbers.
CAPS	The Caps Lock key has been pressed. Pressing the letter keys on the alphabetic keyboard will produce capital letters.
SCROLL	The Scroll Lock key has been pressed and is now active.
END	The End key has been pressed and is now active.
OVR	The Insert key has been pressed, and 1-2-3 is now in typeover mode.
CALC	A worksheet has not been recalculated since the last change to cell contents.
CIRC	A circular reference has been found in the worksheet.
MEM	Random-access memory almost exhausted. Flashes on and off.
HAL	HAL/HAL, a Lotus add-in that provides a natural language interface for 1-2-3, is active in your computer's random access memory and can be accessed by pressing backslash key \.
CMD	A keyboard macro or Command Language program is in the process of execution.
SST	A keyboard macro or Command Language program is in single-step execution.
STEP	Alt-F2 has been pressed, and you are currently stepping through a macro or Command Language program one cell at a time.

1-2-3 Commands Reference

1. WORKSHEET COMMANDS

1.1 WORKSHEET GLOBAL FORMAT /WGF

Selects how most numeric values and results should appear. Formats the entire worksheet, but previously entered values and formulas do not change. The format items are: Fixed-F, Scientific-S, Currency-C, Comma, General-G, +/-, Percent-P, Date-D, Text-T, and Hidden.

1.2 WORKSHEET GLOBAL LABEL-PREFIX /WGL

Selects how you want text labels aligned throughout the worksheet. The label items are: Left L. Right R. and Center C alignments. Use labels in a cell by entering one of the following prefixes before you type the label:

'	Apostrophe aligns labels to the left (default).
"	Quotation mark aligns labels to the right.
^	Caret aligns labels in the center.
\	Backslash repeats characters to fill the cell.

1.3 WORKSHEET GLOBAL COLUMN WIDTH /WGC

Sets column width for the entire worksheet. Default is 9 characters.

1.4 WORKSHEET GLOBAL RECALCULATION /WGR

Sets automatic or manual recalculation modes for the entire worksheet. The items are: Natural N, Column-wise C, Row-wise R, Automatic A (default), Manual M, and Iteration I.

1.5 WORKSHEET GLOBAL PROTECTION /WGP

Protects the entire worksheet from being changed. The options are: Enable E and Disable D.

1.6 WORKSHEET GLOBAL DEFAULT /WGD

Specifies display formats and start-up settings for the hardware – printer, disks and directories accessed automatically; which international displays are used and which type of clock is used. The items are: Printer P, Directory D, Status S, Update U, Other O and Quit.

1.7 WORKSHEET GLOBAL ZERO /WGZ

Suppresses zeros in displays and printed reports, so that only non-zero numbers appear.

1.8 WORKSHEET INSERT COLUMN/ROW /WIC /WIR

Inserts one or more blank columns or rows in the worksheet. The items are Column C and Row R.

1.9 WORKSHEET DELETE COLUMN/ROW /WDC /WDR

Deletes one or more columns or rows from the worksheet. It deletes all data and formulas in the column or row.

1.10 WORKSHEET COLUMN SET WIDTH/RESET WIDTH /WCS/WCR

Adjusts the column width of an individual column.

1.11 WORKSHEET COLUMN HIDE/DISPLAY /WCH /WCD

Hides individual columns or a range of columns.

1.12 WORKSHEET ERASE /WE

Erases the entire worksheet and resets all cell formats, labels' prefixes, and commands to their original values.

1.13 WORKSHEET TITLES /WT

Retains the display of column and row headings that would otherwise scroll off the screen. It is known as freezing. The options are: Both column and row titles, Horizontal, Vertical, and Clear Titles.

1.14 WORKSHEET WINDOW /WW

Displays two parts of the worksheet at the same time. The options are: Horizontal H, Vertical V, Sync S, Unsync U, and Clear C.

1.15 WORKSHEET STATUS /WS

Displays the current global settings that help you operate the worksheet.

1.16 WORKSHEET PAGE /WP

Manually inserts breaks in printed worksheets.

2. RANGE COMMANDS

Range commands control the display formats, protection, and manipulation of portions of the worksheet.

2.1 RANGE FORMAT /RF

Prepares cells so that they display with a specific format for both values- numbers and formulas. The options are: Fixed F, Scientific S, Currency C, Comma, General G, +/-, Percent P, Date D, Text T, Hidden H, and Reset R.

2.2 RANGE LABEL/RL

Selects how you want to align text (labels) in their cells. Options are Left L, Right R, and Center C.

2.3 RANGE ERASE/RE

Erases the contents of a single cell or range of cells.

2.4 RANGE NAME /RN

Assigns an alphabetical or alphanumeric name to a cell or range of cells. The options are Right R, Down D, Left L, and Up U.

2.5 RANGE JUSTIFY /RJ

Fits text within a desired range by wrapping words to form a complete paragraph.

2.6 RANGE UNPROTECT /RU

Allows changes to cells in a protected worksheet.

2.7 RANGE INPUT /RI

Restricts cell pointer movement to unprotected cells.

2.8 RANGE VALUE/RV

Converts formulas in a range to their values so that you can copy only the values to a new location.

2.9 RANGE TRANSPOSE /RT

Reorders columns of data into rows of data, or rows of data into columns of data.

3. COPY AND MOVE COMMANDS

3.1 COPY

Copies formulas, values, and labels to new locations. The cell address changes to reflect the new location or stays fixed depending on whether you use Relative or Absolute cell references.

3.2 MOVE

Reorganizes your worksheet by moving blocks of labels, values, or formulas to different locations. Formula results do not change.

4. FILE COMMANDS

File commands are used to Save and Retrieve worksheets, extract a small worksheet from inside of a larger worksheet, import ASCII data and select the drive and directory for storage.

4.1 FILE RETRIEVE /FR

Loads the requested worksheet file from the disk into the memory.

4.2 FILE SAVE /FS

Saves the current worksheet and settings on the disk.

4.3 FILE COMBINE /FC

Combines values or formulas from one worksheet with data in another worksheet. The items are Copy C, Add A, and Subtract S.

4.4 FILE EXTRACT /FX

Saves to disk portions of the current worksheet as a separate worksheet.

4.5 FILE ERASE /FE

Erases 1-2-3 files from disk. The options are: Worksheet W, Print P, Graph G, Other O.

4.6 FILE LIST /FL

Displays all file names that are stored on the current drive and directory.

4.7 FILE IMPORT /FI

Brings ASCII text files from other programs into 1-2-3 worksheets. The options are Text T and Numbers N.

4.8 FILE DIRECTORY /FD

Changes the default disk drive or directory for the current work session.

5. PRINT COMMANDS

Prints worksheet contents as values or formulas.

5.1 PRINT PRINTER /PP

Prints worksheet contents (values or formulas) to the printer.

5.2 PRINT FILE /PF

Prints worksheet contents as ASCII text to file.

5.3 PRINT PRINTER/FILE RANGE /PPR /PFR

Defines the area of the worksheet to be printed.

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LOTUS 1-2-3 @ FUNCTIONS

LOTUS 1-2-3's @ functions are built-in formulas that perform specialized calculations. Instead of adding a range of numbers + A5 + A6 + A7 + A8 + A9 + A10 + A11, you can use the function @sum(A5..A11) to do the work for you. You can use an @ function by itself in a cell, or combine it with other functions and formulas. Most of 1-2-3's @ functions calculate numeric values. Some of the functions are:

Statistical Functions – calculate lists of values

This function	Returns
@AVG(list)	the average of the values in list
@COUNT(list)	the number of non-blank entries in list
@MAX(list)	the maximum value in list
@MIN(list)	the minimum value in list
@STD(list)	the population standard deviation of the values in list
@SUM(list)	the sum of the values in list
@VAR(list)	the population variance of the values in list

Mathematical Functions – calculations using numeric values

This function	Returns
@ABS(x)	the absolute (positive) value of x
@ACOS(x)	the arc cosine of x
@ASIN(x)	the arc sine of x
@ATAN(x)	the arc tangent of x (2 quadrant)
@ATAN2(x,y)	the arc tangent of y/x (4 quadrant)
@COS(x)	the cosine of angle x
@EXP(x)	the number e raised to the xth power
@INT(x)	the integer part of x
@LN(x)	the natural log (base e) of x
@LOG(x)	the log (base 10) of x
@MOD(x,y)	the remainder of x/y
@PI	the number π (approximately 3.1415926)
@RAND	a random number between 0 and 1
@ROUND(x,n)	x rounded to n places
@SIN(x)	the sine of angle x

@SQRT(x)	the positive square root of x
@TAN(x)	the tangent of angle x.

Exercise 21. Part a: Human resource management

Phase 1. Group work – part a, b and c (3 hours 5 minutes)

Personnel Distribution per Department				
Department	Clerical	Technical	Administration	Total
Accounts	20	10	10	T4
Supplies	25	15	12	T5
Marketing	10	5	8	T6
Transport	8	4	6	T7
Total	T1	T2	T3	T8

1. Create the above worksheet with the appropriate formulas in their respective places, i.e. T1, T2, ...
2. Project the personnel distribution in the year 2000 if:
   a) The clerical staff will increase by 5% in all departments.
   b) The technical staff in the accounts and marketing departments will increase by 8% while those in the supplies and transport departments will increase by only 4%.
   c) The company expects to cut administrative costs by reducing the administrative workforce by 2% in all departments.
3. The company is also planning to introduce a new department of research and development by the year 2000. The initial staff is currently estimated to be 5 clerical, 8 technical, and 3 administrative staff. Add this to your year 2000 worksheet. It should be placed before the accounts department.

Exercise 21. Part b: Budgeting

Phase 1. (continued)

1. Create the following worksheet and create formulas where there are Fs in the information.

AT & C LTD

Profit and Loss budget
1990

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total 1990
Sales Revenue	20000	20000	35000	55000	
Cost of Sales	12000	12000	18000	28000	
Margin Contribution	F3	F4	F5	F6	
Warehousing Expenses	2000	2000	2000	2000	
Freight Expenses	1000	1000	1750	1750	
Gross Margin	F10	F11	F12	F13	F14
Marketing Expenses	3000	3000	3000	3000	F15
Administrative Expenses	4000	4000	4000	4000	F16
Misc. Overhead Expenses	480	480	720	1120	F17
Net Income	F18	F19	F20	F21	F22

2. Insert a new column before the 1st Quarter column.
3. Create a column called "1990 Budgeted" in column you have just inserted.
4. Create a column called "Total 1989" after "Total 1990" column.
5. Create a column called "% Increase or Decrease" after the "Total 1989" column.
6. Enter the following data:

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	Budgeted 1990	Total 1989	% Increase or Decrease
Sales Revenue	120000	110000	F1
Cost of Sales	66000	80000	F2
Margin Contribution	54000	30000	F3
Warehousing Expenses	8000	7500	F4
Freight Expenses	6000	6000	F5
Gross Margin	40000	16500	F6
Marketing Expenses	12000	7400	F7
Administrative Expenses	16000	9800	F8
Misc. Overhead Expenses	2600	2400	F9
Net Income	9400	-3100	F10

Formulas:

(1) Margin Contribution = Sales Revenue - Cost of Sales

(2) Gross Margin = Margin Contribution - Warehousing Expenses - Freight Expenses

(3) New Income = Gross Margin - Marketing Expenses - Administrative Expenses - Misc. Overhead Expenses

Exercise 21. Part c: Critical review of outturn (group exercise)

The purpose of this exercise is to show how a spreadsheet can be used to calculate ratios and trends from sets of accounts. This process is known as "critical review of outturn" and is one of the types of analytical review.

The objective of a critical review of outturn is to gain additional confidence (over and above the confidence you would already have gained through detailed testing work) that the figures in the final accounts are not materially misstated. Used in this way (as a critical review of outturn), analytical review is not a substantive test; it merely provides additional "comfort" to the auditor that the final figures are broadly in line with what was expected.

1. Form 4 groups of participants and elect a rapporteur for each group.
2. Create the worksheet using the data provided by the Balumba Corporation, shown on overleaf.
3. The rapporteurs prepare a report to present to the audience.
4. The rapporteurs present and discuss the results of the group's work with the audience.

Phase 2. Reporting and discussion (35 minutes)

Group rapporteurs present the results of the exercise.

The Balumba Corporation

Trading and Profit and Loss Account
for the year ended 31 December 1992

	$	$
Sales		100,000
DEDUCT Cost of Sales		
Opening Stock	12,000	
ADD Purchases	58,000	
	70,000	
LESS Closing Stock	10,000	
		60,000
Gross Profit		40,000
DEDUCT Expenses		
Salaries	16,300	
Rent and Rates	2,000	
Electricity	1,000	
Travelling	2,000	
Postage and Stationery	500	
Advertising	1,000	
Bank Interest	1,200	
Loan Interest	1,000	
		25,000
Profit before Taxation		15,000
DEDUCT Taxation		6,000
Profit after Taxation		9,000
DEDUCT Dividends		
5% Preference (paid)	1,000	
Ordinary – Interim (paid)	4,000	
Ordinary – Final (proposed)	2,000	
		7,000
Balance carried forward		2,000

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The Balumba Corporation

Balance Sheet as of 31 December 1992

	$	$	$
Employment of Capital			
FIXED ASSETS			
Land and Buildings			30,000
Machinery			21,000
Goodwill			5,000
Patents and Trade marks			2,000

			58,000
CURRENT ASSETS			
Stock	10,000		
Debtors	28,000		
Cash and Bank	17,000		

		55,000	
DEDUCT			
CURRENT LIABILITIES			
Creditors	15,000		
Bank Overdraft	10,000		
Corporation Tax	6,000		
Proposed Dividend	2,000		

		33,000	
			22,000

			80,000
DEDUCT			
LONG-TERM LIABILITIES			
10% Unsecured Loan Stock			10,000

			70,000
			======
Capital Employed			
SHARE CAPITAL (Authorized and Fully Paid)			
20,000 5% Preference shares of $1 each		20,000	
30,000 Ordinary Shares of $1 each		30,000	

			50,000
			5,000
Share Premium			
Retained profits			15,000

			70,000
			======

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Ratios

Gross Profit Margin (%)	35.00
Net Profit Margin (%)	14.00
Return on Net Assets (%)	23.33
Return on Equity (%)	14.17
Current Ratio (:1)	1.68
Acid Test (:1)	1.32
Stock Turnover (days)	67.38
Debtor Turnover (days)	80.30
Creditor Turnover (days)	115.12
Interest Cover (times)	29.00
Dividend Cover (times)	1.42

Exercise 21. Worksheet

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Strengths and Weaknesses

- **Please list what you consider to be three strengths of day eight**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day eight**

1.
2.
3.

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- **Suggestions for improvements**

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Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

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5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

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DAY NINE

Information Management for Research

DAY NINE – Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the features of INFORM-R.
2. Analyze INFORM-R.
3. Evaluate the usefulness of INFORM-R in your organization.
4. Discuss database development, management report production, and analysis.
5. Discuss issues related to information management systems based on the field trip.
6. Lists strengths and weaknesses of the information management systems used in the organization they visited.
7. Suggest relevant recommendation to minimize or overcome the weaknesses to apply in their own environment if applicable.

Handouts

9.22.1 Overview
9.22.2 Tentative Schedule
9.22.3 Draft Guidelines to INFORM-R (text)
9.22.4 Exercise 22. Evaluating INFORM-R: A Tool for MIS in Agricultural Research Management
9.22.5 Exercise 22. Worksheet
9.23.1 Exercise 23. Database Development, Management, Report Production, and Analysis
9.23.2 Exercise 23. Worksheet
9.23.3 Strengths and Weaknesses
9.23.4 Guidelines to Provide Feedback on the Workshop
9.23.5 PAPA Form — First Stage

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Information Management for Research

DAY NINE – Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 22. INFORM-R Computer Demonstration** (Exercise 22)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 23. Database Development, Management, Report Production, and Analysis** (Exercise 23)
13:00 - 14:00 Lunch	
13:30 – 17:00	**Session 24. Field Trip: Assessing an Existing MIS in an Organization**

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Information Management for Research

DAY NINE – Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
9.22.1	Overview	❒	❒
9.22.2	Tentative Schedule	❒	❒
9.22.3	Draft Guidelines to INFORM-R (text)	❒	❒
9.22.4	Exercise 22. Evaluating INFORM-R: A Tool for MIS in Agricultural Research Management	❒	❒
9.22.5	Exercise 22. Worksheet	❒	❒
9.23.1	Exercise 23. Database Development, Management, Report Production, and Analysis	❒	❒
9.23.2	Exercise 23. Worksheet	❒	❒
9.23.3	Strengths and Weaknesses	❒	❒
9.23.4	Guidelines to Provide Feedback on the Workshop	❒	❒
9.23.5	PAPA Form — First Stage	❒	❒

Overheads

9.22.1	Objectives of Day Nine	❒	❒
9.22.2	Schedule of Day Nine	❒	❒
9.22.3	Objectives of Session 22. INFORM-R Computer Demonstration	❒	❒
9.23.1	Objective of Session 23. Database Development, Management, Report Production, and Analysis	❒	❒

Materials

•	Personal Computers	❒	❒
•	Printers	❒	❒
•	Diskettes	❒	❒
•	Spare ink or toner for printers	❒	❒
•	Overhead projector	❒	❒
•	Spare bulbs for overhead projector	❒	❒
•	Extension cords	❒	❒
•	Projector screen	❒	❒
•	Flipchart stands (minimum 2)	❒	❒
•	Flipchart paper/pads (about 10 per day)		

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	Yes ✓	No ✓
● Markers for writing on newsprint	❒	❒
● Markers for writing on transparencies	❒	❒
● Blank transparencies	❒	❒
● Stapler	❒	❒
● Tape (strong masking tape and regular tape)	❒	❒
● Push pins	❒	❒
● Glue	❒	❒
● Pencils/notepads/pens	❒	❒
● Pencil sharpeners	❒	❒
● Certificates	❒	❒
● Photocopying facilities	❒	❒
● Extra notepads and pens	❒	❒
● Scissors	❒	❒

4TB

DAY NINE

Session 22
INFORM-R Computer Demonstration

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Review of the previous day's activities.
- Summary of the evaluation of the previous day.
- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

Invite a volunteer to review the previous day's activities. (10 minutes)

Summarize the evaluation of the previous day. (10 minutes)

Distribute the overview and the schedule for day nine (handouts 9.22.1 and 9.22.2) to the participants. Review the objectives and schedule using overheads 9.22.1 and 9.22.2. Ask if clarifications are needed.
(10 minutes)

SESSION 22

09:00 – 10:30 Session 22. INFORM-R Computer Demonstration

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss the features of INFORM-R.
- Analyze INFORM-R.
- Evaluate the usefulness of INFORM-R in your organization.

EXERCISE 22

Exercise 22. Evaluating INFORM-R, a tool for MIS in agricultural research management (1 hour 25 minutes)

1. Distribute handouts 9.22.3, 9.22.4, and 9.22.5. Handout 9.22.4 gives clear instructions for the exercise. Go over the instructions with the participants step by step. Em-

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phasize and remind the participants about the time. Ask if clarifications are needed. (5 minutes)

Phase 1. Group work

2. Divide the participants into the same four groups as the previous exercise and ask each group to elect a rapporteur.
3. *(experience)* As the groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining. (45 minutes)

Phase 2. Reporting and discussion

4. Ask the rapporteurs to report the results of their group's work. Approximately five minutes are available for each presentation. (20 minutes).
5. Open the discussion to the audience. Finally, provide your views on the results of the exercise. (10 minutes)
6. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

10:30 – 10:45 Tea/Coffee Break

DAY NINE

Session 22
Summary of Overheads

Objectives of Day Nine

1. Discuss the features of INFORM-R
2. Analyze INFORM-R
3. Evaluate the usefulness of INFORM-R in your organization
4. Discuss database development, management report production, and analysis
5. Discuss issues related to information management systems based on the field trip
6. List strengths and weaknesses of the information management systems used in the organization you visited
7. Suggest relevant recommendations to minimize or overcome the weaknesses to apply in your own environment if applicable

9.22.1

Schedule of Day Nine

08:30 – 09:00	Opening of the Day's Activities
09:00 - 10:30	Session 22. INFORM-R – Computer Demonstration
Tea/Coffee Break	
10:45 - 13:00	Session 23. Database Development, Management, Report Production, and Analysis
Lunch	
14:00 – 17:00	Session 24. Field Trip
Tea/Coffee Break	
17:00 – 17:30	Feedback on the Day's Activities and PAPA

9.22.2

Objectives of Session 22. INFORM-R Computer Demonstration

1. Discuss the features of INFORM-R
2. Analyze INFORM-R
3. Evaluate the usefulness of INFORM-R in your organization

9.22.3

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Handout — Overview of Day Nine

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Discuss the features of INFORM-R.
2. Analyze INFORM-R.
3. Evaluate the usefulness of INFORM-R in your organization.
4. Discuss database development, management report production, and analysis.
5. Discuss issues related to information management systems based on the field trip.
6. Lists strengths and weaknesses of the information management systems used in the organization they visited.
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Handouts

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9.23.2 Exercise 23. Worksheet
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9.23.4 Guidelines to Provide Feedback on the Workshop
9.23.5 PAPA Form — First Stage

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Handout — Tentative Schedule of Day Nine

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 22. INFORM-R Computer Demonstration** (Exercise 22)
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 23. Database Development, Management, Report Production, and Analysis** (Exercise 23)
13:00 - 14:00 Lunch	
14:00 – 17:00	**Session 24. Field Trip: Assessing an Existing MIS in an Organization**

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Draft Guidelines for INFORM-R©

A Management Information System

for Agricultural Research

September 1996

International Service for National Agricultural Research (ISNAR)
P.O. Box 93375, 2509 AJ The Hague, The Netherlands
Tel: (+31) (70) 3496100 Fax: (+31) (70) 381 9677
Email: ISNAR@CGNET.COM Internet:WWW.CGIAR.ORG:80/ISNAR/

PREFACE

INFORM-R, a new model to an established management information system, was born of the combined experiences of many people in many countries. It addresses many suggestions for improvement from research managers and management specialists and resolves some shortcomings of the existing INFORM system. It takes advantage of database software developments that have occurred since the first model of INFORM was released, including a relational database product that combines the graphical capabilities of that used in the original INFORM with the advantages of a menu "front", and the power of the relational model.

There surely remains more to be done in further improving this tool in support of research planning, monitoring and evaluation. ISNAR depends on NAROs' experience to identify clearly their real needs in this area.

Christian Bonte-Friedheim

Director General

ACKNOWLEDGMENTS

INFORM, an information system to assist the management of agricultural research, was developed with funds from the Asian Development Bank in the late 1980s by ISNAR staff in collaboration with a number of national agricultural research organizations. Since then it has been implemented in many countries in Asia, Africa and Latin America. In 1993 many of these implementations were reviewed as part of an internal exercise. In 1994 ISNAR invited four people knowledgeable in agricultural research management and information systems to conduct a short external review. Additionally ISNAR has learned much from the scientists and research managers in each of the implementations.

Acknowledgments are therefore due to the NARO scientists and ISNAR staff who broke new ground in the development of the original model, and to the many people who have contributed to the ideas embodied in this new version.

R. Vernon

ISNAR, February 1996

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Request for Comments

While this version of INFORM-R is fully operational, and recipients are encouraged to use it in research program planning, monitoring and evaluation, it should still be regarded as a prototype with scope for correction of undetected errors and for enhancements to enable it to better serve research managers needs. ISNAR will very much welcome comments and suggestions. Write to us or use photocopies of the form provided at the back.

Additional Materials Available

Two further documents are available. A demonstration set of INFORM-R: Pre-defined Reports, includes the management note associated on screen with each one, and also a set of assessment forms for experienced research managers to records their view of the value of each. Readers are invited to ask for a copy.

The INFORM-R: Logical Design defines most of the database tables and their fields. It is primarily of interest to systems developers. Those with existing research management information systems wishing to collaborate with ISNAR in further developments in this area are invited to make contact.

If you get into difficulty ...

First check these Guidelines. If you do not find a solution, check the Access User's Guide and / or the online Help. If you still do not have a solution, contact the INFORM-R practitioner on your station or the National Coordinator or if necessary, ISNAR.

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INFORM-R may be freely used in developing countries and within developing country training activities and development projects, but it may not be sold separately, or distributed under the imprint of any organization other than ISNAR.

1. System Overview

1.1 What is INFORM-R?

Origin

INFORM-R is a computer-based information system to support the management of agricultural research programs. A basic model of such a system under the name of INFORM was developed in the late 1980s in a joint program between ISNAR and a number of national agricultural research organizations. Two criteria that it had to meet were that it could be operated on a cheap personal computer and that it could display information graphically. This basic model has been implemented in some fifteen countries in Latin America, Africa and Asia, mostly using the Reflex database software.

A review of these cases pointed to two main limitations. The first is that without a menu system users are required to learn the many commands and procedures needed to operate it. This has tended to keep it out of direct use by research managers who relied on researchers to take the time to learn to use the software and the system. Secondly the flatfile nature of Reflex limits the scope of the system and its coverage of a wider range of facilities.

INFORM-R

INFORM-R is a modified version of INFORM, designed to overcome these limitations. Through the use of more powerful database software a menu system is offered through which a range of outputs useful to research management can be obtained with very little knowledge of the underlying software.

Version 1 covers researchers and research activities and, linked but in separate files, a simple project budgeting system. Later versions with links to accounts, personnel and physical resource inventory systems are planned, as are versions in Spanish and French.

Availability of the system

INFORM-R may be freely used in developing countries and within developing country training activities and development projects, but it may not be sold separately, or distributed under the imprint of any organization other than ISNAR.

1.2 Main facilities

A menu system enables users to obtain a large amount of information about the research program with very little need for knowledge of the computer and the software used. This information can be displayed on the screen and printed to paper. The menus are largely self-explanatory. A basic knowledge of how to navigate using standard Windows commands is assumed. Such knowledge and proficiency for the extra features inherent in INFORM-R, sufficient to gain access to INFORM-R's standard reports, can be gained in about one day. A mouse can be used to make choices throughout the system but mostly these can also be made from the keyboard by holding down the Alt key and pressing the underlined character on the desired button.

Tip: The Opening Menu

The Keep Button at the bottom-right hand corner switches the opening menu between two states: the normal view with just the main or top row of buttons visible, and all buttons visible. The latter is useful to gain an overview of the facilities available.

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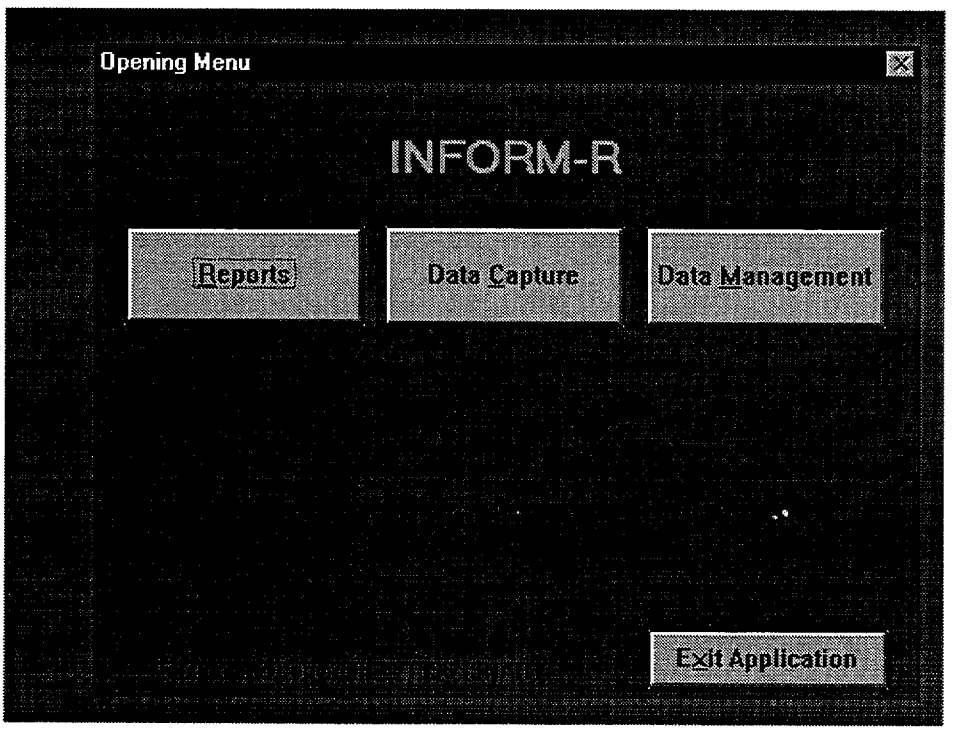
The primary purpose of the system is to present information useful in the management of agricultural research. INFORM-R's reports serve this function. A system also needs data capture and entry to provide the necessary raw data, and data processing to rearrange the data into the structures needed to provide the outputs. An overview of these three primary functions is given below. Each is then covered in more detail in separate sections.

The opening menu (Fig 1) asks the user which of these three main activities they wish to follow.

Fig 1. The INFORM-R Opening Menu



1.2.1 Reports

The system offers some forty built-in reports. Some are tables, others are various types of charts. They can be generated directly from the menu system. Most can be presented on screen and printed out to paper.

Some, like the National List of Researchers, are based on the entire national file. Others are based on data from an individual research station.

In many cases they can be modified to suit particular requirements, either by selecting from standard alternative formats, or by selecting options within one of the standard formats. The National List of Researchers for example is provided in four formats: sorted by surname for the whole research organization, or by station, commodity or scientific discipline.

User-defined Reports

With a little extra skill users can learn to define their own outputs. At the simplest level these will be from single tables. A little further training or study can lead to the ability to combine

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tables to generate answers to a wide range of questions about the research program and its researchers.

See Section 3 for more information on reports.

1.2.2 Data capture

The value of an information system depends on the amount, accuracy and timeliness of the data it holds. Data capture is critical to these features, but to be done well it should be as easy as possible for both the data provider, mostly the researcher, and the database administrator. INFORM-R has several features to serve these requirements, in the areas of data capture and data management.

The system can print out to paper the forms necessary for researchers to record their own personnel data and information about their research activities. For a new implementation, and for new persons and experiments, blank forms are printed. Once the system contains data, partially completed forms can be printed to serve more efficiently the annual or seasonal data update process.

All such forms are matched by corresponding screen displays for easy data entry. For fields where the data relates to a standard list, such as names of stations or commodities, such a list appears on the screen for selection of the appropriate choice without the need to type it out.

Once data has been captured and entered, it can be viewed in the relevant reports described in the previous section.

See Section 4 for more information on data capture.

1.2.3 Data management

Several things have to be done to raw data to enable the reports useful to research management to be presented. Also in this area the user can examine and edit the underlying tables of data. Lookup tables assist the data entry process by automatically offering standard lists of field contents from which a choice can be made, without having to re-key common terms. The contents of these lookup tables can be individually examined and edited, as can the management advisory notes that are linked to each report. There are data consistency checks that present those records that contain missing or otherwise inconsistent data.

This section includes the functions needed by the database administrator, both at station and national level, to carry out the annual roll-over tasks at the end of one research year and the start of the next. This includes stations extracting their station data from their copy of the national database and sending it to national HQ for amalgamation into a new national database. This is then redistributed to all stations.

See Section 5 for more information on data management.

2. INFORM-R Installation

This section is for INFORM Practitioners who will be responsible for INFORM-R installation in their research station. The system is installed when first introduced, and again each year when a new national data set is distributed to stations. It may also be necessary to load a new system when a new version of INFORM is released. See the Data Management section for important information on making backup copies, especially of data files.

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INFORM-R is offered in two versions. The full version requires the presence of a legal copy of ACCESS Version 2 or later. The runtime version works without separate ACCESS software, but its facilities are limited: see below for details.

2.1 Minimum computer requirements

Database software: Microsoft ACCESS Version 2 or later running in Windows 3.2 or later is needed to run the current full version of INFORM-R. (The system has been run on a 386 machine, but it is then very slow.) A 486 machine with 8 MB RAM or more is recommended, increasing to a minimum of 12 MB RAM for ACCESS 95. ACCESS V2 occupies some 18 MB of hard disk space.

Display screen or monitor: common formats are 640 x 480, 800 x 600 and 1024 x 768 pixels. INFORM-R can work on a 14" screen with 800 x 600 pixels (Super VGA) or better. Currently it comes set to 800 x 600 but will of course work with finer resolutions and the output windows will detect and adapt to 1024 x 768 if present. With 640 x 480 it will still work but some of the views will be truncated. Where a country wishes to use the system on one of the higher pixel counts the system can be configured accordingly and will then give the best display for that format.

The system comes set to print to a Hewlett Packard laser printer but this can be changed within the usual ACCESS print configuration dialogue boxes.

2.2 Installation of the full system

The full version of INFORM-R comprises two files: INFORM-R.MDB which contains the menus and operational features of the system, and a file for data, COUNTRY.MDB where COUNTRY is the name of the country in which the system is being implemented. Both files are needed. The default location for both is sub-directory C:\INFORM-R\.

The system is usually delivered as two self-extracting "zip" files: INFORM-R.EXE and COUNTRY.EXE. Make a sub-directory C:\INFORM-R and copy both these files to it. Within Windows (version 3.1 or later) run each file by moving the cursor to the filename and pressing <Enter>. Alternatively double-click on each filename with a mouse. The respective .MDB files are then generated. You can delete the two .EXE files.

The system is started by running INFORM-R.MDB : double click on the file name. This causes ACCESS to be loaded followed by INFORM.MDB and the appropriate country .MDB file. If the last has changed in position or in name from the previous time that INFORM-R was operated, then after the initial INFORM-R splash screen (a Peters projection map of the world) a message appears, entitled "Attaching Tables" asking for the complete name and path of the country data file you wish INFORM to use. Type this in full: e.g. C:\INFORM-R\Country.MDB and press OK.

There are other files that deal with the way ACCESS handles INFORM-R. These files are for use only by the systems administrator.

SYSTEM.MDA in the C:\INFORM-R subdirectory stores information about system settings, security and user accounts. INFORM-R.INI file in the c:\windows subdirectory is used in the runtime version. WRKGADM.EXE in the MSOFFICE\ACCESS directory is the Workgroup Administrator file and is used only when INFORM-R is run under Windows V 3.1.

2.3 Installation of the runtime version

A runtime version does not need ACCESS - there is enough of the ACCESS program included to operate INFORM-R though in a rather limited mode: see below.

2.3.1 Installation

- Get into Windows (Version 3.x or later).
- Put first diskette in the A: drive. Select A:\SETUP.EXE in Program Manager.
- Follow the instructions, using all 6 diskettes in turn in their correct order.

It creates and installs by default into C:\INFORM-R. See, amongst others, two files: INFORM-R.MDB and COUNTRY.MDB.[1] If the latter is actually your country data file, be sure to make a backup and keep it in a safe place. Country national research management information officers are responsible for maintaining this country database file. ISNAR maintains the INFORM-R.MDB file but it would be wise to also make a backup copy of this, too.

If your machine has no Microsoft Office software already installed you will get an error message "Setup Cannot Create SYSTEM.MDA file (-1809)". In File Manager, double click (left mouse button twice in quick succession) on the WRKGADM.EXE in C:\INFORM-R\ to activate the Workgroup Administrator. Click on the "Create" button[2]. Follow the instructions.

If you choose a default directory other than that suggested by Setup you will need to change the INFORM-R.INI file in the C:\WINDOWS directory.[3] Try installing again if there is a problem.

Project Budgeting System (PBS)

To generate a PBS icon make a copy of the INFORM-D icon: click on it once, File, Copy. Go to Group, select INFORM-R: it generates a copy of the icon but it is necessary to change its properties. Click once on it, File, Properties, change Description to "PBS-D. In the command line replace "INFORM-D.MDB" with "PSB.MDB". Leave the rest unchanged including INFORM-D.INI.

2.3.2 Limitations of the Runtime version

The runtime version has no ACCESS toolbar, no Database Window, and no ACCESS Help or Cue Cards. These are all facilities of the ACCESS software.

The Database Window would normally be used as a guide to the underlying tables. In the runtime version these can be seen by choosing Data Management, Tables and then choosing the tables of interest. Some of the options here are actually Queries, based on tables. Even here although you can see table names and their fields this is in data rather than design mode. You cannot alter the design of tables or queries. You can enter, edit and delete data, though without the data processing front end offered in the full version.

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1 COUNTRY.MDB: where data is from your country, then this file bears the name of your country, eg ZAMBIA.MDB.

2 Fuller details in Microsoft Development Library note PRA: Error "Setup Cannot Create SYSTEM.MDA file (1809)"

3 Fuller details in Microsoft Library information sheet "INF: Could not find SYSTEM.MDA or UTILITY.MDA files"

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2.4 Upgrading to a revised INFORM-R

ISNAR is still active in the development of INFORM-R and further changes will inevitably accrue from field testing in different countries, as managers advise us on their perceptions of the system and how it meets their management information needs. Small changes are reflected in new version numbers e.g. Version 1.3 to 1.4. Major changes will prompt a new release e.g. Version 2.0.

In the case of ISNAR issuing a new release of INFORM-R that has major changes to the COUNTRY.MDB file, NAROs will be invited to send in their current database, meanwhile freezing new data entry and updates, and ISNAR will incorporate their data into the new system and return it to the NARO. Where the INFORM-R.MDB file alone has minor or major changes the new version from ISNAR can simply be used to overwrite an old version.

Minor changes to the COUNTRY.MDB file can be updated without the need to send the whole file. Instead just the changed tables are sent, inside a temporary .MDB file. Minor changes can be of the following types:

1. changes to the data: usually entering new data or updating existing data
2. structural change to the logical design such as tables deleted or modified or new tables added
3. changes to the database relational structure as shown in the Access Relationships Window; (these may be incurred by the structural changes of item 2 above)

and may occur at ISNAR and / or the NARO. A NARO is urged to consult with ISNAR before altering the structure of the system. The detailed procedure to be followed depends on which of these apply. But in all cases the following general approach is valid.

ISNAR will send a temporary file called UPDATE.MDB which contains just the table(s) with the changed data and / or structure. It will be accompanied by a statement describing the changes, including those applicable to the relational structure, and the procedures to follow.

In general, the NARO imports the same tables from its COUNTRY.MDB file into the UPDATE.MDB file. The updating is then all done within UPDATE.MDB and the results transferred to the COUNTRY.MDB by simply replacing the changed tables.

The updating steps needed will depend on the situation. Here are some examples.

- ISNAR supplies a new table: this can be imported directly into the COUNTRY.MDB and then deleted from the UPDATE.MDB. Repeat for all such new tables.
- ISNAR is recommending deletion of an existing table(s). This will be simply stated in the statement. The NARO just deletes this table(s) in its COUNTRY.MDB.
- ISNAR supplies a table in which the data (e.g. new records in the Commodities table) has been changed. In the case of changed data any of the following may apply, as will be indicated in the accompanying statement:
  a) append new records from the new ISNAR table to the old NARO table
  b) delete records in the NARO table that are not in the ISNAR table
  c) where records are in both and where one has changed, one has to be overwritten.

  Where the NARO table still has its original data (i.e. there have been no local updates) you can just delete your old table and import the new table from ISNAR.

- ISNAR supplies a table in which the structure has been changed.

ISNAR adopting a NARO Innovation

Where a NARO has identified a change that it feels may have value for other countries, the NARO is invited to send its own UPDATE.MDB file comprising just that table(s) with the innovation, and an accompanying statement describing the change.

Example of Upgrade Procedures

A case is given as an example only. In practice good Access skills are needed. Where these are available it should be possible to update INFORM-R locally. Where this is not the case ISNAR should be consulted for assistance.

This example covers cases 1 and 2. An existing COUNTRY.MDB file , complete with its latest data, is to be upgraded with a new COUNTRY.MDB with revised structures from ISNAR. Either can be used as the 'master': it is simplest to use the one that has changed the most. It may be necessary to change the INFORM-R.MDB at the same time. This can be done by simply overwriting the old with the new.

We assume that a revised COUNTRY.MDB from ISNAR is the master. It will normally be delivered as a self-extracting COUNTRY.EXE file on a diskette. The object then is to transfer data from your existing COUNTRY.MDB to the new file from ISNAR.

If INFORM-R is currently running, close it. Rename your existing COUNTRY.MDB file : COUNTRYX.MDB will do.

To avoid accidentally overwriting a new file we create and use a temporary directory or folder called TEMP. Insert the diskette with new file(s) into A: and run the .EXE file by clicking on it or typing the file name. Set 'extract to path' to C:\TEMP. Copy the old file COUNTRYX.MDB to the TEMP folder also.

It helps to know which tables in COUNTRYX.MDB have had data added and which in COUNTRY.MDB have been modified.

Open COUNTRY.MDB. We assume for this example that the tables [Experiment Persons], [Experiment Treatments] and [Experiment Results] have new data in them. We will therefore need to replace these three tables in the new country file with those from the existing country file.

We need to link COUNTRYX.MDB and the desired tables. Go to Tables in the Database Window. Go to File, Attach Table, choose Microsoft Access, OK. Select the COUNTRYX.MDB file, OK. Select the desired table(s). Access appends a '1' to the attached table.

Now we can:

(a) delete the old table and replace with the new one - by delete and copy table

(b) use Append Query: adds new records to the end

(c) use Update Query: to build a new table from other table(s)

(d) use Select Query to see information in other tables(s).

In the present case we will use Append Query to copy new data records from COUNTRYX.MDB to COUNTRY.MDB. Click on Query Table, Query New - Add Table. Select Treatments1, choose Append Query, Query Properties - set to Append to - Treatments.

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2.5 Installing on a network

ACCESS can be used in a multi-user network and INFORM-R has been designed with this in mind. This has yet to be tested but the following outline covers the steps required.

There are three stages:

1. Create a C:\INFORM-R folder on each client PC and the server PC.
2. Make the server folder sharable and map this server folder on each client PC. Details on setting up folders so that they are shared can be found in Windows 95 Start, Help, select Share.
   a) At the server, select 'My Computer', C:\, point to the C:\INFORM-R filter and click with the right mouse button
   b) Select Properties, Sharing tab, and click radio buttons to select sharing and full access. Click OK. The folder icon will reflect the shared feature by an image of a hand beneath it.
   c) At each client PC: select Start, Programs, Windows Explorer, Tools, Map Network Drive.
   d) Accept the suggested next available drive letter e.g. D:
   e) Open the Path drop down list and select that for the file server- it will be the one with the \INFORM-R folder in it.
   f) If you tick the 'Reconnect at Logon' check mark, it will connect automatically each time you start the client PC (assuming the server is running). Otherwise you need to repeat steps (c) to (e) each time.
   g) the mapping is shown in the left pane of the Explorer window.
3. Install Files
   a) Install Microsoft Access on each PC if not already installed.
   b) Install INFORM-R.MDB on each PC in the C:\INFORM-R folder.
   c) Install the COUNTRY.MDB file on the file server. Ensure it is not on any of the client PCs – if it is then delete it from those sites.
   d) at each client PC load INFORM-R. The system will ask for the location of the country.MDB file: type in the drive name and path of the file server e.g. D:\INFORM-R\COUNTRY.MDB.
   e) When you open INFORM-R you may get a message saying you may not open the database exclusively. In such a case go to File, Open, Choose INFORM-R: and set "Exclusive" to off.
   f) to avoid having to set "Exclusive" off each time, create a Shortcut on your Desktop. Open INFORM-R folder, drag INFORM-R.MDB with the right mouse button to the Desktop and release the mouse. Select Create Shortcut. Double clicking on the shortcut starts INFORM-R.

Access allows two or more persons to access a database but not to simultaneously change or add data to the same "page" of data. When a user wishes to add data (i.e. add new records), ensure

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no other user is adding data to the same table. When a user edits existing records Access imposes locking at the record level: only the first user accessing the record will be able to save data.

Alternative Setups

Where INFORM-R.MDB is still undergoing change it may be more convenient to locate this file as a single copy on the server. This will slow down the initial loading of INFORM-R into each client's local memory but has the advantage of allowing INFORM-R updates to be installed at only the server.

Similarly, where client PCs have limited hard disk space it is possible also to have the ACCESS database software located on the server.

See ACCESS User's Guide: Chapter 1 Setting up Microsoft Access, for details and for comments on the advantages and disadvantages.

2.6 Software problems

This section is primarily the concern of the national INFORM coordinator and assumes a good working knowledge of ACCESS. There are three known "bugs" in ACCESS V2 that we have seen to affect INFORM-R. All three have been corrected in ACCESS 95.

- Missing data in the display of an attached table.

Loading INFORM-R automatically also loads and links the related country data .MDB file. Such attached files are marked with an arrow in the database window. If such a file is double clicked it opens in the data view. Occasionally the data fails to display and instead "Name?" appears.

The solution is to detach and re-attach that table. First close it. With the highlight still on that table in the database window press <Delete>.Respond to the message "Remove attachment to Table?" by clicking on OK. The table name disappears from the window but this indicates only that the attachment is deleted, not the table.

Re-attach the table. Click on File, and select Attach table, Microsoft Access (OK), your Country .MDB file (OK), the table you detached, Attach (OK). Close the Attach Table box and open the re-attached table. It should now display data correctly.

- Find Command and the Tab stop in a Datasheet.

The Tab stop can usefully be set to ensure that, during data entry for example, the cursor jumps to those columns (fields) that require data, missing those that do not. Do not do this and also use the Find Command: if you attempt to find an item in a column bypassed by the Tab stop a General Protection Fault occurs. This can mean the loss of recent Access input, though other programs are not affected: A GPF forces the closure of Access but not the restarting of the PC.

- Running a report when there is no data

Running a report in Access when there is no data may cause the PC to lock, requiring it to be rebooted. Within its preset reports INFORM-R tests for no records and prevents this from happening. This test works because the source tables for all preset reports are known. But this test will not work if a query is set prior to running an INFORM-R report because such a query may restrict the view such that no records are found. In such a case the PC has to be rebooted: press Ctrl+Alt+Delete. With Access 95 this command is less drastic: rather than rebooting the PC it allows you to selectively close Access only.

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3. Reports

These are the most important part of the system for the user.

Tip: Before You Print, Check What Will Be Printed

Before sending a report to the printer, it is wise to examine the Print Preview on screen by means of the INFORM-R Preview button. Check how many pages will be printed and that what is printed is actually what you want. The number of pages is shown in the top left corner of each report as for example Page 1/24 which means 24 pages will be printed. Use File, Print to select the number of pages to print.

3.1 Types of reports

Pre-defined reports

INFORM-R comes with a pre-defined set of some forty outputs. One of them is a list of all the others complete with their associated management notes - see Report 41. Most can be both presented on screen and printed to paper. Some are tables, others are various types of chart. They can be simply selected from a sequence of menus

National v. station

Some reports, like the National List of Researchers, are based on the entire national file. Others are more appropriate to the individual research station. Some come in a choice of sort order: both the National List of Researchers and the National List of Experiments can be presented as a single national list, or ordered by research station, by commodity or by scientific discipline. Most can be modified to suit particular requirements, simply by clicking on appropriate buttons on the screen.

User-defined reports

Users with a little more skill can generate their own further reports to answer specific questions that may arise.

Other outputs

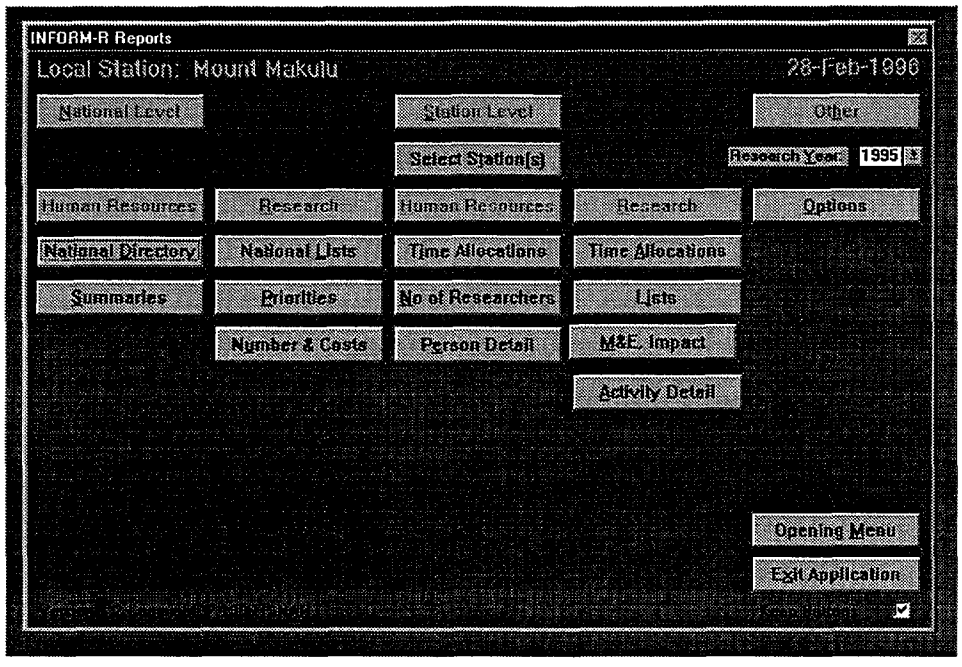
INFORM-R has other printed outputs in the form of printed questionnaires to help with data capture on experiments and researchers' details. See the Data Capture section later.

3.2 Finding the report you need

There are two ways of getting to a pre-defined report. You can follow the menu system, which has a hierarchy as shown in Fig 2. When a list is displayed of reports of the class you have selected, click on the "Show Selected Report" button, or double click on the report title itself to have the report displayed.

Secondly, if you know the report number you can type it in at the box at the bottom of the menu window. Once you have a report on screen its number is shown on the lower of the two "Record Number" boxes. By editing this number, or using the related back and forward arrows, you can move directly to another report without returning to the menu.

Fig 2. The Report Menu



3.3 Screen buttons to control the data that is displayed

At the bottom left of most screen reports there are two sets of standard Windows navigation buttons and a box showing the number of the current record that is in focus. The lower set refers to the INFORM-R reports and enables the user to step directly from report to report without returning each time to the report selection menu. The upper set relates to the records within the currently displayed report. With these buttons you can go to the first or last record or to any whose number you type in.

Other buttons are as follows:

- Station Button: when viewing a station-level report, you can see the same report but for another station by activating the drop-down list for research station and choosing another station.
- The Data View button switches the screen to a standard ACCESS view, usually a Datasheet or if derived from more than one table, a query result. This can be useful for scrutinizing the underlying data of a report. In the data view you can:
  - make the columns wider or narrower, by dragging the Column Separators to left or right.
  - rearrange columns by dragging them using your left mouse button : click on the Column Header then drag and drop the column holding your left mouse button down.
  - zoom in on any field using your right mouse button or the keyboard (Shift & F2).
- The Show Notes button presents a temporary window in which notes are presented that may help managers in interpreting the displayed report, and deciding what further action may be taken. Clicking on the same button removes the Notes display. See Data

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Management, Lookup and System tables later for how to edit these notes. The last report is a list of all reports including their management notes.

- The Options button enables various features to be activated and deactivated. The toolbar relevant to the current view, usually the Form view, can be set to display or not display. Toolbars are mainly for use by those modifying the system. Similarly the Database Window can be switched on or off. Both these can be done from ACCESS too - see the Tips .

Tip: To Display the ACCESS Database Window

To display the Database Window press the function key F11. Removal is by clicking on the INFORM-R window outside the Database Window. The Database Window provides access to the tables, queries, forms and reports used in INFORM-R.

Tip: To Display the ACCESS Toolbars

Click on View on the menu bar at the top of the screen, then Options. In the lower part of the Options dialogue box set "Built-in Toolbars Available" to Yes. Click on OK. Return to View, choose Toolbars, click on the toolbar(s) you wish to have displayed and on Show, Close.

- The Options system settings specifies the year(s) the current output relates to. It controls, too, aspects of how a graphical report is printed. Later versions of INFORM-R may have additional parameters here.
- The Preview button displays the version of the report designed for printing to paper to be examined on screen. Clicking the mouse anywhere within the boundaries of the page toggles the display between whole page and a magnified view of a portion of it. The part magnified corresponds to where the mouse cursor was situated prior to clicking. Close this view by clicking on the standard Windows button at the top left or (Windows 95) right corner of the display. Caution: make sure you click on the corner of the display itself and not further up on that of one of the outer windows as this could close INFORM-R.
- The Print button sends the currently displayed report directly to the printer. If you wish to control the printing, for example by printing only selected pages, click instead on File on the ACCESS menu bar, and select Print. This way you can also change the print Setup for different printers, paper sizes, etc.
- The Hold button displays a subform (displayed on the output level form) as a normal form. A reader unfamiliar with Access forms and subforms may omit this description. It has two main purposes:

  1. The user is able to "hold" the information from one station, choose another station (on the output level form) and compare this new data with the "held" information.

  2. To display some sets of related data INFORM-R uses a form embedded in another form as a sub-form. Control over the underlying data of a form, displayed as a subform, is more limited than on a normal form. The Hold button enables the subform to be held as a form. On a normal form the user can filter, sort, search and select data using the standard ACCESS features (see Edit and Record menu items). By opening the subform as a normal form the user gets more control using the standard ACCESS facilities. For example a window can be sized with the mouse to fit the form size correctly. There is also more help available, implemented with a special information screen that adopts the information to the state of the form (sub or normal form). The output form is in subform mode if it is embedded; it is in

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normal mode after opening it with the Hold button. To check which forms and subforms are currently on display click on Windows at the top of the screen. This can also be used to close those not needed: click on the name of the form to close to bring it to the front, and close it.

- Sort and Find facilities
  On some reports you can have the data sorted on any column: position the cursor on the title of the column to sort by, and click the special Sort column title button. Ascending and descending order can be chosen.
  On some reports you can find a particular entry by clicking on the special button for this purpose. Alternatively you can press Ctrl-F, the ACCESS Find command. Note that the ACCESS default is set to match your search text with the whole field. More often you will wish to set a match with any part of a field and you should then make this change in the Find dialogue box.

- Display full contents of a field
  In some cases a table structure does not allow the full contents of a long field such as Experiment Title or Objectives to be read. There is usually in such cases a button allowing the field to be displayed in full. Alternatively move the cursor to the field concerned and press Shift+F2.

3.4 Pie charts

Pie charts are useful for giving a quick overview of the relative proportions of data classes, such as numbers of researchers or experiments of each standard discipline. An algorithm is used on these displays to aggregate small classes, which would not show usefully on a pie chart, into a common residual class labeled "Rest". The underlying components can always be seen in full in the companion numerical chart on the right of the display. The Data View button (see above) gives the same information.

3.5 Exporting data from INFORM-R

The software components of Microsoft Office offer several facilities for the transfer of information between them. Any of the reports can be exported to a text document.

Tip: To Capture the Image of a Window

- *Press Print Screen to capture the image of the entire current screen. Then move to the document in which you wish to place it and press Ctrl+V.*
- *Press Alt+Print Screen to capture just the current window.*
- *If you wish to edit the image, select Accessories, Paintbrush, etc.*

3.6 Frequently asked questions

- A Report appears blank with no information
  There is no data. Try moving to another station, person or experiment. You may need to change the selected year.

- A window appears to present incompletely
  INFORM-R usually comes set for a PC screen of 800x600 Pixels (Super VGA). If you use it in 640x480 format (VGA), or on a laptop computer with a screen smaller than 14 inches, the edges of the laptop display will not be visible.

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4. Data Capture

This section covers the capture of data on researchers and their experiments.

"Researchers" includes all those individually responsible for one or more research activities. This sometimes includes technicians.

"Experiments" includes all research activities from the time a formal proposal is prepared. Proposals are stored separately until they are reviewed. Approved proposals are "rolled" into the experiments table and those rejected are retained for future reference in the proposal table. A new record is kept for each year of an experiment. Experiments that are terminated, usually on completion, are kept in the system. Approved experiments that were not implemented, or that had to be abandoned, should always be kept in the system and a report prepared explaining the reason they were abandoned.

The procedure for capturing data on researchers and experiments is the same. The system prints out blank sheets for completion by researchers. There is a matching data entry screen for easy data entry from these paper forms.

4.1 Print empty data capture sheets

The system can print out to paper the forms necessary for researchers to record both personnel data and information about their research activities. For a new implementation, and for new persons and experiments, blank forms are printed. Once the system contains data, partially completed forms can be printed to serve more efficiently the annual or seasonal data update process.

The main forms that the system can print are either a blank form or a complete form with base data for each person or experiment.

There is, in addition, a facility for adding special forms for activities other than research experiments and surveys, such as training events, demonstrations, management and administrative assignments.

To print a form press Ctrl+P, select how many pages and copies if you wish, and choose OK.

4.2 Data entry

Each data capture form is matched by a corresponding screen display for data entry. A fourth data entry window caters for proposed activities.

Each can be viewed as a Form or as a Datasheet through View in the top menu. For Personal, Research Activity and Proposed Activity the default display is as datasheets of the existing data. To enter new records, click on the last record box in the bottom left of the screen, and then on the next record box to get a blank line. As each field (column) is filled in, pressing Tab or Enter moves the cursor to the next column to the right. As new columns scroll leftwards into view, important columns such as experiment title and ID remain locked in view.

The form view is more structured and shows just one record at a time. Some long text fields like Objectives and Justification have a 'zoom' button to the left : clicking on this enables you to see the whole field. Pressing Shift+F2 does the same thing. Some fields such as Title and Objectives are required fields: you must enter something in order to be able to proceed. Others such as Justification are set, in the default INFORM-R, to not required.

The system offers comprehensive data entry screens. These can also be reached from Reports, Station, Research, Annual Reports: double click on the ID column and select More.

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Lookup lists and controlled terms

For fields where the data relates to a standard list, such as names of stations or commodities, such a list appears on the screen for selection of the appropriate choice without the need to type it out. These are of three types: suggestive, controlled but open to new entries, and controlled and closed to new entries.

Double clicking on a field with a lookup table displays the table with all its columns; if the field down arrow is clicked the first column only is displayed. If a new record is added to a lookup table F9 should be pressed to refresh the lookup list.

Note that while Disciplines is a controlled list, Specialisms is not.

Research Time Allocation

The Research Time Allocation displays by default as a form showing for each researcher the broader time allocations to research, management, extension, study, etc., together with a subform showing that part of research time allocated to each experiment. The total of the latter are also shown and can be compared with the time allocation to research.

To enter researchers' time allocation data, switch on the Forms Toolbar (Other, Options, Toolbar On), or in runtime version, use the top menu: View, Form. Move to the Datasheet view by clicking on the Datasheet icon on the toolbar, or through the top menu: View, Datasheet. Find and select the person whose overall time and research time you wish to enter or edit and click on that record. Move to the form view by clicking the Form icon on the toolbar or through the top menu: View, Form.

Tip: To Find a Record

- *press Ctrl-F, the ACCESS Find command*
- *Note that the ACCESS default is set to match your search text with the whole field. More often you will wish to set a match with any part of a field and you should then make this selection in the Where: box of the Find dialogue box.*

Tip: To Print a List of Standard Terms

- *INFORM-R stores lists of standard terms: usually these are displayed at the appropriate point of data entry. But any such list can be examined, and printed out to paper.*
- *From the opening menu, select Data Management, Tables, Lookup and then the particular list that you are interested in.*
- *To print it, press Ctrl+P, or select File, Print.*

Required fields

Commodity is an example of a required field. If entering a new commodity it is necessary to supply related information such as the commodity group. The data entry person may not have this extra information but can continue with data entry by entering "unknown".

Fields may be set to Required for two reasons: (a) for good research management reasons e.g. Objectives - because all experiments should have these, and (b) for system management reasons e.g. Experiment-ID - because without this field the system cannot manage the data. The latter type always has to be left in place but the former type may be suspended, for example, in a new country implementation of INFORM-R to accommodate existing but incomplete data. Later it can be reset back to *Required.*

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4.3 Experiment's life cycle

INFORM-R is based on the following model of the experiment life cycle: research proposal, approval or rejection, interim report, monitoring report, annual report, evaluation report (on completion of an experiment). For most of these one can print out (a) a blank form for capturing data on a new experiment or researcher, (b) a form with existing data printed out, too, for updating, and (c) full data for reporting purposes. And for each of the data capture sheets there is a corresponding data entry window on the screen.

- Research Proposal
  INFORM-R will print out blank questionnaires: Select Data Capture, Print Data Capture Sheets, Proposals. For the corresponding data entry screen: select Data Capture, Data Entry, Research Proposal, Proposal.
- Approval of Proposals
  When a proposal has been approved it is allocated an Experiment ID number. This is entered in the data entry screen and the Approved box marked by clicking with the mouse. Press the button Show Approved Proposals to check them that they have all their required fields filled in. When this has been done one can initiate the Rollover Proposals to Experiments procedure.
- Experiment Implementation
  Two outputs cater for management information during the life of an experiment: interim monitoring and annual reports.
- Experiment Completion
  On completion of an experiment, noted by filling the end date field, the evaluation report allows managers to record an assessment of its performance.

5. Data Management

There are several built-in processes and facilities for checking and correcting data, and for allowing the contents of individual tables to be examined.

5.1 Tables

Most of INFORM-R's tables can be viewed here. These cover many aspects, some inherent to INFORM-R such as CARIS keywords, others specific to a country, such as Research Stations. They are used either to look at or to edit their contents.

This is available even in the runtime version but access to tables does not give access to the Design mode i.e. you cannot change the table structure, only the data contents. In the full version you can get access to both design and datasheet views through the database window. Press F11 to display the database window.

For example, to edit the Management Notes, select Data Management, Tables, System, Reports. The displayed table carries information about all the standard reports. Move down the Report title column to the report you wish to alter. Scroll to the right to display the field Report Notes. Press Ctrl+F2 or click on the cell with the right mouse button to zoom into an edit box. Note: when editing do not use the Enter key until you have finished: to move to another line press Ctrl+Enter.

List of tables and fields

The country or data MDB file (e.g. ZAMBIA.MDB) includes a report which lists tables and their fields along with their descriptions. Open this file directly (not through INFORM-R). Go

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to Reports and select the one called Tables and Fields (Logical Design in earlier versions). This can be studied on screen or printed to paper. The report is useful in exploring what INFORM-R covers.

The descriptions shown against the field names are the same messages as seen at the bottom of the screen when addressing a particular field in normal use of INFORM-R.

System tables used internally by INFORM-R are not included.

5.2 Data processing

Data consistency checks all records and displays those that are invalid in some way. Such invalidity will affect outputs.

New Research Year is a roll-over function that carries all non-completed experiments, projects and programs into a new set of records for the new year, retaining all those for the previous year.

5.3 Import / Export

Here there are the facilities needed to archive data, and extract a station's data to forward to national HQ.

5.4 Backing up and restoring files

INFORM-R is used at research stations and at HQ. Each station is responsible for updating its records. Some data such as that on research activities is usually updated only annually. Other data such as person records may be updated on a continuous basis. Usually annually, the country MDB file from all stations are sent to HQ where they are merged to provide a new national version of the next year. This new national version is then sent out to all stations to ensure they have updated national data.

Because data is held in only one of the two INFORM-R files, only the country-MDB file (e.g. ZAMBIA.MDB) needs to be exchanged between the station and HQ. A new version of the INFORM-R.MDB file is sent out from HQ to stations only when some significant changes have been made to the structure of INFORM-R.

Operating systems such as Windows 95 and 3.1 have backup and restore utilities that greatly reduce the size of a file. This makes it easier to send files on diskette. You can select to have the entire hard disk backed up (a tape unit is usually used to backup to) or selected files. An incremental backup copies only files that have changed since the last backup. In INFORM-R we are usually interested in backing up, and later restoring, just one or two files.

The Backup and Restore functions are reached by clicking on the start button at the bottom left of the WIN95 screen, then pointing successively to Programs, Accessories, and System tools and then clicking on Backup. There is an extensive set of Help windows which can be viewed as a guide during the procedures. Examples are shown below.

Backup: To run Backup

1. Click the Start Button
2. Click on Programs
3. Click on Windows Explorer
4. Click on the drive that contains the folders or files you want to backup
5. Click the File Menu

6. Select Properties
7. Click the Tools tab
8. To Run the backup Wizard, click on Backup now

To backup selected folders and files

9. Click the Backup tab
10. Click the plus sign next to the drive that contains the folders or files you want to back up
11. To select all the files in a folder, click the box next to it. To select only certain files, click the icon for the folder that contains the files, and then click the box next to each file in the right side of the window
12. Click Next Step, click the destination where you want the backed up files to be stored, and then click Start Backup
13. Type a name for the backup set. In the case of INFORM-R use the name of your station so that HQ is in no doubt as to the origin and contents of the diskette(s)

A shaded check box indicates that only some of the files in that folder are selected.

You can save the file into a file to avoid selecting each time you want to backup. To do this, in Step 12 above after selecting the destination where you want the backed up file to be stored:

1. Click on File on the menu bar
2. Then click on Save
3. Type a name for the file set

Creating a shortcut for the backup on the desktop

The File set created in the backup procedure is saved in a folder called Programs Files. To create a shortcut, to this:

1. Click on My Computer or run Windows Explorer
2. Click on the folder Programs Files
3. Click on the folder Accessories
4. Click on the File set that you want to create a shortcut to
5. Drag the shortcut icon onto the desktop

Restore

To restore backed up folders and files

1. Click the Restore tab
2. Click the drive where you placed the backup set when you backed up the files
3. In the right side of the window, click the backup set you want, and then click Next Step
4. In the left side of the window, click the box next to each folder you want to restore

5. To display more folders, click the plus sign next to a folder. Select individual files in the right side of the window
6. Click Start Restore

6. INFORM-R Project Budgeting Module

This is a simple system for monitoring expenditure against budget for each experiment or study. It therefore includes only budget allocations, and the corresponding expenditure that are attributable to experiments.

Three files are needed to operate this system: a system file PBS.MDB, a data file: PBS-DATA.MDB and the standard INFORM-R country data file e.g. ZAMBIA.MDB to provide details of the experiments and researchers. All three files should be available in the same sub-directory, normally C:\INFORM-R.

The main PBS data is held in the following tables.

- Experiments Budget holds the annual budget for each experiment for each year, broken down by category such as Allowances, Transport, Labor, etc.
- Experiment Budget Allocations tracks the release of the budget as periodic allocations throughout the year.
- Experiment Expenditure records each individual expenditure attributable to an experiment, and the category under which it falls as above.
- Proposed Activity Budget holds the estimated budget needed for each proposed experiment as given in the research proposal. On approval of such a proposal and consequent allocation of an Experiment ID (Master No in Zambia) this data is transferred to the Experiments Budget table.

The main menu offers :

- Data Entry: to enter new data on Experiments Budgets, Proposal Budgets, Allocations or releases of budgets throughout the year, and on Expenditure.
- Overview of the data in each of these data sets; may be used also for data entry.
- Processing: to rollover from one year to the next and from one allocation period to the next; to import and export data sets between the INFORM-R PBS and other systems (not yet fully implemented).
- Reports: 4 standard reports on Experiments Budgets and Expenditure, and 1 on Proposal budgets. Can be applied to selected set of experiments to meet special interests, for a donor for example.
- Select Station(s) and Budget Year: the former intended mainly for the National Headquarters; it enables staff to work with any one or combination of research stations' data.

There are processing functions to rollover to a new budget year; others to cover such things as the import and export of data, are yet to be implemented.

A number of reports compare the expenditure with budget and with released allocations to date.

Tip: The Opening Menu

The Keep button at the bottom right-hand corner switches the opening menu between two states: the normal view with just the main or top row of button visible, and all buttons visible. The latter is useful to gain an overview of the facilities available.

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6.1 Data entry

This is the recommended place for the keying in of budget, allocation and expenditure figures to the appropriate fields against each experiment. Such data can be entered both here and in the Overview set of choices but this is likely to be the easier place to do so, using simple datasheets uncluttered by links to other areas. In Overview a number of additional facilities are available, mostly in the simultaneous display of related information.

Another reason for entering data here is that datasheets can be adapted to local hardware specifications and operator preferences. See the Tips: these two options are not available in Overview, where forms are used to link various sources of information to provide a wider overview of the budget situation.

Tip: Enhancing the Datasheet View on the Screen

- *A Datasheet can be maximized using the Windows icon for this function, so as to make use of the full screen where larger screen configurations exist.*
- *An operator may wish to use a larger font: this can readily be selected in Datasheet view by selecting in the top menu: Format, Font.*

Note that each budget record applies to one experiment for one research year and that a new record is generated for the same experiment in the following research year. The same applies to allocations except that here a new record is generated for each experiment with each move to a new allocation period. This generation of new records is done through Processing, New Budget and Processing, New Allocations respectively. These functions are described later but are mentioned here because these processes should be done at the rollover of allocation period and research year prior to entering new allocation and budget data.

Four options are offered here: the Experiment Budget, (new) Proposals Budget, Experiment Allocations, and Expenditure.

Data entry: Experiment budget

The Experiment Budget is the annual amount designated to each experiment, broken down into major cost types: Allowances, Transport, Labor, Materials, Other.

Before such budget data can be keyed in, empty records have to be created. This is done automatically using the Processing, New Budget facility which creates records for each new year, complete with Experiment ID or Master No, Government % and Donor name(s) copied from the previous year. The last two can of course still be changed - Donor name has a look-up list: Press F4 to generate this without having to leave the keyboard, or start typing the first letters to generate any matching existing donor name.

Then all that remains is to key in the budget figures under Allowances etc. in this Data Entry: Experiment Budget facility. All data entry fields are visible on the screen simultaneously, along with the Station and Experiment ID.

If during the year it is necessary to add individual new records this can be done here.

Tip: Adding New Records in a Datasheet

The standard Windows navigation buttons at the bottom left show how many records exist and which one is in the current focus, and enable one to move to any desired record. Click on the Last Record button and then move down one line to start entering a new record. This way existing records can be seen above, which is sometimes helpful.

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Note that before creating a new record in the PBS it is necessary first to create an Experiment record complete with Master No in the Experiment table of the COUNTRY.MDB (e.g. ZAMBIA.MDB) file: the PBS will accept a new record only if the experiment already exists in the main Experiment table.

The Total Budget column is a calculated field, derived automatically as the sum of the Allowances, etc. but excluding any amount in the New Capital column. (The way capital funds are handled varies from country to country: the field has been included here as a provision for the future.) A second column, Starting Budget, provides a record to the initial budget, unaffected by alterations to the component columns (Allocations, etc.).[1]

All columns in which data usually has to be added are usually visible on the screen without having to scroll sideways. Some extra columns, such as the Experiment Title, may be off the screen to the right with some hardware but can be seen by scrolling.

Closing the Experiment Budget window, by clicking on the standard Windows close icon, takes the user back to the main menu. Caution: ensure that you click on the Windows close icon of the Experiment Budget, and not on that of the PBS which is above it. The latter will close the PBS and ACCESS: this is inconvenient, but data will not usually be affected.

Data entry: Proposals budget

This enables the estimated budget for new proposals to be entered and this is done by adding records to the bottom of the Datasheet. See the earlier Tip: Adding New Records in a Datasheet.

When a research proposal is approved and allocated an Experiment-ID (Master No), its data both in the INFORM-R Research Proposal tables and in the PBS Proposals Budget table is moved into the Experiment and Experiment Budget tables, respectively. This process is included in the INFORM-R system from where it is accessed.

Approval of proposals is usually done annually at a regional or national research program planning meeting, but occasionally may also be done during the year.

Data entry: Experiment allocations

This feature allows for situations where funds are released at intervals throughout the year: it tracks each such release and thus distinguishes between budgets (promised money) and funds actually provided.

Before such allocations data can be keyed in, empty records have to be created for each experiment in the new allocation period. This is done automatically using the Processing, New Allocations facility. These records are automatically filled with Experiment-ID, Experiment Title, Budget Year and Period within year. It remains only to enter the allocation amount in each record.

If you wish, it is possible to create the allocations records for all (nine) periods of a year on the same occasion though the generation procedure has to be run separately for each period.

Closing the Allocation window takes the user back to the main menu.

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[1] The way this is done is by the Starting Budget column copying the contents of the Total Budget column when the latter is greater than zero and Starting Budget is zero, and only when the operator moves on to another record.

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Data entry: Expenditure

Individual items of expenditure are entered here in the datasheet view. This allows the user to see previous records and to copy where appropriate from the same field in the previous record. Usually all columns will be visible at once but, if not, then maximize the window with the Windows maximize icon.

Tip: Copying Data from the Previous Record in a Datasheet

Pressing Ctrl+" in a Datasheet will copy whatever is in the field above ie. the contents of the same field in the previous record.

The system offers a drop-down list of Experiment-IDs (Master Numbers) and of standard Expenditure Types and Procurement Locations from which a selection can be made.

The system checks that the Experiment-ID belongs to the currently selected station: if not it displays a message to this effect and prevents further entry. Most likely this will be due to mis-typing the ID which should therefore be retyped. If the ID does not exist (on any station) a message to this effect is displayed. The user should type in another number, valid for the local station.

If the expenditure amount causes the total expenditure-to-date for this experiment to exceed the total allocation-to-date, a message appears warning of this, but you are not prevented from proceeding with entering this amount. Press Enter and the message disappears. If the total expenditure exceeds the budget for the experiment, this too is displayed as a message, but you can still proceed with the entry. Press Enter to continue.

The Procurement Location field should be left blank except where procurement and the related payment processing are done at another location - for example if HQ procures something on behalf of a remote station. In such a case use the drop-down list to enter the procurement location station. This procedure prevents duplicate entry of expenditure records when station records are merged into the national set.

6.2 Overview

This main menu button provides a facility to browse through each of the main data sets. One can also enter data here. This area differs from the Data Entry options described above in that a more comprehensive view of information is provided.

Overview: Experiment budget

This option differs from the data entry view in that

- one can select the budget year to be viewed without leaving this screen: use the lower of the two record number bars
- similarly one can choose to see data for just the station(s) selected, or for all stations (click on the All Stations button)
- experiment details can be accessed: if the Experiments, Full button is clicked, experiments from all stations are shown and with full details of the experiments including the main scientist and the parent project and program.

The initial view provided is a subform in which the Find and Sort (ascending) commands can be used. To Find any data item click on the column header with the right button, and select Find. To sort, double click on a column header.

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The All Stations button, apart from reverting to all stations, provides an Access Form in Datasheet mode which can be interrogated with the standard Find (Ctrl+F), and sorted in both ascending and descending order (click on the column header with the right mouse button). It is also possible to view the underlying query by making the toolbar visible (See Tip: Making a Toolbar Visible) and clicking on the Edit Filter icon, and by this means to filter out a subset of records by adding a criteria to this query.

The Experiments, Full button generates a form in Datasheet mode which automatically includes all stations, and provides details of each experiment including the main scientist and the parent project and program. It leaves you at the same experiment as you were previously looking at.

Overview: Proposed budget

This provides the same facilities for research proposals and their estimated or provisional budgets as described above for Experiments Budgets.

Overview: Allocations

The view presented here has upper and lower parts. The lower part shows the allocation (funds released) for the current or another selected period, for any chosen experiment. To the right of this display summary data is shown for: a) the total budget for the experiment, b) the total allocated to date, and c) the balance of the budget not yet allocated. For information, the top window shows the breakdown of the full budget. The two windows are linked: one can use the upper part of the window to select an experiment, and move to the lower to see the allocation details.

The All Stations and Experiments (full) buttons at the lower right of the display operate as described above for Overview, Experiments Budget.

The Allocations (all) button expands the view to include all allocations of all periods, in the selected budget year for the selected station(s).

Overview: Expenditure

This selection shows in the lower window details of each item of expenditure, for the experiment selected in the upper window. To the right a summary is given of expenditure to date, classified by the types (Allowances, Labor, Materials, etc.) shown in the budget breakdown in the top window.

The buttons at the bottom of the display operate as described above for Overview, Experiments Budget.

6.3 Processing

Processing: Research station

Period updates between HQ and Stations.

Processing: New budget

The Processing, New Budget facility automatically generates records for each new year, complete with Experiment-ID or Master No, Government % and Donor name(s) copied from the previous year. This should be done at the end of each research year. These new records are then available for data entry of the new year's budget figures using the Data Entry, Experiments Budget facility.

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Processing: New allocations

This facility automatically generates records for each experiment for the new allocation period, complete with Experiment-ID or Master No, and Budget Year and Period. This should be done at the end of each allocation period.

These new records are then available for data entry of the new year's budget figures using the Data Entry, Experiments Budget facility.

Processing: Sun Accounts

To be implemented.

Processing : Excel

To be implemented.

6.4 Reports

A set of five standard reports is available. Normally they will apply to the experiments associated with the research station selected.

ACCESS provides a facility for adding a criteria to the records to be included so that, for example, only those for one donor are used, thus providing a means of generating donor-specific reports. Proceed as follows.

1. Display the Database Window (press F).
2. Select Macro, New.
3. Click on the Database Window.
4. Select Reports.
5. Click and Drag the Report to be generated, to the Macro window. ACCESS generates a macro which when run will open the selected report. First we add our condition(s):
6. Move to the lower window pane (press F6) and move down to the Where Condition line.
7. Type in a Where Condition as follows: Donor = "SIDA" Donor is a field name: if the field name used is of more than one word, enclose it in square brackets. SIDA is a text string and must therefore be in quotation marks; numeric data must not be so enclosed.
8. Run the Macro by clicking on the Run [!] icon in the top menu. The system asks that you save the macro first: say Yes.
9. Asks for a name: you can accept the default offered or type in your own.
10. Click OK : The macro will run and generate a report.

Tip: If the Machine Hangs

If you wish to stop a lengthy process press Ctrl+Break.

If the machine hangs (not responding to the keyboard) press Alt-Ctrl+Del .

In Windows 3.1 the machine will reboot.

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In Window 95 you can end the current task ("PBS not responding") by following the instructions. Restart PBS.

7. Notes on Some INFORM-R Features

7.1 Use of an intermediate table

Such a table is rebuilt - which may take c. 20 seconds - each time and is therefore appropriate to those situations where a significant amount of data processing is done within one dataset and in very large datasets such as archive data. It has been used, for example, to restrict records to those of the currently selected year, including if required the replicate records, and to exclude research activity records where Main Discipline = Administration from the main research management outputs.

7.2 "Expatriate" & other scientists with significantly augmented non-government Salaries

A question arises as to how to accommodate the high salaries of expatriate researchers. From a national economy point of view, as used within the Ministry of Finance, the full cost is needed including salary, housing, vehicle where included, etc.

In a research management information system such real costs or even actual salaries would distort sometimes very seriously the picture of resource allocation to commodities, disciplines, AEZs, etc. The solution is to attribute instead the salary of a senior local researcher. This applies also to any national whose salary is outside and significantly above the government pay scale.

7.3 The research year

The research year typically revolves around the planting season, starting shortly before the usual planting period. INFORM-R requires the research year to be defined, with start and end dates, to enable it to present to the user information relevant to the selected year. This definition can be adapted to each country. From the Database window (press F11 to present the Database window), and with the toolbar switched on, select Forms, select on the toolbar Window, Unhide, INFORM-R Configuration. The research year and its start and end dates are then presented.

7.4 Experiment annual reports

The data capture forms include two fields for paper use only: they are not recorded in the system, viz. Problems Encountered, and Comment on Budget & Expenditure.

The Experiment Annual Report (menu path: Reports, Station, Research, Reports, Experiment Annual Report) is set to print only those records (experiments) where the Report field is not empty, and does not start with the text string "No report...". The report for any individual experiment excludes the sections on Treatments and Treatment Results if relevant fields are empty. The related data capture forms are of course printed in full to enable this data to be entered on the forms.

7.5 Experiment replicates: How they are treated in the outputs

A replicate is a copy of an experiment usually on another site. It inherits all the properties of the parent experiment except for those few fields included in the Replicate table. Outputs address experiments and their replicates in one of three ways:

a. Where the element measured is human effort including scientists time, replicates are treated as additional effort - it takes almost as much time to plant, assess and

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harvest a replicate as the parent.
So in Outputs 5, 14, 24, 25, 26, 27 experiments and replicates are treated equally. This applies to just the Cost columns of Output 14 and the ladder outputs: 15, 16,17 & 18.

b. In outputs where parent experiments and replicates have similar impact but where they are listed individually, they should both be included but the Replicate Reference field should be added next to the Experiment ID field.
This applies to Outputs 10 - 13, 28, 29, 30 and 38. An extra column next to (or concatenated with) the M No column is needed.

c. Where the basic unit is more logically the Experiment (complete with any replicates), all records that are replicates are excluded. This applies to Outputs 31, 33, 34, 35, 37, 39 and 40. Also to the No (of Experiments) column in the ladders: 15 - 18 and to the column for No of Expts in Output 14, No and Relative Costs of Experiments.

7.6 Queries and their use in ad hoc reports

Queries provide a powerful method of interrogating a database. They allow one to choose fields from one or more selected tables and have the contents of just those fields displayed. One can also restrict the display to those records that match set criteria such as Start Date > 1 January 1996.

Queries therefore provide a natural extension to the standard outputs built into INFORM-R. Ad hoc questions that arise in research management and that are not already provided for in the standard outputs can usually be answered by the use of queries. They should therefore be a key part of the INFORM-R training for the INFORM practitioners at each research station.

The ACCESS manual describes this function in detail. Additionally one can examine those used in INFORM-R and learn from their construction. Go to Data Management, Tables (?Data sets), Persons, Select View, Query design to see the structure of the underlying query. This one draws fields from just one table. To see one that uses two tables, go to Data Management, Tables (?Data sets), Person Costs.

Where a query is needed again it can be saved. If you feel it is of widespread applicability bring it to the attention of the National Coordinator for consideration for inclusion in the INFORM-R built-in reports.

7.7 Modifying graphical outputs

To be implemented.

8. Management Issues in the Implementation of an MIS

The introduction of a management information system can bring large benefits to an organization. However the associated changes in the way the organization operates do not come lightly and individuals may have very different perceptions of how the change will affect them. The management of change is therefore important. Factors that have emerged as critical are discussed further here.

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8.1 Appointment of a patron or champion

It is a common finding that for the successful implementation of a management information system there should be a strong involvement by someone from senior or top management. This champion of the system should have the authority to demand outputs from the system, ensure their use in the regular cycle of research program planning and monitoring, and intervene in the resolution of problems. Sometimes two such champions are appointed, with the second also joining the Users Committee. This implies becoming an active user of the system, which the primary champion does not necessarily do.

8.2 Appointment of a users committee

A user committee needs to be appointed, representing the potential users (see Fig 3).

During the establishment of an MIS, the committee needs to meet a number of times to monitor and advise on the establishment process and ensure users' needs are well addressed.

When the system is operational, an annual meeting should be sufficient. The role then shifts to monitoring how the system serves its users and agreeing on behalf of all on any changes to the system to be passed on to the system administrators to implement nationally.

8.3 Agreement on management information requirements

It is important to consult widely with research managers and reach agreement on their broad information needs for managing the research program. This provides an outline of what the system needs to include.

At its simplest a system may provide very basic inventory information: simply a list of research activities at each station and, if researchers are also included, then a list of researchers. This would not usually qualify the system as a management information system but such is the inadequate state of information management in some places that even this provision is a useful step forward.

More typically an MIS for agricultural research will aggregate data on individual research activities to provide information on the distribution of resources across commodities and non-commodity (production) factors such as soil, water, post-harvest processing, economics & sociology, across scientific disciplines, across geographical areas such as agro-ecological zones, and between basic, applied and adaptive research. This information enables a comparison to be made between resource allocation with agreed research priorities.

Resource allocation can most simply be quantified by numbers of experiments. Accuracy is progressively improved by the use of researchers time as a % of person year, the same but multiplied by annual salary, by tracking experiment-related expenditure, and finally by attributing overhead costs to experiments in a suitable proportional manner.

A decision is needed on the extent to which the research program MIS covers personnel and financial areas. Some coverage is often desirable, for example research-related data on the researchers, and budget allocations to research activities. Beyond that is more properly the domain of separate personnel and accounting systems.

An arguable area for the extended MIS is data on research activity proposals, completed activities and on the actual results of experiments. Coverage of the last has the merit of facilitating the production of annual research reports, an element woefully neglected in some research institutions.

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Fig 3. Potential Users of INFORM-R Products

User	Notes
Research Managers	Station directors, program leaders: in resource allocation, program planning, monitoring, at station level
Research Scientists	Checking what research has been done before and what is being done now, before proposing new work
NARO Leaders	National resource allocation in relation to national and AEZ research priorities; research program planning and monitoring
Ministry of Agriculture	National resource allocation in relation to national & AEZ agricultural priorities
University Agriculture Faculties	National resource allocation, program planning and monitoring
Ministry of Finance	National resource allocation in relation to national priorities
Farmer Organizations	National resource allocation across commodities, and constraints within commodities
Donors	Targeting individual donor support with respect to national agricultural research priorities: INFORM-R can produce donor-specific reports.

8.4 Technical responsibility for the system

There needs to be a unit with technical responsibility for the system. It should not be a single person as the consequences of one person's absence, due to travel, sickness or for whatever other reason are too serious. The unit should be closer to research management than to a computer or other technical service facility. A planning, monitoring and evaluation unit is a good home for this responsibility, as INFORM-R provides information for and should be closely integrated with each of these functions. Two or more members of such a unit should be trained in the system and its software.

An MIS for agricultural research normally has to operate at two levels: research station and national. Most data is entered at station level, on an annual or seasonal cycle. Annually or seasonally the station systems have to be aggregated to a national system which is then redistributed back to stations. This requires that stations do not unilaterally introduce significant changes to their system, but rather pass suggestions for change to the national user committee for consideration. Approved changes are then passed to the technical unit for implementation.

Examples of titles of the person in charge of this work are National Research Information Officer, Database Administrator and National INFORM Coordinator. They would take a lead position in the prototype introduction and evaluation. They will need a good grounding in ACCESS, so as to be able to modify the system, and implement new outputs on request from the Users Committee.

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See also the section below, Recognizing the limits.

8.5 Implementation goals

The MIS implementation should itself have targets. These will vary in different cases but a suggested set is as follows:

- Within days or a few weeks of the main INFORM-R training workshop, issue the first reports.
- Have such INFORM-R outputs used by research managers in the next cycle of station and program planning; make them available to research scientists either through printed outputs to each researcher or where computer usage is widespread, in electronic form.
- Have the MIS integrated nationally and its outputs used in the next cycle of national or AEZ research program planning.

8.6 Achieving data accuracy and timeliness

These two issues are closely linked. Accuracy of data is achieved by limiting it to just what is needed, by the early issue of outputs (timeliness) and through peer pressure.

Data needs to be sufficiently accurate for the purpose, and no more. For example researchers' time distribution is requested to the nearest 2% = 1 week. This is quite sufficient for the purpose of informing management of the broad resource allocation to commodities, AEZs, disciplines, etc.

At least some outputs of interest to those providing the bulk of the data, the researchers, need to be released quickly to both researchers and managers. If this is done, peer review can be expected to exert a strong pressure on those who missed some information or exaggerated or otherwise gave misleading data: their peers will pick up many such errors (What do you mean by saying you are working on my bean variety trial?). It does no harm, also, for those supplying data to know that soon afterwards the resulting information will be in the hands of both their peers and managers. These effects are realized in the second round, when data suppliers are guided by the experience of the results of the first.

It is therefore important to get some outputs out soon, even if the data is incomplete and not fully verified. Delaying outputs to the timetable of the slowest is to set standards to those with the lowest.

The importance of timeliness is that data loses value with time, and delays in delivering outputs loses the interest of both the data providers and data users. An important part of timeliness is data capture.

Data capture

This is often one of the most difficult tasks in any information system where the data comes from people rather than automatic mechanisms. Within INFORM two efficient methods are used. In the initial implementation scientists are gathered in a meeting room and given a presentation of INFORM to show them what it is, what it has to offer them and management, and what it needs to make it work. This is followed by a discussion where any issues can be resolved. Finally personal forms, and often experiment forms also, are given out for immediate completion. Any questions are dealt with on the spot. At the end, the forms, which are data capture sheets, are collected.

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In the second and subsequent round of data capture, usually the following season, INFORM-R prints out data capture sheets complete with standing data, leaving blank only those few fields likely to change. These sheets, for each person and each experiment, can then be completed very quickly by the individual and the project leader, respectively.

8.7 Recognizing the limits

Three factors limit the capacity of an information system.

Need for a boundary for the information to be covered

There is a natural tendency in the development of an information system to continuously extend the boundary so as to include further areas on the basis that they might be useful. The tendency should be resisted because it risks delaying the release of an operational system to end users and adds progressively to the cost of initial development and subsequent maintenance. While the original requirement specifications cannot usually be adhered to absolutely, because requirements cannot be completely predicted in advance of users seeing the system, they should be kept in view. A useful rule is to restrict the addition of further items to those for which a user claims a need and demonstrates a use within the general subject area of the system.

Limit to management issues that an MIS can address

There is an old saying "the map is not the country": it is just a representation of a very small set of data about the country. It can be very useful in working out where you are and which is the best way forward. It may be unable to tell you whether you will find a place to eat in the next village or whether it will rain on the way there.

Much the same applies to an MIS: it may report precisely the numbers of scientists with an MSc or higher degree currently working in plant protection, and of past experiments that have looked at fertilizer effects on bananas but it is silent on the relative leadership capabilities of station directors. It is also weak on causal relationships such as why there have been three times as many experiments on fertilizers than on plant diseases. It may flag an apparent issue for management such as a major difference between agreed priorities and actual resource allocation it does not provide the explanation for the difference. It provides managers with facts with which better management decisions can be made but managers still need to weigh up the evidence, from the MIS and beyond, and make the decision.

Resource allocation to managing the MIS

In any research organization some resource has to be diverted from the core business of actual research to management. Ideally this should be contained within a maximum of say 20% of the total cost of the organization: regrettably this is often exceeded by burgeoning bureaucracy, always at the expense of the core research.

Management of the MIS has its own cost and this adds to the above cost of management. This is a further reason to constrain the system to reasonable limits.

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8.8 Information Implications in the Life Cycle of A Research Activity

No	Item	Notes	INFORM-R
1	Scientist thinks of a new research activity	Prompted by ideas from the farming community and/or the extension service	
2	Find out what has been done before on this problem locally and elsewhere	Search library journals, CARIS, former NARO annual reports, on-line & CD ROM databases, and INFORM-R	Search current (& archive) INFORM-R records See step 13 below
3	If there seems to be a case for further research, check against AEZ priorities, and their current balance v. current allocations		Examine priority v. resource allocation chart for this AEZ
4	If proposal would not adversely distort the current match of allocation to priorities: Prepare research proposals		Key to INFORM-R: print paper data capture form for new proposals; enter data into associated data entry screen form
5	Presentation to research planning meeting (by AEZ)		Use PC & LCD to display research proposal, and AEZ priority & allocation chart; distribute list of new proposals
6	Approval		Click on 'Approved' check box
7	Allocation of Experiment-ID		Type in Experiment No
8	Upgrade Proposal to a Research Activity		Upgrade proposal to a Research Activity
9	Implement research activity Record mid-season status Record standard monitor indicators		 Interim report Monitor report
10	Prepare RA annual report	At end of research year	Annual Report
11	Prepare RA teminal report	On completion	As above, but using INFORM-R Exp Evaluation table
12	Add to archive database an agreed number of years after the end data	Can remain in current database unless and until this becomes unwieldly: then create separate but still accessible archive	INFORM-R must 1. handle multiple year records of experiments properly 2. provide smooth access to current & archived records
13	Go to 1	(impact assessment may be	included later)

Budgeting not included.

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Exercise 22. Evaluating INFORM-R: A tool for MIS in agricultural research management (group work)

Phase 1. Group work (1 hour 20 minutes)

1. Form the same groups as the previous exercise, elect rapporteurs, and sit at the assigned computers.
2. Start your computer. Make sure the trainer has provided you with an ISNAR-INFORM-R diskette.
3. Evaluate INFORM-R tool by:
   a) Agreeing with your group members on major issues to be observed and evaluated. Remember that you have studied ISNAR Briefing Paper 21 during one of the previous days and are aware of INFORM-R components.
   b) Discussing and coming to consensus on, for example:
      - How friendly is the tool to be implemented in the organizations?
      - Usefulness of INFORM-R
      - Relevance for your work
      - Strengths and weaknesses
      - Anticipated level of acceptance
      - Other

Phase 2. Reporting and discussion (35 minutes)

4. The rapporteur summarizes the results of the group's analysis and writes down on the flipchart or overhead to report to the audience.
5. Make sure you present this report within the time assigned by the trainers.

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Exercise 22. Worksheet

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DAY NINE

Session 23 Database Development, Management, Report Production, and Analysis

Instructions to Trainers

SESSION 23

10:45 – 13:00 Session 23. Database Development, Management, Report Production, and Analysis

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Discuss database development, management report production, and analysis.

PROCEDURE

Training techniques: group work.

EXERCISE 23

Exercise 23. Database development, management, report production, and analysis. (2 hours 10 minutes)

1. *(experience)* Invite the participants to go over the exercise instructions in handout 9.23.1, distributed to them on day 6, session 17, which they have been working on as "homework".
2. *(experience)* Ask for feedback on the development of the exercise and clarify issues if necessary.
3. *(experience)* The groups continue working on exercise 23. Emphasize and remind the participants about the time.
4. As the individuals or groups work, circulate from group to group to check progress. Clarify any concerns they may have while working. Be sure to remind them of the time remaining.
5. Remind the groups and their rapporteurs that the presentations on group results will be done on the following morning and that they should finish the preparation for the reporting session during this afternoon.

CLOSURE

Closure (5 minutes)

1. Distribute handouts 9.23.3 – 9.23.5. Remind participants that due to the field trip, they should fill out their forms for PAPA and evaluation of the day after the field trip. These results should be discussed on the following day.
2. Make a transition to the next session. (field trip)

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DAY NINE

Session 23
Summary of Overheads

Objective of Session 23.
Database Development, Management, Report Production, and Analysis

4. Discuss database development, management, report production, and analysis

9.23.1

BEST AVAILABLE COPY

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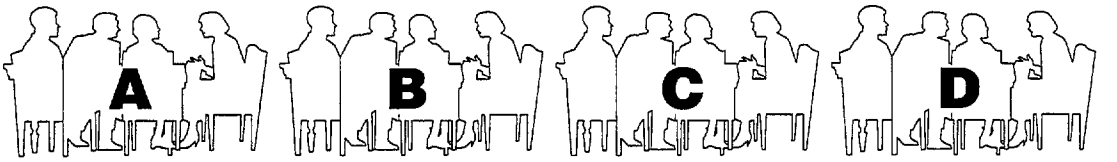
Exercise 23. Database development, management, report production, and analysis (group exercise — homework)

Phase 1. Group work

1. Form four or five groups and elect rapporteurs. Participants from the **same** NARS should be together in one group and work in each area. For example, group A works on human resources database, group B on physical resources, etc.



   If participants are from **different** institutes, each group will work on all areas, e.g., on human resources, physical resources, etc.

2. Work a few hours in the evenings from Monday through Thursday (second week) to accomplish this task, which is mainly "homework".
3. Using the data from your institutions, please answer the questions outlined. Produce appropriate data flow diagrams, tables, and special graphs.
4. Try to perform the tasks to your utmost to complete all sections.

Phase 2. Reporting and discussion

5. On the last Friday of the workshop, reports from the working groups will be presented in the morning. Therefore, be sure you finish your reports on Thursday.

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A. Human Resources Database

Using the human resources database for scientists in your institution, answer the following:

1. What is the gender profile of scientists in your institution?
2. Age profile:
   - How many scientists are 40 years and older?
   - What is the average age of the scientists?
   - How many of the scientists will be retiring in the next 10 years?
   - Based on the age profile of the scientists, what would be your recommendation on the human resources planning strategy for your institution?
3. Is there an appropriate disciplinary mix of scientists trained to manage the research system?
4. If your answer to 3 is "no", in what disciplinary areas do the scientists require training in order to efficiently manage the research?
5. Produce a printout of your database to attach to the report.

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B. Physical Resources Database

1. Develop a database on your institution's physical resources and produce the printout.
2. Given the amount of work to be done or currently being done in the institution, do you feel the resources are sufficient for research to be carried out effectively?
3. Assess the status of the resources available in light of the institution's capacity to increase its activities.
4. Is the balance of the resources available correct in terms of the manpower required to operate or utilize these resources?
5. Given the total operation budget, is your institution in a position to maintain the given equipment in good working condition?

C. Financial Resources Database

1. Review your institution's annual budget in the context of funds available for various types of functions.
   - What is your institution's total operating budget annually?
   - What % of the total budget goes directly into research programs?
   - Can a case be made for an increase in your institution's domestic funding?
   - Is there a chance for acquisition of external funds, considering the size of the budget? In which areas? You may wish to identify such sources and outline the strategy for obtaining the funds.
2. What % of the annual operating budget goes to scientists' salaries and wages?
3. Do you feel this is appropriate or not? Explain.
4. If your answer to 3 is "no", what should be done, i.e., what changes need to be made to correct this?

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D. Research Programs Database

1. Compile the cost of the research programs at your institution and indicate how financial resources have been allocated.
   - Costs of individual research projects?
   - Costs by commodity or program groups?
2. Based on your knowledge, is the allocation of resources in line with the research priorities? This assumes your institution has a research plan. Are sufficient funds allocated to projects to enable proper implementation?
3. How much time on average (%) do scientists spend on:
   - projects?
   - commodities?
   - total time spent on research/per scientist?
4. Do you feel that the time allocations are sufficient for the research projects to be properly implemented? If yes, assuming that the scientists are not involved in extension or teaching, do you feel that they are fully employed, under-employed or overloaded?
5. What is the distribution of the research projects by:
   - station?
   - agro-ecological regions?
6. Does the distribution sufficiently cover the ecological regions where the commodities are most important?
7. Using your knowledge of the system, does the human resource complement sufficiently match the work that is being done? In this case, you will need to consider deployment of scientists in relation to projects currently on the ground.

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Exercise 23. Worksheet

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Strengths and Weaknesses

- **Please list what you consider to be three strengths of day nine**

1.
2.
3.

- **Please list what you consider to be three weaknesses of day nine**

1.
2.
3.

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- **Suggestions for improvements**

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Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

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5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

FIRST STAGE

PAPA - ideas for action items

Date : _____

Workshop title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Note: You can use the workshop objectives, what you learn during the workshop, the handouts, conversations with participants and trainers, etc., to come up with ideas.

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DAY NINE

Session 24
Field Trip: Assessing an Existing MIS in an Organization

Instructions to Trainers

SESSION 24

14:00 – 17:00 Session 24. Field Trip: Assessing an Existing MIS in an Organization

OBJECTIVES

By the end of this session, the participants will be able to do the following:

- Discuss issues related to information management systems based on the field trip.
- List strengths and weaknesses of the information management systems used in the organization they visited.
- Suggest relevant recommendations to minimize or overcome the weaknesses to apply in their own environment if applicable.

PROCEDURE

Training techniques: brief presentation and plenary discussion

PRESENTATION

(experience) Give a brief presentation to instruct on major features of the field trip. Provide the participants with information on the organization in general, and related information systems which should be observed to develop learning. (15 minutes)

EXERCISE 24

Exercise 24. Field trip. (2 hours 40 minutes)

1. *(experience)* Consider this field trip an important exercise for the workshop and request the participants' attention to take notes on the kinds of existing information management systems observed.
2. Emphasize the need to assess strengths and weaknesses of these systems, and ways to minimize and/or overcome these weaknesses if they have a similar situation in their own organization.
3. *(experience, process)* Remember that during the morning of day 10 (continuation of session 23) time has been allotted to invite volunteers to share their experiences and lessons learned during this field trip session.

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"

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DAY TEN

Information Management for Research

DAY TEN — Overview

Objectives

By the end of the day the participants will be able to do the following:

1. Report on database development, management, report production, and analysis.
2. Plan actions for future activities in information management.

Handouts

10.23.1 Overview
10.23.2 Tentative Schedule
10.25.1 PAPA Form – Second Stage
10.25.2 Evaluation of the Workshop

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Information Management for Research

DAY TEN — Tentative Schedule

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 23. (Continued)**
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 23. (Continued)**

13:00 – 14:00 Lunch

14:00 – 15:00	**Session 25. Participant Action Plan Approach (PAPA) and Workshop Evaluation**
15:00 – 15:30	**Final Remarks and Closing**

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Information Management for Research

DAY TEN— Checklist for Trainers

Handouts to be distributed

		Yes ✓	No ✓
10.23.1	Overview	❐	❐
10.23.2	Tentative Schedule	❐	❐
10.25.1	PAPA Form – Second Stage	❐	❐
10.25.2	Evaluation of the Workshop	❐	❐

Overheads

10.23.1	Objectives of Day Ten	❐	❐
10.23.2	Schedule of Day Ten	❐	❐
10.25.1	Objectives of Session 25. PAPA	❐	❐

Materials

●	Personal Computers	❐	❐
●	Printers	❐	❐
●	Diskettes	❐	❐
●	Spare ink or toner for printers	❐	❐
●	Overhead projector	❐	❐
●	Spare bulbs for overhead projector	❐	❐
●	Extension cords	❐	❐
●	Projector screen	❐	❐
●	Flipchart stands (minimum 2)	❐	❐
●	Flipchart paper/pads (about 10 per day)	❐	❐
●	Markers for writing on newsprint	❐	❐
●	Markers for writing on transparencies	❐	❐
●	Blank transparencies	❐	❐
●	Stapler	❐	❐
●	Tape (strong masking tape and regular tape)	❐	❐
●	Push pins	❐	❐
●	Glue	❐	❐
●	Pencils/notepads/pens	❐	❐
●	Pencil sharpeners	❐	❐
●	Certificates	❐	❐

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	Yes ✓	No ✓
• Photocopying facilities	❒	❒
• Extra notepads and pens	❒	❒
• Scissors	❒	❒

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DAY TEN

Session 23. Database Development, Management, Report Production, and Analysis (Continued)

Instructions to Trainers

PRE-SESSION

08:30 – 09:00 Opening of the Day's Activities

- Summary of the evaluation of the previous day.

- Overview of the day's activities.

OBJECTIVES

By the end of the pre-session, the participants will be able to do the following:

- Assess the progress of the workshop.
- List the objectives and describe the agenda for the day's activities.

OPENING

It is not necessary to review the previous day's activities, because they will be continued today.

Summarize the evaluation of the previous day. (15 minutes)

Distribute the overview and the schedule for day ten (handouts 10.23.1 and 10.23.2) to the participants. Review the objectives and schedule using overheads 10.23.1 and 10.23.2. Ask if clarifications are needed. (15 minutes)

SESSION 23

09:00 – 10:30 Session 23. (Continued)

10:30 – 10:45 Tea/Coffee Break

10:45 – 13:00 Session 23. (Continued)

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Report on database development, management, report production, and analysis.

EXERCISE 23

Exercise 23. (Continued). (3 hours 40 minutes)

Reporting and discussion

1. Ask the rapporteurs to report the results of their group's discussion. State the amount of time you will allow for each presentation. (total of 3 hours)
2. Open the discussion to the audience.
3. Finally, you should provide your views on the results of the exercise.

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4. *(process, generalize)* At the end of the exercise provide feedback on the content of the presentations. Ask the participants questions such as "How did you feel doing this exercise?" and "What did you learn?" to encourage discussion of the process. (5 minutes)

CLOSURE

Closure (5 minutes)

1. *(application)* Ask the participants "What might you do differently in your job as a result of what you have learned?"
2. Make a transition to the next session.

13:00 – 14:00 Lunch

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DAY TEN

Session 23
Summary of Overheads

Objectives of Day Ten

1. Report on database development, management, report production, and analysis
2. Plan actions for future activities in information management

10.23.1

Schedule of Day Ten

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 23. (Continued)
Tea/Coffee Break	
10:45 – 13:00	Session 23. (Continued)
Lunch	
14:00 – 15:00	Session 24. Participant Action Plan Approach (PAPA) and Workshop Evaluation
Tea/Coffee Break	
15:00 – 15:30	Final Remarks and Closing

10.23.2

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Handout — Overview of Day Ten

Information Management for Research

Objectives

By the end of the day the participants will be able to do the following:

1. Report on database development, management, report production, and analysis.
2. Plan actions for future activities in information management.

Handouts to be distributed

10.23.1 Overview
10.23.2 Tentative Schedule
10.25.1 PAPA Form – Second Stage
10.25.2 Evaluation of the Workshop

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Handout — Tentative Schedule of Day Ten

Information Management for Research

08:30 – 09:00	**Opening of the Day's Activities**
09:00 – 10:30	**Session 23. (Continued)**
10:30 – 10:45	Tea/Coffee Break
10:45 – 13:00	**Session 23. (Continued)**
13:00 – 14:00 Lunch	
14:00 – 15:00	**Session 25. Participant Action Plan Approach (PAPA) and Workshop Evaluation**
15:00 – 15:30	**Final Remarks and Closing**

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DAY TEN

Session 25
Participant Action Plan Approach (PAPA)

Instructions to Trainers

SESSION 25

14:00 – 14:30 Session 25. Participant Action Plan Approach (PAPA)

OBJECTIVE

By the end of this session, the participants will be able to do the following:

- Plan actions for future activities in information management for research.

PROCEDURE

Training techniques: presentation, individual work, group sharing, PAPA.

PRESENTATION

(experience) Give a brief presentation reinforcing the use of the PAPA during this workshop. Remind the participants of the information you presented on the PAPA at the beginning of the workshop. You may want to use the overheads on PAPA from day one, session 1. Note that the participants have been jotting down possible action items throughout the workshop. Now is the time for them to focus on finalizing their specific action items for when they return to their jobs. Be sure to ask the participants if they have any comments, questions, or need clarification. (5 minutes)

EXERCISE

PAPA Exercise – Second stage (25 minutes)

1. Distribute handout 10.25.1 (3 forms). These are the forms for the second stage of the PAPA action plan.

Phase 1. Individual work.

2. Ask the participants to review the work they have done over the last ten days and to refer to the PAPA notes they made throughout the workshop. They should formulate specific action items and write them on the handout. Tell them to refer to the questions about their action items to be sure they are written as "specifically" as possible. (15 minutes)

Phase 2. Group sharing and discussion.

3. Go around the room and ask each person to tell you their action items. List each item on flipcharts. If some people have similar items, just indicate with a check by the item. Do not rewrite. This will give a good idea of the range of action items people are interested in undertaking. (10 minutes)

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4. Collect the completed forms from the participants. (Make photocopies to return to the participants before they leave.) Remind them that you will be following up with them after several months to see how they have progressed toward their action items.

14:30 – 15:00 Workshop Evaluation

OBJECTIVE

- Evaluate and provide feedback on the workshop.

Distribute handouts 10.25.2 and 10.25.3. Have the participants complete the evaluation before they leave the session. Give them about 15 minutes for this task. During the last 15 minutes ask the participants to make oral comments regarding the evaluation of the workshop. Facilitate a brief discussion.

Note: A diskette with the text of the evaluation form in WP5.1 is included and, if necessary, may be adjusted to meet your needs.

15:00 – 15:30 Final Remarks and Closing

DAY TEN

Session 25
Summary of Overheads

Objective of Session 25. PAPA

2. Plan actions for future activities in information management for research

10.25.1

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SECOND STAGE

ACTION PLAN

Date: _____

Workshop Title: SADC/ESAMI/ISNAR Workshop on Information Management for Research

Name: _____

Organization: _____

Action Items	Start to implement action plan (check if known)		
I plan to:	Within 2 months	After 2 months	As arises

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PARTICIPANT ACTION PLAN APPROACH

Supervisor's Contact Address

Name: _____

Organization/Center: _____

Name of Immediate Superior: _____

Title of Immediate Superior: _____

Address: _____

_____

_____

_____

Tel. No.: _____

Fax No.: _____

Telex No.: _____

Email: _____

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Questions About Your Action Items

1. *Preliminary nature of plan*

   - Were you specific in writing the action item?
   - What will you need to do when you return to work to find out which actions are possible?

2. *Resources*

   - Who would be carrying out the proposed action, or helping with it (formally or informally)?
   - Are the skills for carrying it out available?
   - How much time will this take?
   - Are there special materials or equipment required?
   - What is involved in obtaining them?
   - Will you be using a tool, system or aid from this training workshop?
   - How much adaptation is required?
   - Is continual monitoring or follow-through required?
   - Who will do it?

3. *Implementation*

   - Do you have the authority to implement the action?
   - If not, who does?
   - How do you think you can go about getting approval?
   - What do you think the degree of support is for your idea?
   - Will you need to sell people on it?
   - Who?

4. *Effects*

   - Whom will this action affect?
   - How will it affect them?
   - Will anyone be the worse for the results?
   - Anyone improved?
   - What will be affected?

5. *Environment*

   - What in the organizational environment might interfere with your doing this?
   - What in the organization will support your effort?

Workshop on Information Management for Research

Evaluation Form

Your cooperation in completing this questionnaire will be greatly appreciated. The information you provide will be useful in planning future events and will help resource persons to improve their materials and presentation.

A. General Reactions

In general, I would rate the workshop as:
- ☐ Excellent
- ☐ Good
- ☐ Average
- ☐ Fair
- ☐ Poor

On balance, would you say that the workshop objectives were achieved?
- ☐ Yes
- ☐ No
- ☐ Partially

(If no, please explain briefly in section H)

B. Objectives

The objectives of this workshop are listed below. Please mark to what extent, in your opinion, the objectives have been achieved, using a scale from 1 to 5. The scale is:

1 - I cannot perform this objective or I have not been exposed to the information.
2 - I cannot perform this objective but I have been exposed to the information.
3 - I can perform the skill or express the knowledge with assistance from others.
4 - I can perform the skill or express the knowledge without assistance from others.
5 - I can perform the skill or express the knowledge well enough to instruct others.

1. Discuss basic concepts of data processing systems.	1	2	3	4	5
2. Discuss database management	1	2	3	4	5
3. Discuss the role of MIS	1	2	3	4	5
4. Discuss information technology	1	2	3	4	5
5. Discuss MIS for research program analysis	1	2	3	4	5
6. Discuss MIS for human resources	1	2	3	4	5
7. Discuss MIS for financial resources	1	2	3	4	5
8. Discuss the concept of INFORM	1	2	3	4	5
9. Discuss the information cycle	1	2	3	4	5
10. Design the database structure for physical resources	1	2	3	4	5
11. Practice dBase IV	1	2	3	4	5
12. Discuss the establishment and development of MIS: data analysis	1	2	3	4	5
13. Discuss MIS using GOPP	1	2	3	4	5
14. Practice dBase IV reports	1	2	3	4	5
15. Discuss database management: security, recovery and integrity	1	2	3	4	5
16. Discuss Lotus 1-2-3	1	2	3	4	5
17. Discuss information management systems	1	2	3	4	5

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C.
Strengths and Weaknesses

- **Please list what you consider to be three strengths of the workshop:**

1.
2.
3.

- **Please list what you consider to be three weaknesses of the workshop:**

1.
2.
3.

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D. Topics

In this section we would like you to rate the content, the usefulness, the presentation, and the time allotment for each of the topics included in the course. When rating ***content***, you should consider such factors as rigor of material (theory, soundness, methodology). In regard to ***usefulness,*** rate the topic in terms of its applicability/relevance in your day-to-day work activities. Factors to consider in assessing ***presentation*** include clarity, logical structure, good use of visuals, etc. Please place a check in the box that most accurately represents your opinions of these factors.

Sessions	Content					Usefulness to Work					Presentation/Exercise					Time Allotment		
	Excellent	Good	Average	Fair	Poor	Excellent	Good	Average	Fair	Poor	Excellent	Good	Average	Fair	Poor	Too Short	Just Right	Too long
Day 1.																		
1. Introduction	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Concepts of information and communication	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Database management: fundamentals of database systems	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. The role of MIS in agriculture and natural resources research	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 2.																		
5. Information technology: overview	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Computer basics	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7. MIS for research program analysis	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 3.																		
8. MIS for financial resources	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9. INFORM: an information system for agricultural research management	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10. Planning and development of MIS: an overview	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 4.																		
11. Development and management of physical resources	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12. MIS: data collection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
13. Management Information Systems for Human Resources	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 5.																		
14. Establishment and development of an MIS: data analysis	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

D. Topics

In this section we would like you to rate the content, the usefulness, the presentation, and the time allotment for each of the topics included in the course. When rating ***content***, you should consider such factors as rigor of material (theory, soundness, methodology). In regard to ***usefulness,*** rate the topic in terms of its applicability/relevance in your day-to-day work activities. Factors to consider in assessing ***presentation*** include clarity, logical structure, good use of visuals, etc. Please place a check in the box that most accurately represents your opinions of these factors.

Sessions	Content					Usefulness to Work					Presentation/Exercise					Time Allotment		
	Excellent	Good	Average	Fair	Poor	Excellent	Good	Average	Fair	Poor	Excellent	Good	Average	Fair	Poor	Too Short	Just Right	Too long
Day 6.																		
15. Designing of a database structure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
16. Forms design	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
17. MIS: Project initiation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 7.																		
18. Database queries design	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
19. Database reports design	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 8.																		
20. Database management: security, recovery, and integrity	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
21. Introduction to Lotus 1-2-3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 9.																		
22. INFORM-R computer demostration	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
23. Database development, management, report production, and analysis	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
24. Field trip: Assessing an Existing MIS in an organization	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Day 10.																		
25. Participant Action plan approach	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

E. Features

	Very Good	Good	Fair	Poor
Accommodations	☐	☐	☐	☐
Meals	☐	☐	☐	☐
Lectures	☐	☐	☐	☐
Discussions	☐	☐	☐	☐
Papers/Handouts	☐	☐	☐	☐
Organizations and Management	☐	☐	☐	☐
Quality of visual aids	☐	☐	☐	☐
Quantity of visual aids	☐	☐	☐	☐
Field trip	☐	☐	☐	☐

F. Additional Topics

What additional topics would you have liked included in this activity?

G. Management Topics

On what other management topics would you like to receive training in future events?

H. Comments

Please use the space below to write down any additional comments or suggestions you might have.

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Guidelines to Provide Feedback on the Workshop

1. **The Module**

   Content

   - usefulness/relevance
   - amount of information

   Structure

   - sequence
   - duration
   - balance between trainers' and trainees' participation
   - instructions to trainers
   - visual aids
   - handouts, exercises
   - extra readings
   - PAPA
   - evaluation

2. **Process: training techniques and direction**

   - usefulness/relevance/effectiveness
   - group interaction
   - clarity of questions/exercise instructions
   - opening and closure of the days

3. **Trainers', facilitators', and trainees' performance**

   - presentation/communication skills
   - interaction/effective participation
   - punctuality/interest/commitment/willingness to facilitate learning/willingness to participate
   - other attitudes

4. **Logistical support**

   - organization
   - accuracy
   - punctuality
   - willingness to assist participants
   - services provided in general

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5. **Workshop environment**

- physical (training facilities, training material, hotel facilities in general)
- psychological (personal feelings such as self-motivation, interest, satisfaction, self-achievement)
- social (development of friendship, relaxed, comfortable among participants, etc.)

6. **Workshop results/outputs**

- personal and professional assessment
- recommendations

7. **General comments**

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Information Management for Research

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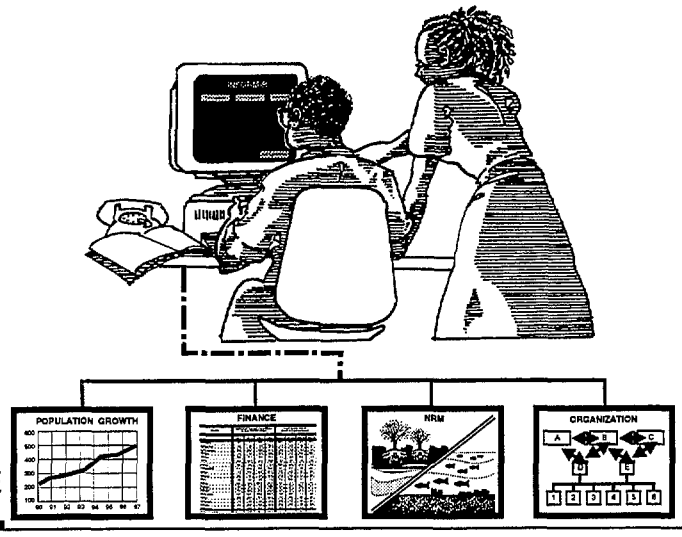

A TRAINING MODULE

Information Management for Research

Annex: Overheads

JULY 1997

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Information Management for Research

Workshop Goal

To develop basic skills in information management for research

Major Objectives

By the end of the workshop the participants will be able to do the following:

- **Identify techniques for exploiting the potential of MIS and IT for the conduct and management in NARS**
- **Recognize systems and technologies to enhance the effectiveness of NARS**
- **Set up MIS in NARS**

Expected Outputs

1. Improved information management awareness and skills
2. Basic computer skills in dBase IV and Lotus 1-2-3
3. Action plan to apply information management in your own working environment
4. Improved commitment to work as a team toward establishing a critical level of expertise in information management
5. Increased interest to serve the SADC-NARS in other duties related to information management for research

Workshop Duration – Ten Days

Objectives of Day One

1. Discuss background, rationale, objectives, and schedule for the 10-day workshop
2. Explain the use of the participant action plan approach (PAPA)
3. Identify the trainers and trainees
4. Discuss basic concepts of data processing systems
5. Discuss conceptual and practical issues of information
6. Discuss database management
7. Define MIS
8. Discuss database systems
9. Discuss the role of management information systems in agriculture and natural resources
10. Discuss and identify some characteristics of information needs for research planning
11. Discuss and exercise the use of INFORM in PM&E

Schedule of Day One

08:30 – 09:00	Welcome
09:00 – 10:30	Session 1. Introduction to the Workshop
	Tea/Coffee Break
10:45 – 13:00	Session 2. Concepts of Information and Communication
	Lunch
14:00 – 15:30	Session 3. Database Management: Fundamentals of Database Systems
	Tea/Coffee Break
15:45 – 17:00	Session 4. The Role of Management Information Systems (MIS) in Agriculture and Natural Resources Research
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Participant Action Plan Approach

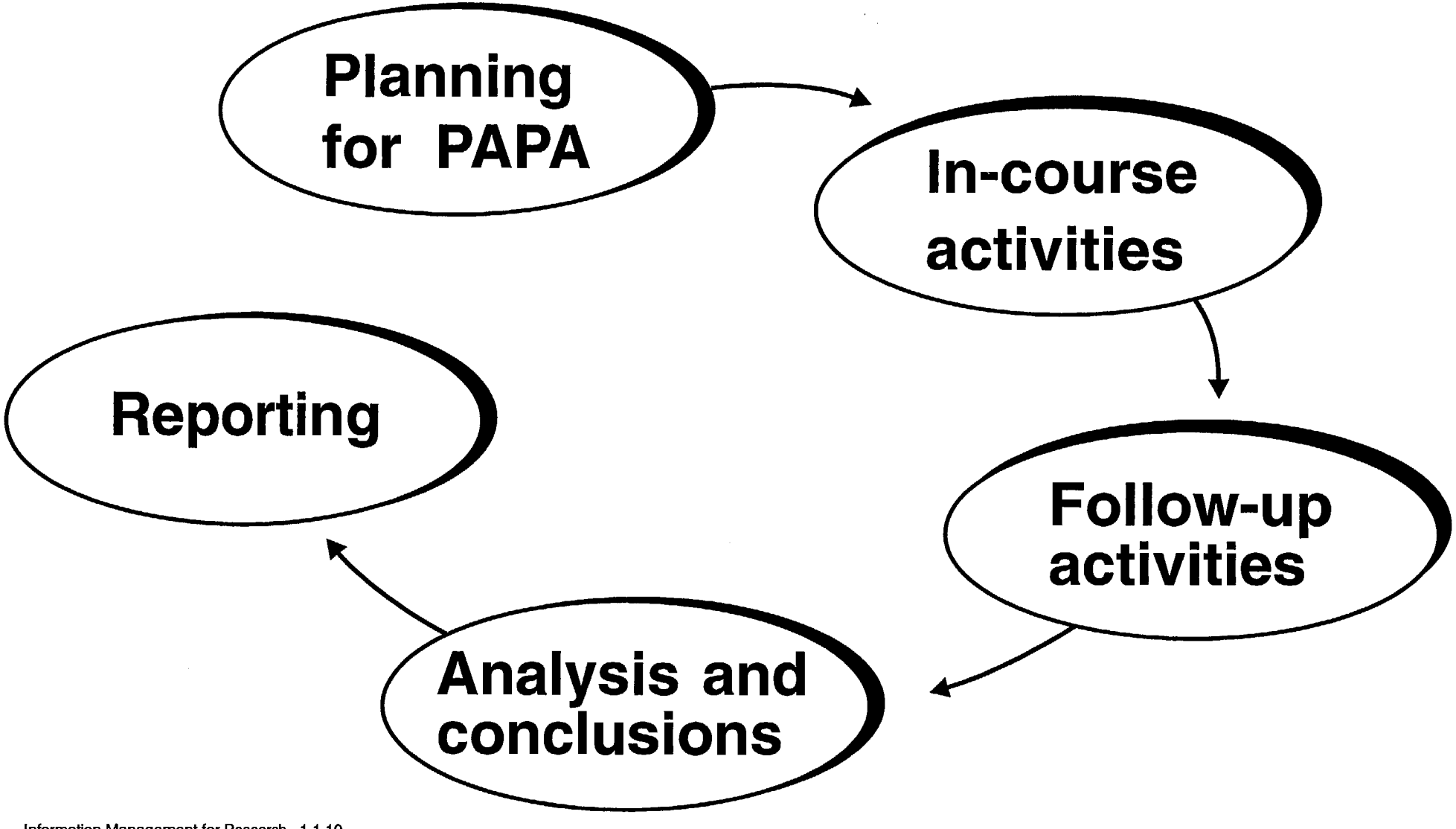
Why PAPA?

- Systematic and continuous planning of future activities by trainees as training evolves
- Formal link between trainees and trainer for follow-up activities
- Further involvement of trainee in improving the training material after training event

Uses of PAPA

- Assess the transfer of skill to workplace
- Determine the impact of change introduced
- Identify problems of implementation
- Decide how to modify the course
- Evaluate the most useful parts/quality of training

Steps in PAPA



Step 2: In-course Activities

Stage 1

Objectives:

- introduce PAPA to participants
- identify possible action ideas to be tried on the job

Procedure:

Jot down action ideas during the training

- use format provided
- do it at end of last session each day
- confer with other participants/trainers periodically

Step 2: In-course Activities

Stage 2

Objectives:

- develop action plan

Procedure:

- prepare preliminary list of action items
- confer with partner
- finalize and prioritize list of action items
- report individual action plans
- make copy and submit to trainer

Step 3: Follow-up Activities

Trainers	Participants
• Formulate and send questionnaire →	• Fill out and return questionnaire
• Analyze and interpret data	
• Prepare report →	• Receive report and send feedback
• Modify course content	

PAPA Questionnaire, First Stage
Ideas for action items

Date : _____

Workshop title : _____

Date/Venue : _____

Name : _____

Organization : _____

Ideas I would like to try when I return to work at my research institute, based on what I have learned in this training workshop

_____

_____

_____

_____

_____

Note: **You can use the workshop objectives, what you learn during the workshop, handouts, conversations with participants and trainers, etc., to come up with ideas.**

Objectives of Session 2.
Concepts of Information and Communication

4. Discuss basic concepts of data processing systems

5. Discuss conceptual and practical issues of information

Basics Concepts of Data Processing Systems

- Information
- Data
- Communication

Information System

the arterial system of an organization

or

the electric power system supplying power to the city

Data and Information

- DATA are raw materials, while INFORMATION is a finished product
- DATA become INFORMATION when they achieve relevance
- DATA are groups or series of non-random symbols used to represent INFORMATION
- This INFORMATION is usually recorded observations which are not currently affecting behavior
- DATA represent facts about quantities, actions, events, and objects

Data and Information (continued)

- INFORMATION is selected and organized DATA which are processed according to certain decisions

- INFORMATION is DATA processed with respect to user, problem, time, place, and function

- INFORMATION has an assumed utility which can be used for decision-making

- DATA on the other hand do not:
  - necessarily have any apparent utility
  - affect behavior
  - lead to decision-making

Data Processing System

- Wide range of systematic activities which have collection, input, processing, storage, and output in common

- Activities to process transactions for day-to-day operation

Information Processing System

- Wide range of systematic activities which have collection, input, processing, storage, and output in common

- Activities to process transactions for day-to-day operation plus additional functions related to information for management planning

Scientific and Business Data Processing

Scientific

data for engineering and research purposes

Business

data within the business environment, i.e., personnel, accounts, management

DP Methods and Computers

Computers are important in DP methods

- Speed
- Accuracy
- Storage
- Efficiency

Qualities of Information

- Accuracy
- Timeliness
- Conciseness
- Completeness

Information and Management

- Management Information
- Information Management

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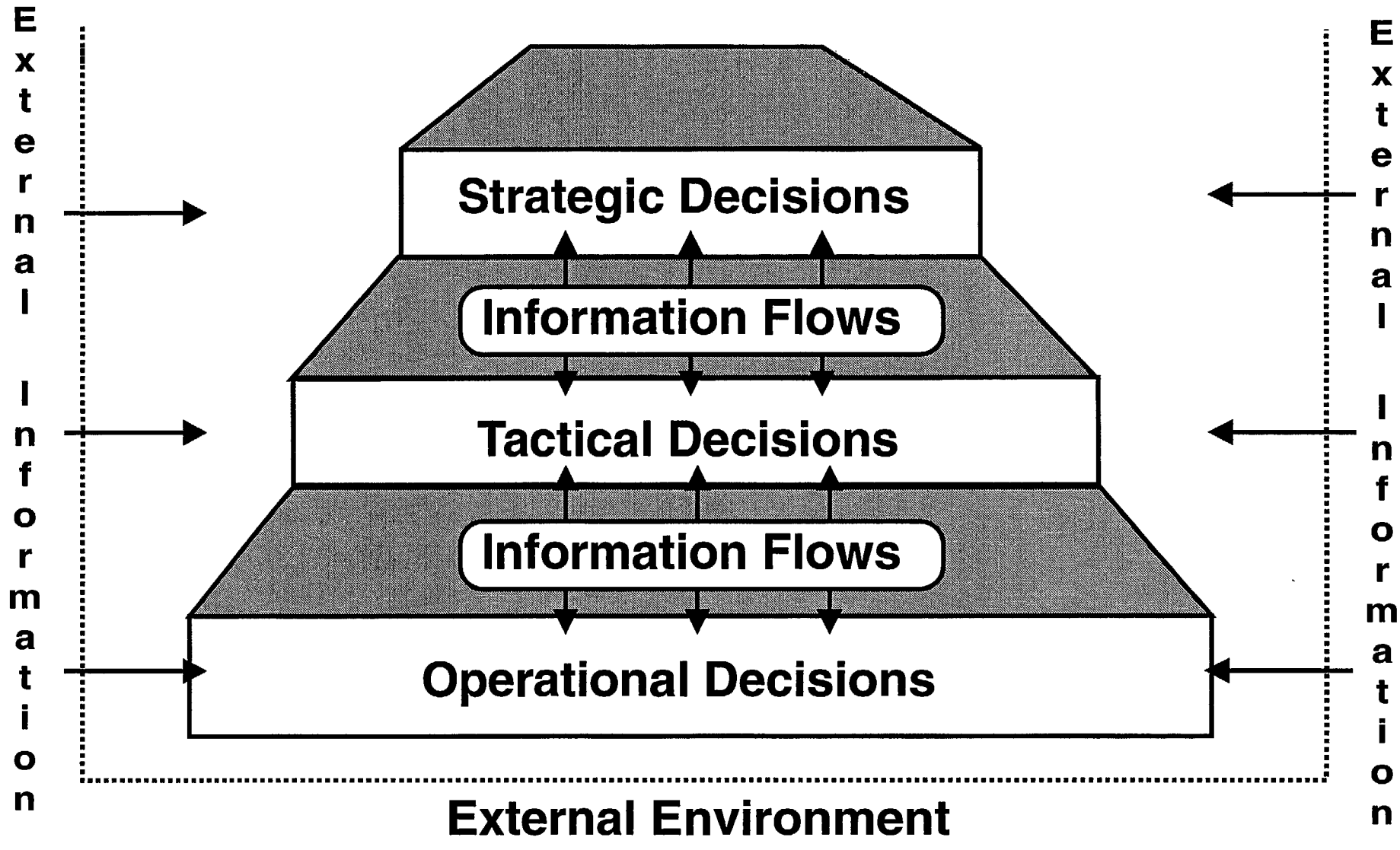
Pressures for Information

1. Advances in processing technologies
2. Improved methods of communication
3. Reduced costs of processing
4. Developments in IT: simpler & user-friendly
5. Increased complexity of environment
6. Increased complexity of organizations themselves
7. Improved knowledge, education, and training
8. Greater demands

Functions of Information

- Reducing uncertainty in decision-making
- Providing error signals which indicate a deviation from planned performance or operation, thus aiding control activities
- Providing a mechanism for the communication of plans, forecasts, procedures, guidelines, etc.
- Supplying historical evidence of transactions, levels of performance, results of decisions, etc.
- Reducing complexity through enhancement of users' knowledge and understanding of situation

Levels of Organization Decision-making



Information Technology (IT)

- The acquisition, processing, storage, and dissemination of:
  - vocal
  - pictorial
  - textual
  - numeric

- Information by micro-electronics combination of computing and telecommunications

The Intel Processors

Processor	Word Length	Internal Bus Width	External Bus Width
8080	8	8	8
8088	16	16	8
8086	16	16	16
80286	16	16	16
80386	32	32	32
80486	32	32	32
P24T	32	64	32
Pentium	32	64	64

Objectives of Session 3. Database Management: Fundamentals of Database Systems

6. Discuss database management
7. Define MIS
8. Discuss database systems

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Database Management

Management Information System (MIS)

- an integrated user-machine system

- for providing information

- to support the planning, operations, management, analysis, and decision-making functions in an organization

Integrated System

Information system builds structures from data to reveal patterns, trends, and tendencies that users need to perform their jobs

Advantages of Databases

Databases facilitate the production of information

- may store large volumes of data
- are readily accessible
- can be implemented on computers of all sizes

File Processing Systems

- collect only data necessary for reports
- store data only in pre-report format
- store data in formats efficient for data processing required for reports
- represent all data semantics
- data files and program are interdependent

Limitations of File Processing Systems

- data is separated and isolated
- data is often duplicated among files
- application programs are dependent on file formats
- difficult to represent complex objects from users' environment
- major changes to the system are very time consuming

Objectives of Database Management

- shareability
- availability
- evolvability
- integrity
  - quality
  - privacy

What Is a Database?

A mechanized, shared, formally defined, and centrally controlled collection of data

Three parts of a database:

1. application data
2. data dictionary or meta-data
3. overhead data

Main Components of Database Technology

- database management systems (DBMS)
- database
- computer technology

What Is a Database Application?

A business computer system
that processes a portion
of a database
to meet the information needs
of a specific group

Database Application System Components

- hardware
- programs
- data
- procedures
- people

Different Types of Data

- **source data**
  facts stored in the database

- **overhead data**
  describes structures that represent relationships: lists, indexes

- **meta-data**
  describes the structure of the database

- **application meta-data**
  describes the constructs of particular applications

People

- **Clientele**
  for whom the system is developed

- **Systems development personnel**
  design and implement the database and its applications

- **Operations personnel**
  run the computer and associated equipment

- **Database administration (DAB) personnel**
  deal with database security, ownership, backup, and recovery of data

Different Mechanisms in Database Application

- updating data
- displaying data
- controlling data

The Role of a Corporate Database

Allows management to:

- research the past
- organize the present
- plan for the future

Advantages of Corporate Databases

- Redundancy reduced
- Inconsistency reduced
- Data can be shared
- Standards enforced
- Security restrictions
- Integrity
- Conflicting requirements balanced

Data Analysis Methodology

1. Define the major data areas of the organization

2. Define entity types for each of the data areas of the organization

3. Determine relationships existing between entity types

4. Derive an entity model for the area of the organization

5. Determine attributes for the entity types

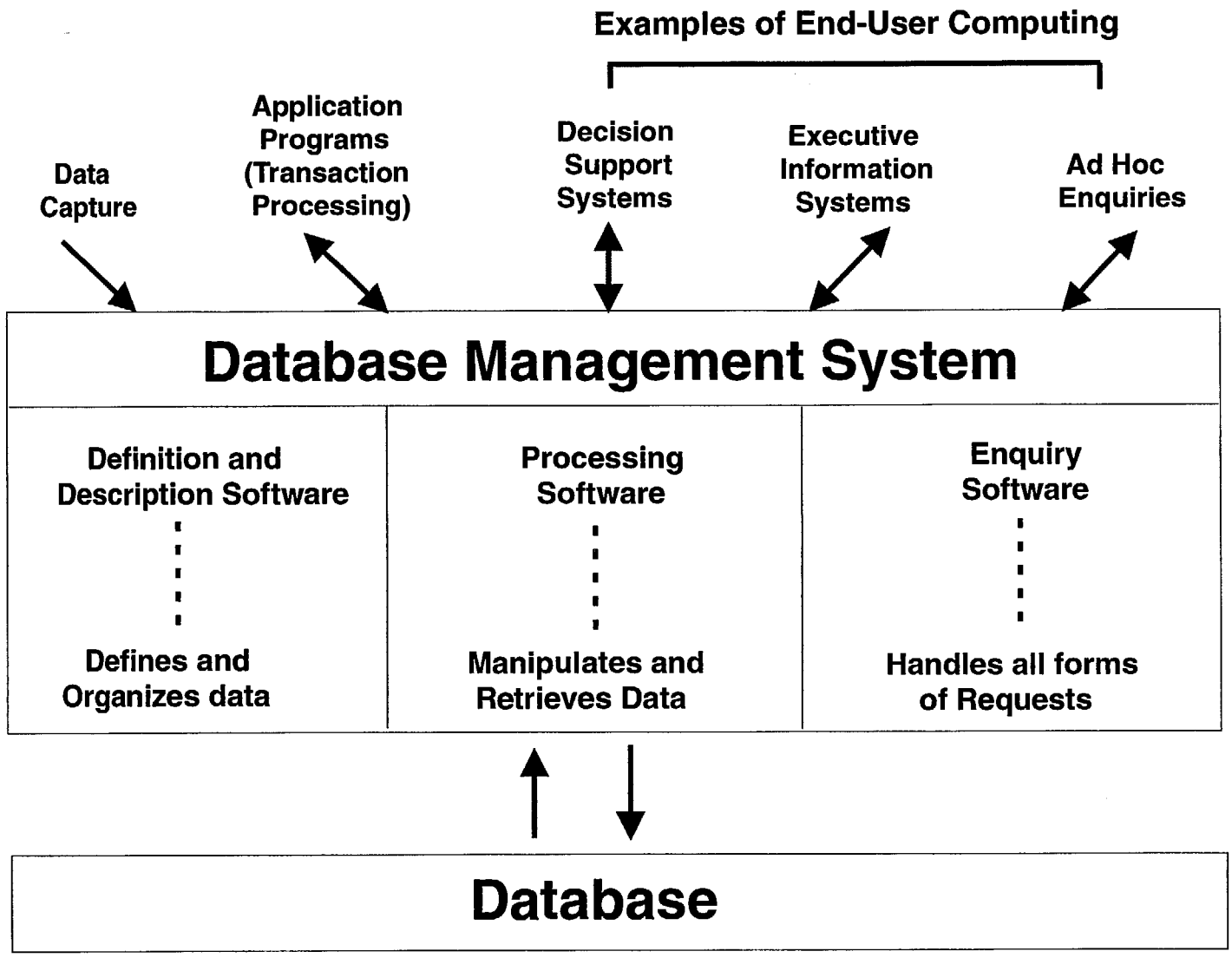
Data Analysis Methodology (continued)

6. Normalize the attributes of the entity types

7. Amalgamate entity models to derive a complete model for the organization

8. Test the adequacy of the entity model against the functions and processes required of it

Database Management System



Objectives of Session 4.
The Role of MIS in Agriculture and Natural Resources Research

9. Discuss the role of MIS in agriculture and natural resources

10. Discuss and identify characteristics of information needs for research planning

11. Discuss and exercise the use of INFORM in PM&E

The role of MIS in Agriculture and Natural Resources Research

Why Management Information?

1. Need for information to plan and program research activities

2. Research activities, in turn, generate a vast amount of information

3. Tremendous increase in the total volume of operations and resources directly under research institutions' control

Functions of a Research Organization

- Developing research programs
- Mobilizing and effectively utilizing financial resources
- Developing and maintaining a physical infrastructure
- Developing and maintaining a critical mass of well-qualified staff

A Systems Approach

Portrays the processes and relationships between functional areas, work areas, and management information.

Table 1. Inter-relationships of Functional Areas, Work Areas, and Management Information of a Research Institution

Functional areas	Work areas	Management information
Human Resources Management	Recruitment Training and development Performance appraisal Salaries and wages	Workforce – size, composition & deployment Management accounts
Financial Resources Management	Budgeting Mobilization Accounting	Management accounts Donor and funding agencies
Physical Resources Management	Procurement Utilization Control Maintenance	Management accounts Project data Inventory
Programs Management	Priority setting Program formulation Budgeting & resource allocation Implementation M/E	Projects data Management accounts Personnel information

Information Needs for Various Levels of Management

- Policy level
- Institutional level
- Station level

Information Needs at the Policy Level

Decision-making areas:

- set broad priorities and allocate resources at national level
- formulate research policies
- analyze alternatives and mobilize resources
- provide overall monitoring and evaluation
- provide leadership

Sources of Information

- Socioeconomic survey
- Technical review
- Diagnostic studies

Information Needs at the Institutional Level

Decision-making areas:

- develop long-term and strategic research plans
- provide leadership and direct supervision of programs
- monitor programs
- provide overall management of station

Sources of Information

- Physical/financial organization
- Quarterly progress, annual and final reports
- Annual review
- Final report

Information Needs at the Station Level

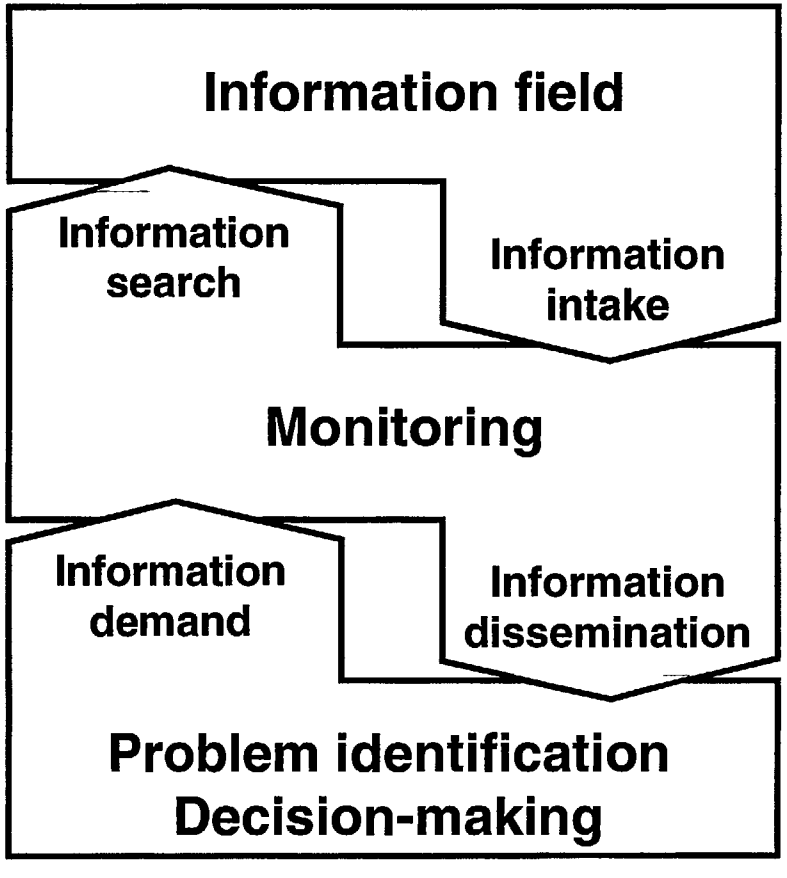
Decision-making areas:

- short-term planning
- project planning and budgeting
- implementation of projects
- monitoring of projects

Sources of Information

- Technical and socioeconomic analysis
- Annual research reports
- Technical review
- Personnel evaluation
- Physical/financial organization

Monitoring, Information Field and Problem Identification



Tasks for Monitoring and Evaluation

- sensing
- screening
- structuring
- storing
- retrieval and communication

Relationship of Monitoring and Evaluation to MIS

MONITORING

Recording

Analysis

Reporting

Storage

Corrective action in implementation

(Data)

(Information)

EVALUATION

Information from monitoring

Information from other sources

Analysis

Recommendations

Modification in objectives, resources & implementation

The Use of INFORM in Planning, Monitoring, and Evaluation

Objectives of Day Two

1. Discuss information technology and its importance
2. Assess information technology use and organization
3. List computer hardware and software composition
4. Discuss computer keyboard and mouse usages
5. Practice basic commands for computer skills development
6. Practice dBase IV: database management system
7. Discuss MIS for research program analysis
8. Discuss information requirements for planning

Schedule of Day Two

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 5. Information Technology: Overview
	Tea/Coffee Break
10:45 – 12.00	Session 5. (Continued)
12:00 – 13:00	Session 6. Computer Basics
	Lunch
14:00 – 14:45	Session 6. (Continued)
14:45 – 15:30	Session 7. Management Information Systems for Research Program Analysis
	Tea/Coffee Break
15:45 – 17:00	Session 7. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Objectives of Session 5.
Information Technology: Overview

1. Discuss information technology and its importance
2. Assess information technology use and organization
3. List computer hardware and software composition

Information Technology: Overview

Computer Hardware

Parts of a computer that you can touch

Examples:

- input/output devices
- backing or external storage devices
- central processing unit (CPU)
  - main memory
  - arithmetic and logic unit (ALU)
  - control unit (CU)

Computer Software

Parts of a computer that you cannot touch

Examples:

- programs, data, or information
- operating systems
- procedural language processors
- non-procedural language processors
- utility software
- packaged software

Two Main Types of Networks

Local area network (LAN)

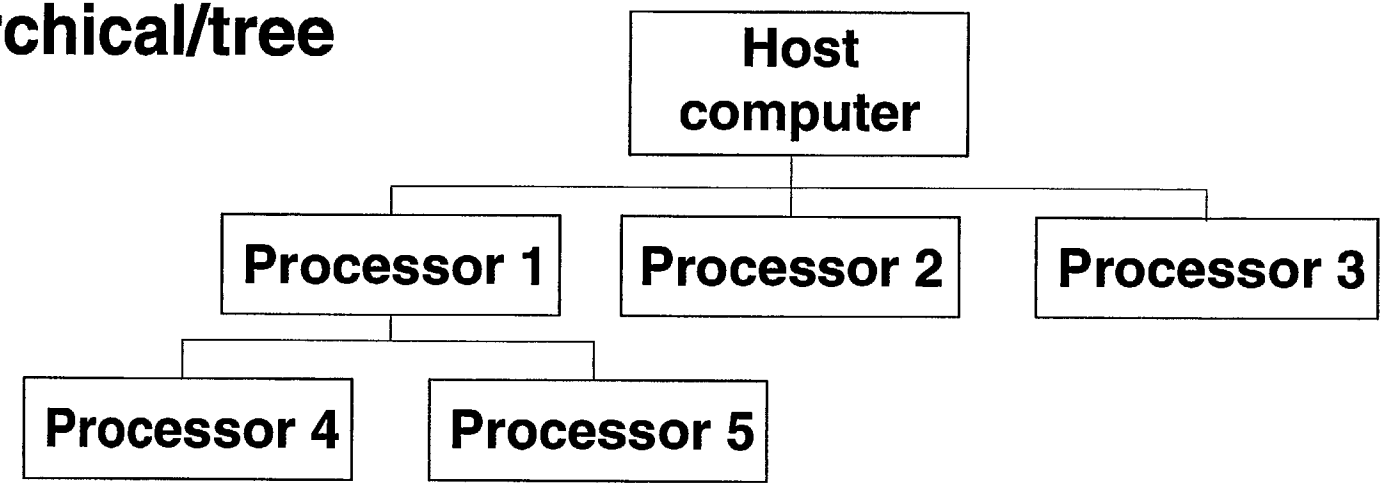
Technology to support transmission of data between computer systems that are located in the same premises or that can be physically interconnected

Wide area network (WAN)

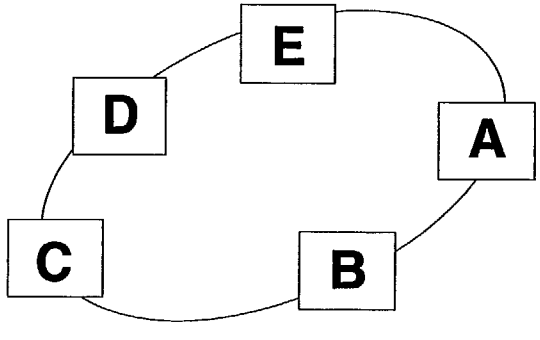
Technology to support transmission of data between computer systems that are too far apart to be interconnected

Examples of Network Patterns

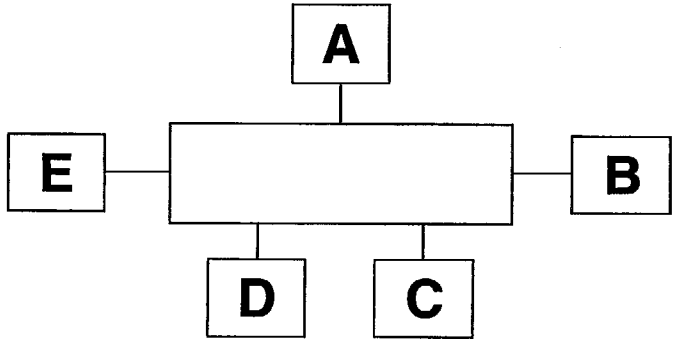
hierarchical/tree



ring/loop scheme

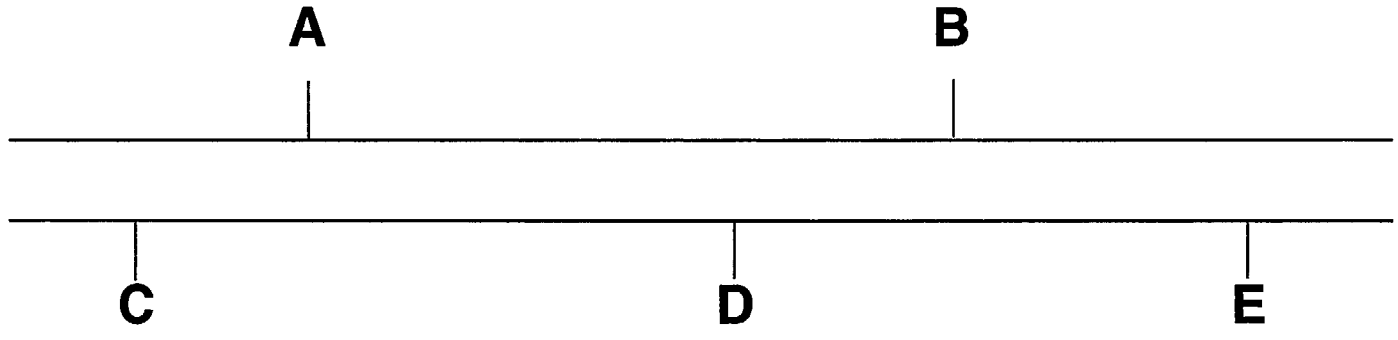


or

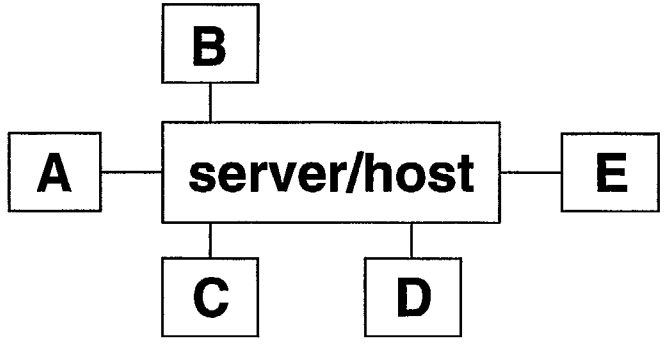


Examples of Network Patterns (continued)

bus



star



Operating Systems

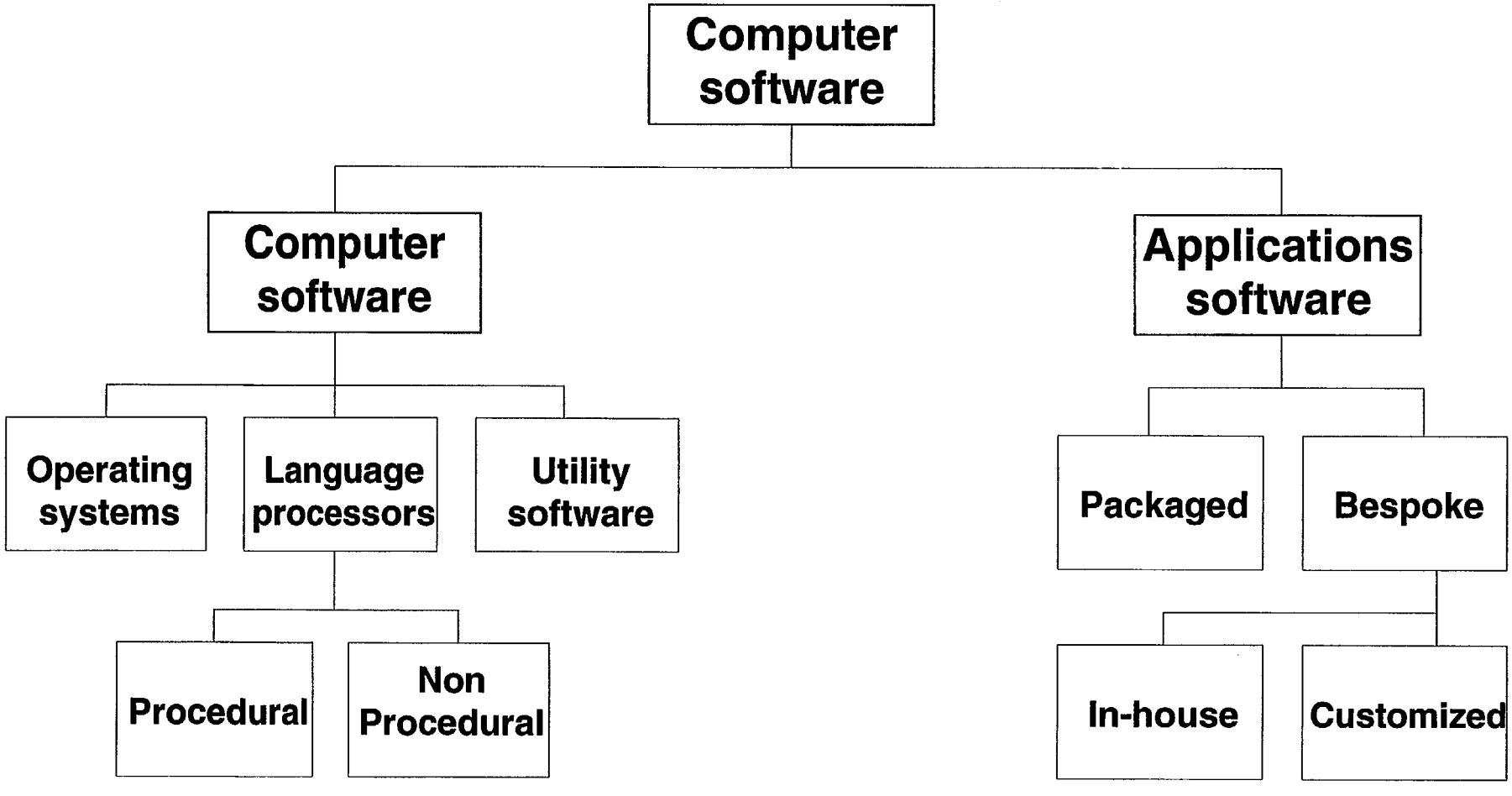
- Monitor and ensure effective and efficient use of all resources of the computer

- Interpret and execute commands entered by the user or coming from the different user interfaces

- Software is responsible for the management of computing resources

- Common examples of software are UNIX, SCO-UNIX, OS/2, AIX, VMS, WINDOWS, etc.

Basic Structure of Computer Software



Objectives of Session 6. Computer Basics

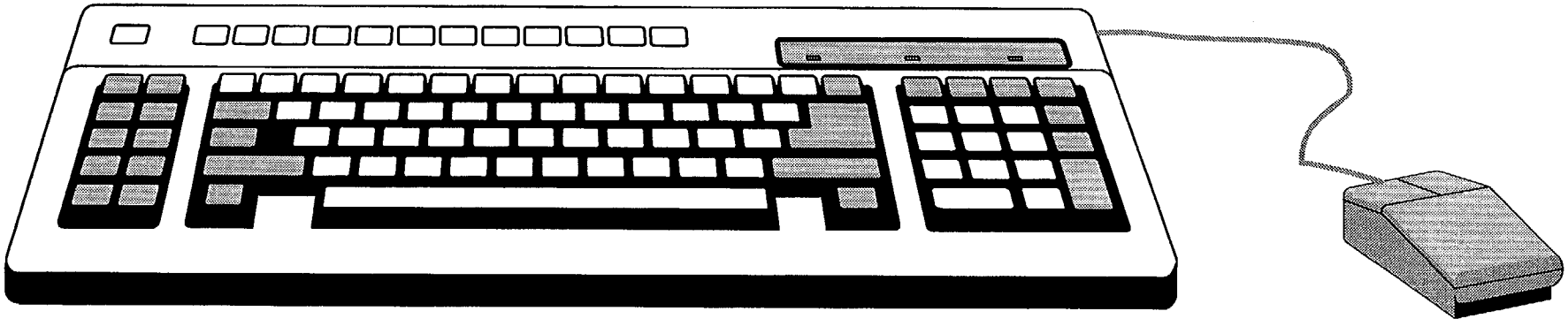
4. Discuss computer keyboard and mouse usages

5. Practice basic commands for computer skills development

6. Practice dBase IV: database management system

Computer Basics

Keyboard and Mouse



Objectives of Session 7.
MIS for Research Program Analysis

7. Discuss MIS for research program analysis

8. Discuss information requirements for planning

MIS for Research Program Analysis

Questions Answered by Information on Research Programs

1. What research has been done in the past?
2. What programs or projects are currently going on?
3. Where are the projects being executed?
4. Who is executing the projects and who are the cooperating partners?
5. When did the projects start and what are the expected completion dates?
6. What are the resource allocations?
7. Who funds the projects?

Uses of Information on Research Programs

- Program planning and formulation
- Budgeting and resource allocation

Program Planning and Formulation

A deliberate effort aimed at focusing on areas of national priority that would show more impact upon introduction of new technologies

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Steps of Program Planning and Formulation

1. Definition of objectives
2. Determining the activities to achieve the objectives
3. Establishing a planning and programming cycle
4. Determining schedule of activities

Information Required for Program Planning and Formulation

- Information on external environment
- Information on internal environment

Budgeting and Resource Allocation

A program budgeting system is a system by which information on individual research activities and resources, allocated for their implementation, is collected and processed

Table 1. Information Requirements and Possible Sources for Program Planning and Formulation

Information required	Possible source
• Research priorities	National research plan
• Economic information	Government statistics
• Research technical activities	MIS Research programs
Resource Allocation	
• Funding and sources	MIS financial resources
• Human resources availability	MIS human resources
• Equipment and facilities	MIS facilities

Reports Generated for Budgeting and Resource Allocation

- Financial resources
- Human resources
- Physical resources
- Project allocation

Financial Resources

- Allocation of funds by commodities
- Allocation of funds by individual projects
- Sources of funds
- Allocation of funds by agro-ecological regions

Human Resources

- Deployment of scientists by commodities
- Deployment of scientists by project
- Scientists' time allocation by projects

Physical Resources

- Allocation of facilities and equipment by projects
- Allocation of facilities and equipment by commodities

Projects

- Allocation of projects by agro-ecological regions
- Allocation of projects by stations

Issues on Data Collection

1. What information is needed by managers?
2. How is the data collected?
3. When and how should the database be updated?
4. Who is responsible for data collection?

Objectives of Day Three

1. Discuss MIS for financial resources
2. Develop a database structure for financial resources
3. Discuss the concept of INFORM
4. Analyze INFORM structure
5. Discuss INFORM implementation in agricultural research organizations
6. Evaluate the usefulness of INFORM
7. Discuss the information cycle
8. Define information systems and MIS
9. Discuss MIS planning
10. Discuss critical success factors for the implementation of MIS

Schedule of Day Three

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 8. MIS for Financial Resources
	Tea/Coffee Break
10:45 – 11:45	Session 8. (Continued)
11:45 – 13:00	Session 9. INFORM: An Information System for Agricultural Research Management
	Lunch
14:00 – 14:45	Session 9. (Continued)
14:45 – 15:30	Session 10. Planning and Development of MIS: An Overview
	Tea/Coffee Break
15:45 – 17:00	Session 10. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Objectives of Session 8.
MIS for Financial Resources

1. Discuss MIS for financial resources

2. Develop a database structure for financial resources

Management Information Systems for Financial Resources

Why Information on Financial Resources?

1. Diminishing financial support for proper execution of programs and support services

2. The need to carefully rationalize the management of these scarce resources

Why Is Information Required?

Information is required on the institution's overall budgets and expenditures in order to make good decisions in planning, mobilization, and allocation of financial resources

Information Is Necessary

To assist research managers in financial planning information is necessary in the following areas:

- research programs
- human resources
- facilities and equipment
- funding of research

Program Financial Plan or Budget

based on:

- research material costs
- transport costs
- subsistence costs for out-station work
- monitoring and evaluation costs
- publication costs

Financial Information on Human Resources

Number of:
- professionals
- technical support staff
- field labor
- administrative support staff
- staff on training

and their associated costs

Example:

Makanda Livestock Research Institute

Summary of Overall Budget
Makanda Department of Research

	Cost (US$)
1. Personnel salaries and wages (number of staff)	
a) Scientists (20)	197,000
b) Technical Staff (20)	120,000
c) Administration (20)	60,000
d) Field labor (100)	150,000
2. Station operations	
a) Vehicles	30,000
b) Subsistence (per diem)	15,000
c) Conferences	5,000
d) Office supplies	10,000
3. Maintenance and repairs	
a) Physical	15,000
b) Buildings	15,000
4. Printing and documentation	
a) Printing and photocopying	10,000
b) Communication	5,000
c) Books and journals	10,000
5. Utilities	
a) Phone	5,000
b) Water	5,000
c) Electricity	5,000
6. Research program materials and supplies	
a) Cattle meat and milk	50,000
b) Small ruminants	50,000
TOTAL	757,000

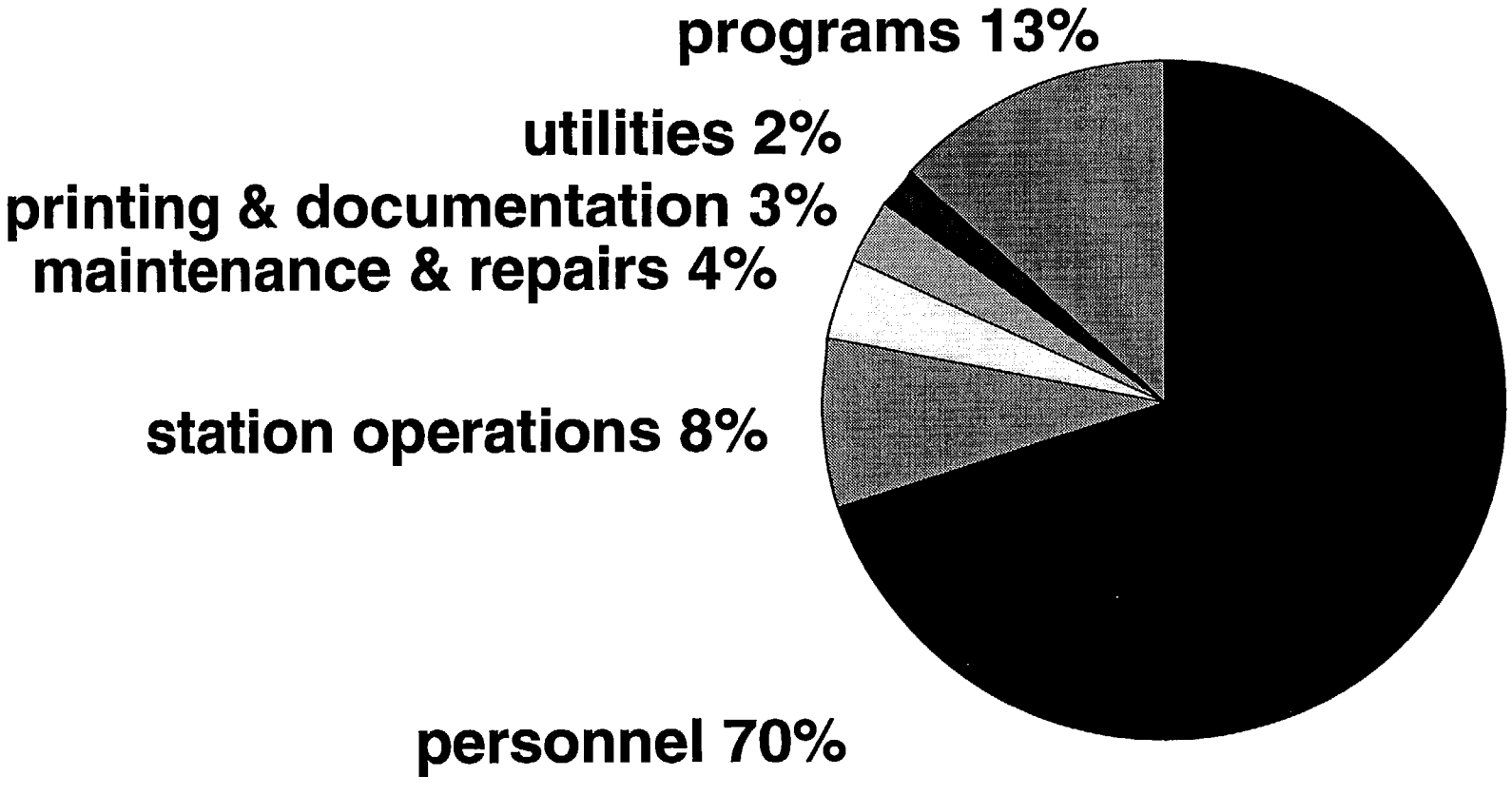
Summary of Total Operating Budget for Makanda Research Institute

Category	Cost (US$)	%
1. Personnel	527,000	70
2. Station operations	60,000	8
3. Maintenance & repairs	30,000	4
4. Printing and documentation	25,000	3
5. Utilities	15,000	2
6. Research programs	100,000	13
TOTAL	757,000	100

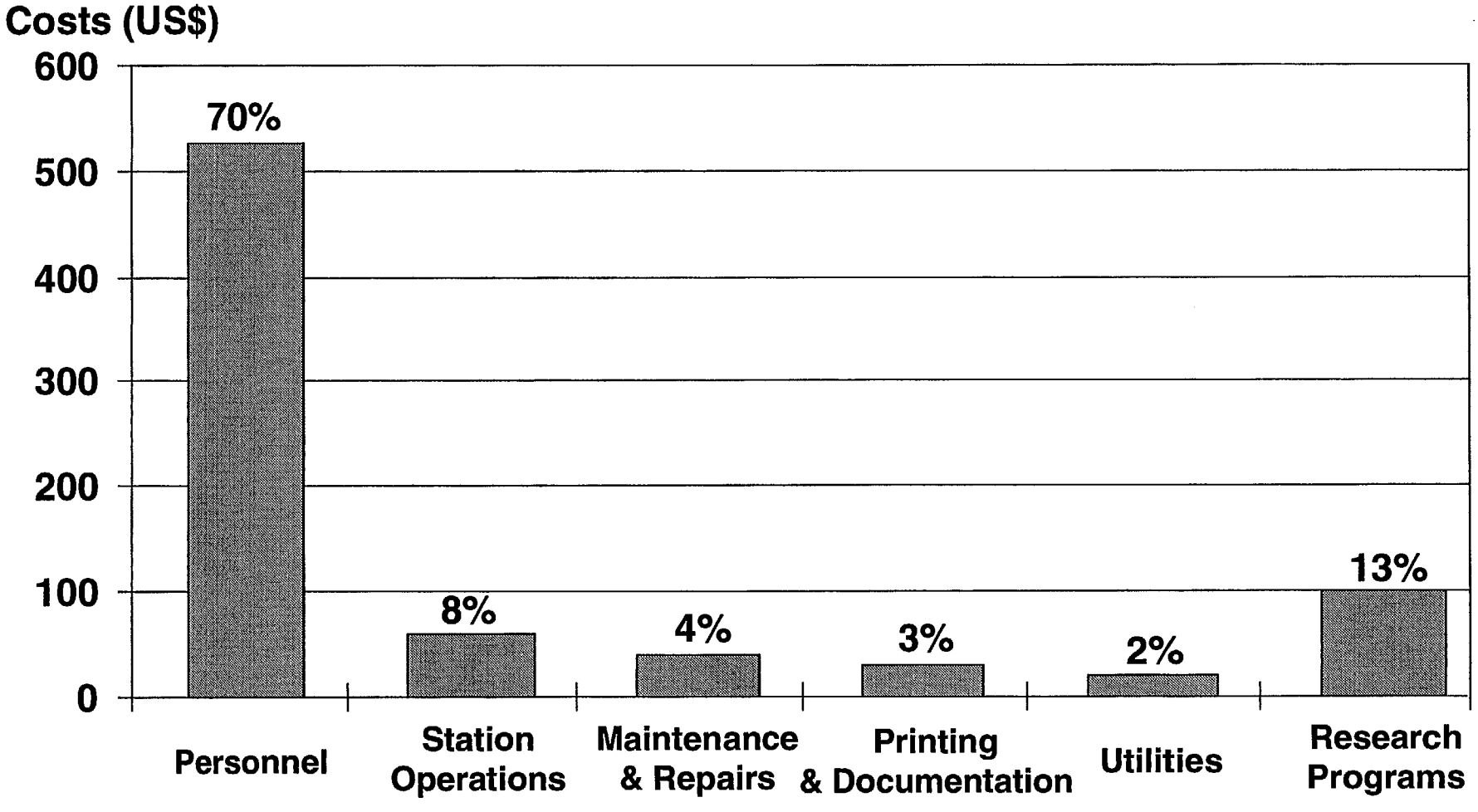
Average Annual Costs per Scientist at Makanda Research Institute

Category	Cost (US$)	%
1. Scientists' salaries	9,850	26
2. Research support staff	13,500	36
3. Administration staff	3,000	8
4. Station operations	3,000	8
5. Research operations	5,000	13
6. Non-research costs	3,500	9
TOTAL	37,850	100

Summary of Total Operating Budget
Makanda Livestock Research Institute



Summary of Total Operating Budget
Makanda Livestock Research Institute



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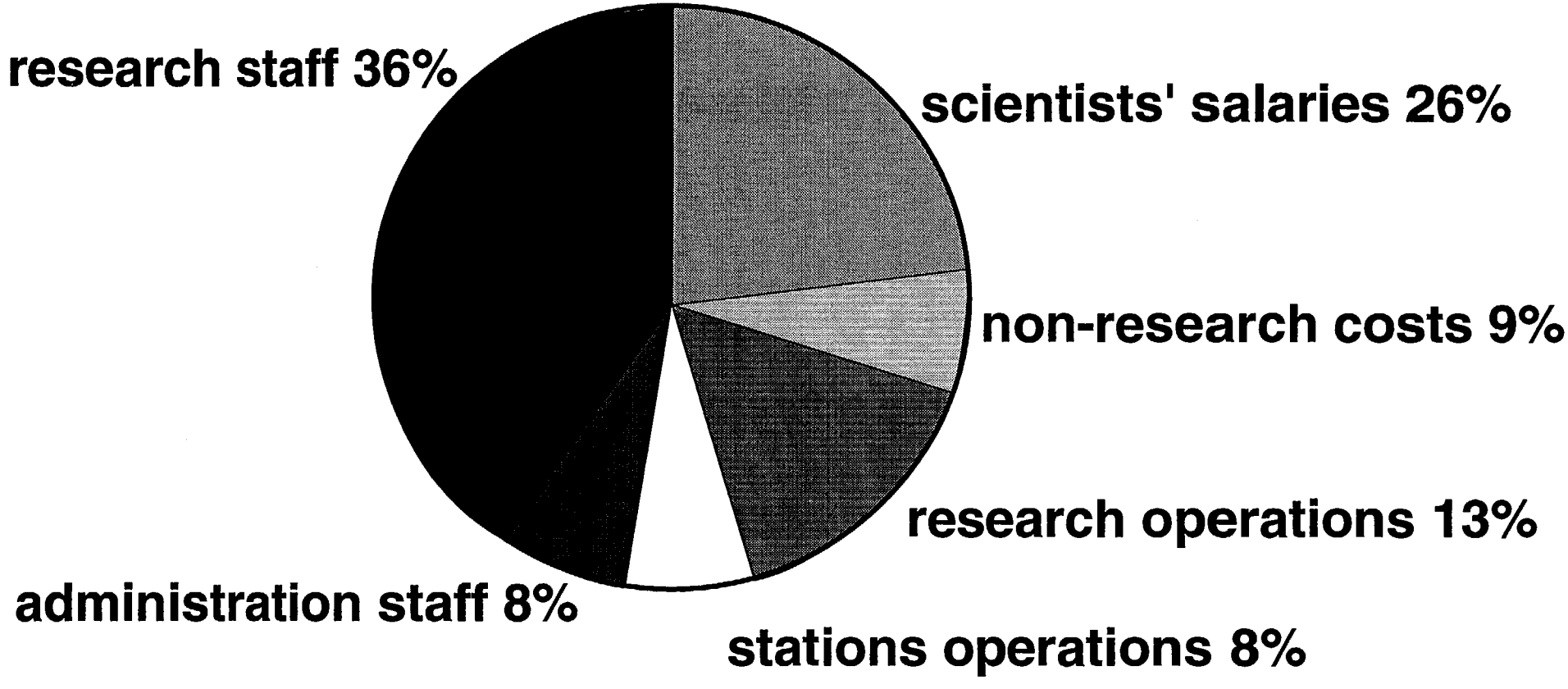
Average Total Annual Costs per Scientist at Makanda Livestock Research Institute



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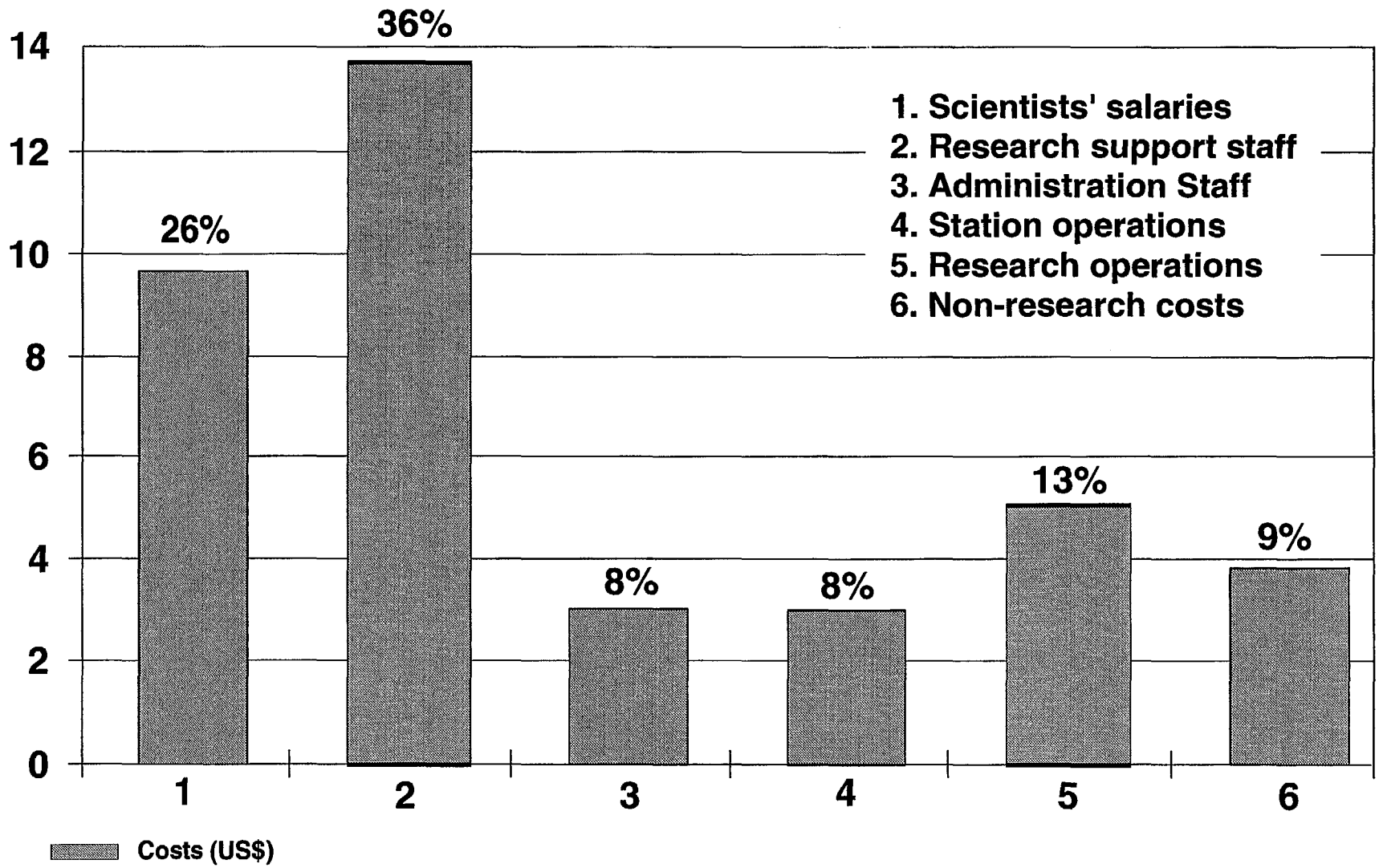
Average Total Annual Costs per Scientist at Makanda Livestock Research Institute



Objectives of Session 9.
INFORM: An Information System for Agricultural Research Management

3. Discuss the concept of INFORM
4. Analyze INFORM structure
5. Discuss INFORM implementation
6. Evaluate the usefulness of INFORM

INFORM: An Information System for Agricultural Research Management

Definition of INFORM

A computer-based management information system that provides agricultural research managers with facts they need for their tasks

Management Information Systems

present information so that the key features of the underlying research system can be quickly and clearly identified

How Does INFORM Work?

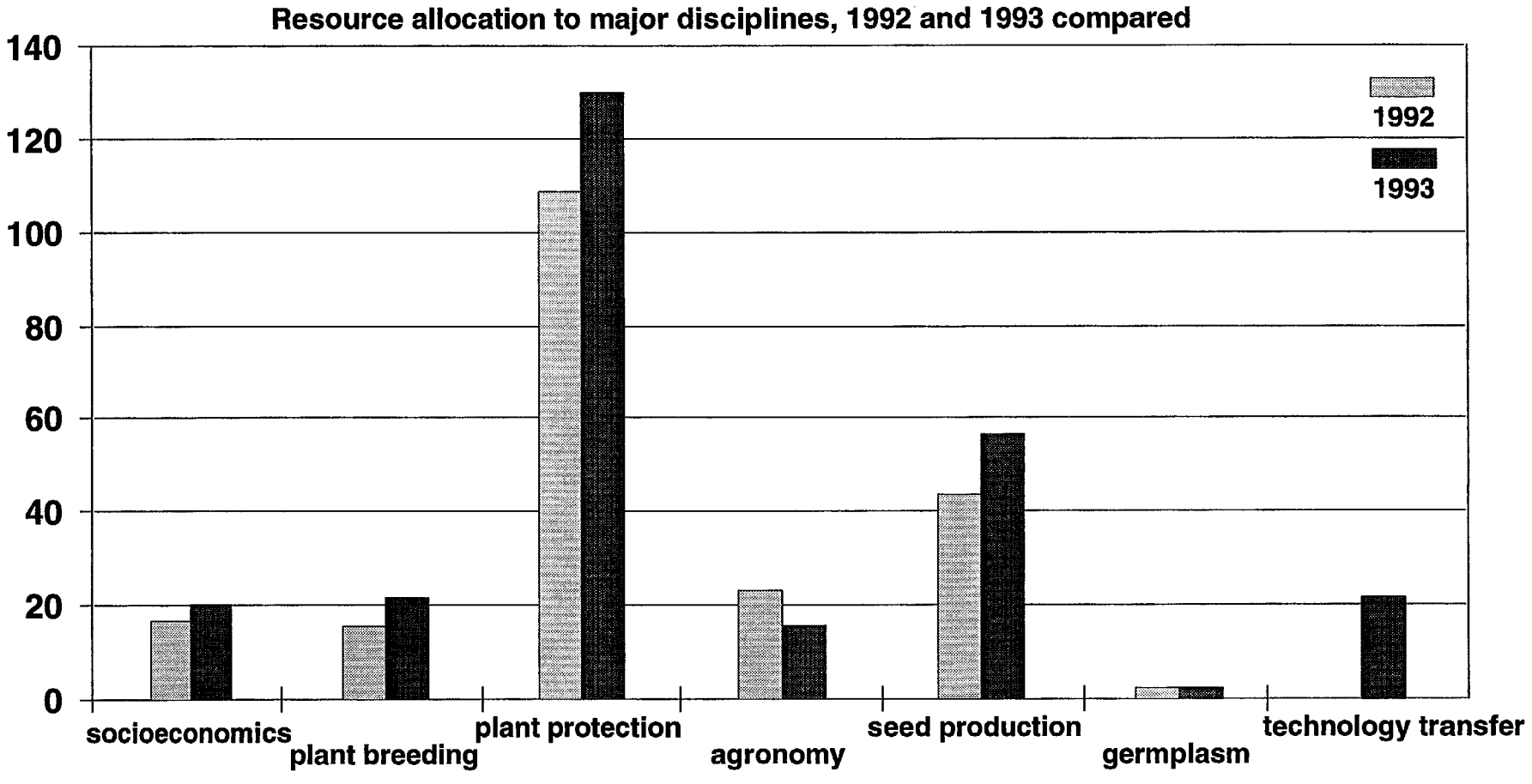
has efficient procedures for capturing and processing data in order to deliver the information required

Examples of Data on Researchers Held by the INFORM Management Information System

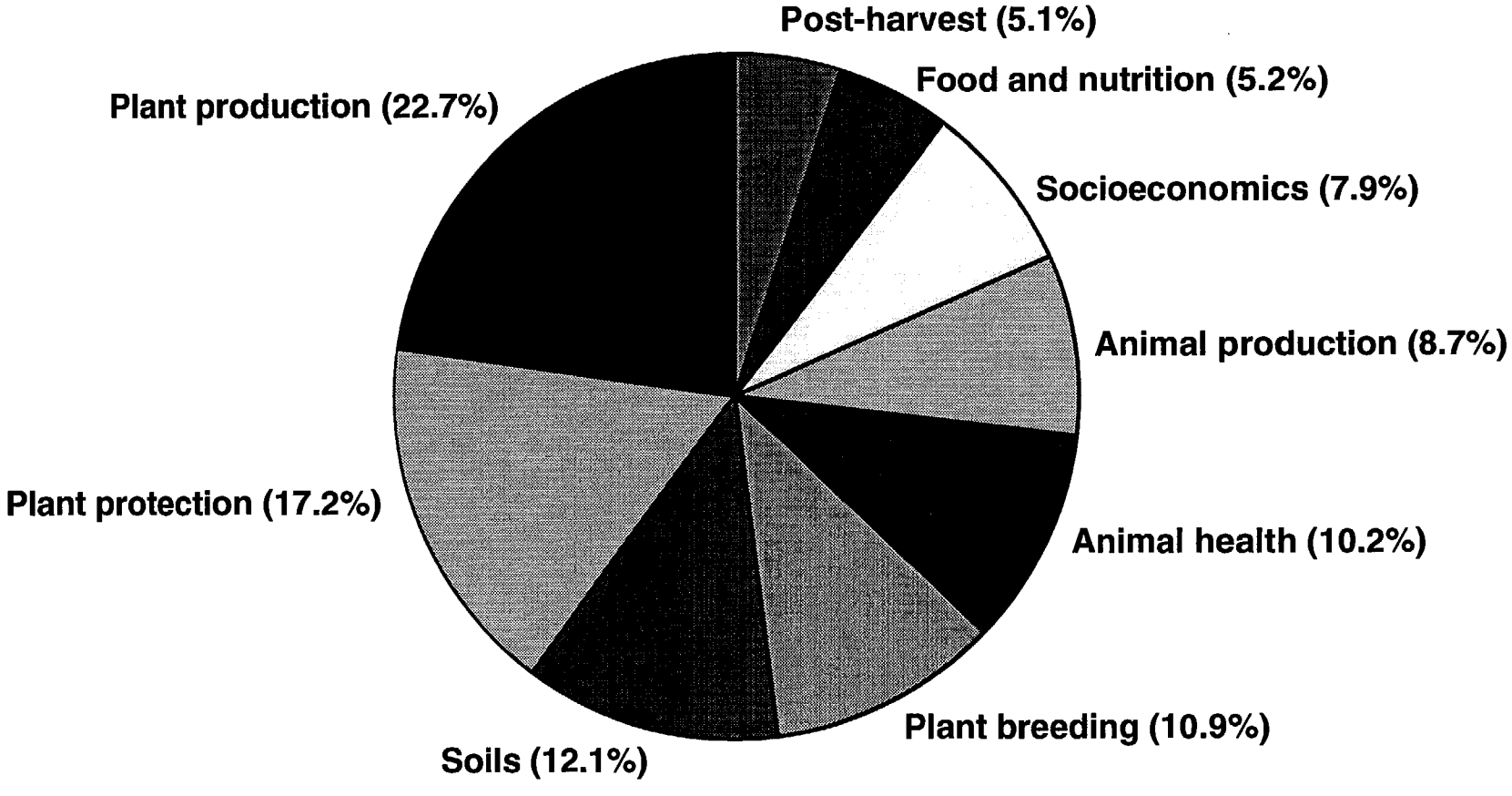
Personal data	Percentage time allocations	Percent of one person year	Research time breakdown*	Percent of one person year
Name	Research	80	Experiment A	40
Date of birth	Management/administration	10	Experiment B	20
Highest degree	Extension		Experiment C	10
Discipline	Training	10	Experiment D	10
Main crop	Degree studies		Experiment E	
Studying now?	Other		Experiment F	
Expected degree			Experiment G	
	TOTAL TIME	100		80

**The percentage of time spent on research (80 percent in this case) is broken down into time spent on each experiment*

An Example of the Graphical Output of INFORM



An Example of Resource Allocation by Discipline



Comparison of National Priorities for Commodities with Their Actual Resource Allocations

National priorities across commodities					Actual resource allocation	
Tea	1	1		1	1	Coconut
Rubber	2	2		2	2	Rubber
Rice	3	3		3	3	Tea
Coconut	4	4		4	4	Rice
Milk	5	5		5		
		6		6		
		7		7		
		8		8	8	Potato
		9		9		
		10		10		
		11		11		
		12		12		
		13		13		
		14		14		
		15		15		
		16		16		
		17		17	17	Milk
		18		18		
		19		19		
		20		20		
		21		21		
Potato	22	22		22		

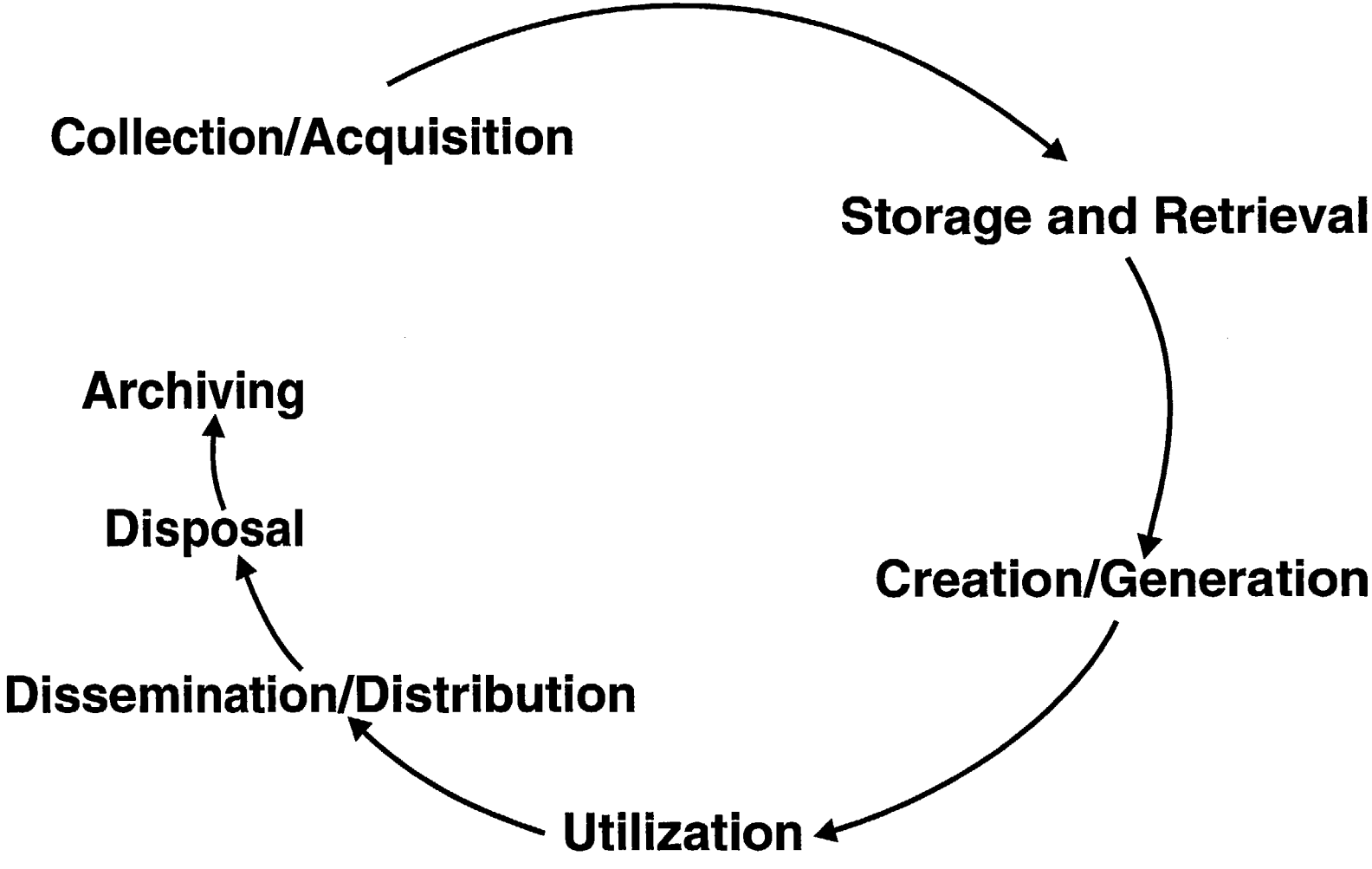
The information in the left column is provided by external sources. Information on the right was provided by INFORM

Objectives of Session 10.
Planning and Development of MIS: An Overview

7. Discuss the information cycle
8. Define information systems and management information systems
9. Discuss MIS planning
10. Discuss critical success factors for the implementation of MIS

Planning and Development of Management Information Systems: An Overview

Information Cycle



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Information Systems

Sets of elements that interact to provide information required to meet needs of a business entity

Management Information Systems

Sets of elements that interact to provide managers with information they need to make decisions and govern their organizations

Different Characteristics of MIS Structures

- centralized
- hierarchical
- distributed
- decentralized

Systems Development Life Cycle

different phases:

study ------▶ design --------▶ development --------▶ operations

Seven Steps to Analyze and Design a Structural System

1. Investigate the current system
2. Produce specifications of the required system
3. Select from the technical options
4. Produce user specifications
5. Design the data
6. Design the processes
7. Produce the physical design

Seven Reasons for MIS Planning

1. Integrate MIS objectives in the organization's plans
2. Focus on the objective of MIS
3. Provide allocation of resources for MIS developments
4. Ensure an efficient and systematic development of MIS
5. Provide basis for control of MIS projects at all stages
6. Balance MIS benefits and costs
7. Increase participation of users in MIS development

Objectives of MIS Planning

- Provide guidelines for and direction to continuing systems development studies and projects
- Provide a foundation for coordinated development of MIS
- Provide adaptability of MIS to business change and growth
- Minimize cost of integrating related MIS with each other
- Reduce total number of small, isolated systems to be developed, maintained, and operated
- Ensure MIS plan is part of the organization plans
- Ensure resource allocations for information systems development are incorporated in the organization plans

Six Levels of Strategic Planning for MIS

1. Strategic business planning
2. Strategic applications planning
3. Strategic data planning
4. Strategic technology planning
5. Strategic organization planning
6. Migration planning

Critical Success Factors

Management aspects believed to be crucial to the success of an operation

Examples of CSF for INFORM Implementation

- Support from the top management
- Scientists' interest should be met
- Director's cooperation is needed in the selection of MIS trainee practitioners
- An MIS training workshop should include two intending practitioners
- MIS should produce useful outputs soon
- MIS implementation should itself have goals which are defined QQT

Objectives of Day Four

1. Design the database structure for physical resources
2. Discuss tools and techniques for data collection
3. Define necessary requirements to undertake data collection
4. List advantages and disadvantages of each method
5. Discuss MIS for human resources
6. Describe the use of human resources MIS
7. Practice the design of a database for human resources

Schedule of Day Four

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 11. Development and Management of Physical Resources
	Tea/Coffee Break
10:45 – 11:45	Session 11. (Continued)
11:45 – 13:00	Session 12. Management Information Systems (MIS): Data Collection
	Lunch
14:00 – 15:30	Session 13. MIS for Human Resources
	Tea/Coffee Break
15:45 – 17:00	Session 13. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Objective of Session 11. Development and Management of Physical Resources

1. Design the database structure for physical resources

Physical Resources

Component	Examples
Buildings:	laboratories, glass houses, field shelters, offices, stores
Land:	experimental, roads and landscape, fencing
Equipment:	routine analytical equipment, tractors, generators, computers
Supplies:	water, power, furniture

Scope of Physical Resources Management

Effective management of resources embraces:

- Procurement – purchasing
- Transportation
- Receiving
- Inventory control – store keeping
- Servicing and maintenance

Information Use

1. Procurement
   - Making correct and right decisions on acquisition of the right quality of materials, at the right time, in the right quantity, from the right source, at the right price

Information Use (continued)

2. Supply
   - Ensure steady supply of materials and services

3. Protection and maintenance of facilities

4. Inventory

5. Planning for space

6. Develop staff, policies, procedures, and organizational structures to meet the above objectives

Planning and Development – Macro Level

1. Macro level issues (at national level)

- 1.1 Strategies and plan
- 1.2 Consolidation of stations network
- 1.3 Regionalization and decentralization
- 1.4 Rehabilitation
- 1.5 Supply and purchasing policies
- 1.6 Maintenance and repair policies
- 1.7 Personnel development policies
- 1.8 Inventory control procedures
- 1.9 Monitoring procedures
- 1.10 Centralized research support services
  - 1.10.1 Central library and documentation services
  - 1.10.2 Statistics, data processing, and socioeconomics
  - 1.10.3 Plant protection: Museum and collections, survey and identification
  - 1.10.4 Routine chemical analysis of food, feed, pesticides, and fertilizers
  - 1.10.5 Seed banks
  - 1.10.6 Maintenance of scientific instructions

Planning and Development – Micro Level

2. Micro level issues (at station level)

2.1 Buildings
2.2 Land
2.3 Equipment
2.4 Supplies
2.5 Centralized research support services and sharing facilities

Utilization and Support Services

3. Administrative

- 3.1 Supply and purchasing
- 3.2 Inventory control
- 3.3 Storage
- 3.4 Labor operations
- 3.5 Transport
- 3.6 Finance
- 3.7 Policies and procedures

4. Engineering (physical plant services)

- 4.1 Operations and management
- 4.2 Repair and maintenance
- 4.3 Policies and procedures

Utilization and Support Services (continued)

5. Farm operations

- 5.1 Land facilities allocations
- 5.2 Record keeping
  - 5.2.1 Experimental land database records
  - 5.2.2 Inventory control
  - 5.2.3 Commercial operations
  - 5.2.4 Labor operations
  - 5.2.5 Climatological records
- 5.3 Land development and maintenance
  - 5.3.1 Experimental and non-experimental land
    - Experimental design and plot layout
  - 5.3.2 Soil and water management
  - 5.3.3 Basic surveying and designing
  - 5.3.4 Land levelling and shaping
- 5.4 Planting, harvesting, and post-harvesting
- 5.5 Mechanical operations
- 5.6 Crop and animal husbandry
- 5.7 Management of pests, nurseries, greenhouses, and field equipment

6. Research and non-research activities directly supporting research

- 6.1 Library and documentation services
- 6.2 Experimental design and statistics
- 6.3 Data management
- 6.4 Laboratory methods
- 6.5 Land use management and record keeping
- 6.6 Seed banks
- 6.7 Routine chemical analysis
- 6.8 Pest and disease identification
- 6.9 Soil information
- 6.10 Climatological information

Objectives of Session 12.
Management Information Systems: Data Collection

2. Discuss tools and techniques for data collection
3. Define necessary requirements to undertake data collection
4. List advantages and disadvantages of each method

Planning and Development of MIS: Data Collection

Tools and Techniques

1. Inspection and reading/examination
2. Observation
3. Statistical sampling and measuring
4. Questionnaires
5. Interviews

Qualities of "Good" Data

- reliable
- qualifiable
- verifiable
- valid
- relevant
- precise
- accurate
- complete

Qualities of "Good" Collection

Good data collection methods must be:

- unbiased
- efficient
- easily administered
- understandable

Good data collection sampling techniques are:

- random sampling
- systematic sampling
- stratified sampling

Objectives of Session 13.
MIS for Human Resources

5. Discuss MIS for human resources

6. Describe the use of human resources MIS

7. Practice the design of a database for human resources

Management Information Systems for Human Resources

Personnel

One of the key functions of a research organization is to develop and maintain a critical mass of well-qualified scientific and support personnel

Human Resources MIS

- provides effective control and use of information on scientists and support personnel

- enables accurate and efficient administration, management, and analysis of human resource positions

Functions Facilitated by HRMIS

- Administration
- Management
- Analysis

Personnel Management

Administration

- Recruitment
- Examinations
- Assignment
- Initial training
- In-service training
- Promotions
- Payroll
- Retirement pensions

Management

- Personnel strategies and policies
- Financial resources planning
- Management of institutions
- Retrenchment (downsizing)

Analysis

- Personnel profiles
- Deployment

HRMIS – Information Architecture

Information areas:

- research strategies and policies
- personnel time allocation and time sheets
- employment/personnel forms
- data on retirement benefits

Information for Planning

- Personal data
- Education data
- Activity data
- Employment data
- Training data

HRMIS – Systems Architecture

Responsible for maintaining data on research personnel policies, scientists, support personnel, and activities related to scientists

Databases

Databases facilitate proper management of information

- may contain large volumes of data
- are readily accessible
- can be implemented on computers of all sizes

Human Resource Information

- Research scientists
  - Biodata: Who are they ?
  - Researcher activity: What do they do?

HRI – Database

- Biographic data
- Time allocation
- Experiment titles & time allocated to
- SBA of a researcher

HRMIS – Technological Architecture

Defines the nature of the hardware, sofware, and communications technology required to support the information and systems architectures

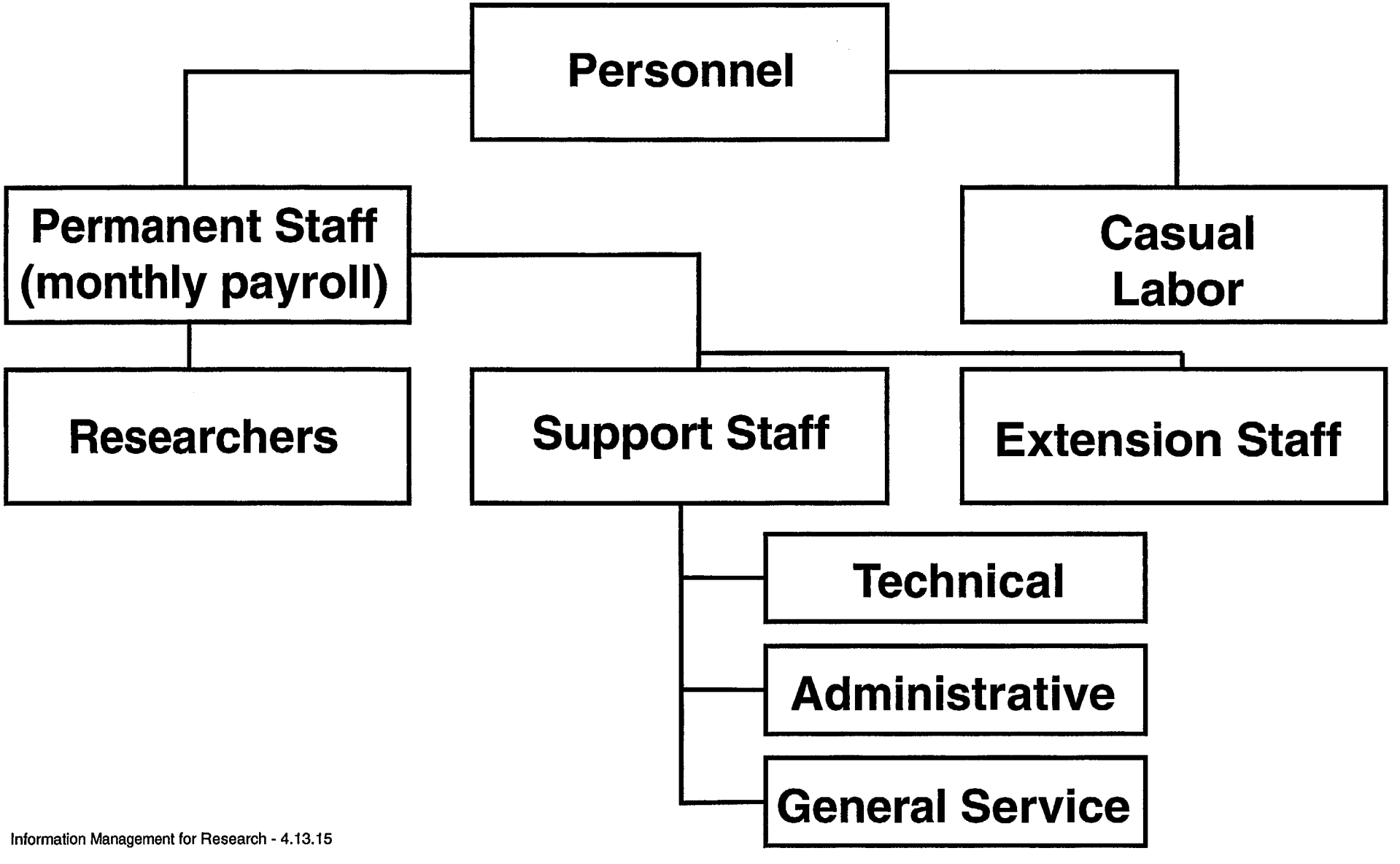
Elements of Technological Architecture

- Application-specific factors

- Use of "open systems architectures"

- Software portability

Types of Staff



Objectives of Day Five

1. Discuss the establishment and development of an MIS: data analysis

2. Discuss the normalization process

3. Apply the logical data structuring technique

4. Identify and practice a composite logical data structure

Schedule of Day Five

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 14. Establishment and Development of an MIS: Data Analysis
	Tea/Coffee Break
10:45 – 13:00	Session 14. (Continued)
	Lunch
14:00 – 15:30	Session 14. (Continued)
	Tea/Coffee Break
15:45 – 17:00	Session 14. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Normalization

- A technique examining dependencies between data items, so that data items which are found to be related in certain ways can be grouped together

- Ensures that any piece of information is represented only once in the organizational data model

Benefits of Normalization

- ✔ A fairly mechanical process for producing a data model
- ✔ Leads to identification of attributes overlooked in the data modelling process
- ✔ Leads to identification of entities overlooked in the data modelling process
- ✔ Is used to check E-R model produced by the data modelling process

Relational Terminology

Relation – two-dimensional table of data

Tuple – row in the table

Domain – column in the table

Types of Keys

Key – domain or domains which uniquely distinguish all tuples in a table

Simple Key – key requiring only a single domain to establish identity

Compound Key – key where more than one domain is required to establish identity

Composite Key – compound key in which at least one domain of the key is not a unique identifier and therefore needs to be linked with other domains

Properties of a Relation

1. Each domain must be a unique data item and have a unique name

2. No two tuples are identical

3. The sequence of tuples and domains should not be significant

Steps in Normalization

(1) Convert the document into an unnormalized form or UNF

(2) Convert the unformalized table to first normal form (1NF)

(3) Convert 1NF relations to second normal form (2NF)

(4) Convert 2NF relations to third normal form (3NF)

(5) Synthesize 3NF relations into a data model

(6) Check synthesized model is in 3NF

Example of Normalization

The Academic Database System of a University

The Unormalized Table

Student Code Number	STUDCODE
Name	STUDNAME
Address	ADDRESS
Sex	SEX
Course Code	CCODE
Course Title	CTITLE
Tutor Code Number	TUTCODE
Tutor Name	TUTNAME

Example of a Repeating Group

For students:

Student Number	F135654
Name	James Sanderson
Address	3 Beech Close, Warrington WR3 2BH
Sex	Male

Course Code	Course Title	Tutor Code	Tutor Name
4PDCS1	Computing	124	R.Watkin
4PDNE1	Electronics	133	T.Parks
4PDMA	Mathematics	146	L.Williams

Example of a Non-Repeating Group

For staff:

	PFNO	SNAME	FIRST	MIDDLE	DOB	SEX	DOA	GRADE	SALARY
1	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000
2	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000
3	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000
4	R028	Jackson	M	D	2/5/65	M	8/4/80	RDO	12,000

Example of a Repeating Group (2)

For staff:

	DEGREE	COLLEGE	YEAR	DISCIP
1	BSC.	Cambridge	1980	Agriculture
2	MSC.	Harvard	1983	Entomology
3	MPHIL.	Harvard	1985	Technology
4	PHD.	Univ. of Mrv.	1990	Control

Convert the Unnormalized Table to First Normal Form (1NF)

1. Identify a key for the unnormalized table
2. Remove all repeating groups
3. Move the repeating group along with the original key
4. Identify and underline a new key for the new relation

Rule: a 1NF relation has no repeating group

Convert INF Relation to 2NF

1. Examine whether domains are dependent on the whole key or just part of it

2. If a particular domain depends more on part of the key than the whole key, then that domain with that part-key should be removed to a new relation

3. Pose the question for each non-key domain in turn to achieve this

Rule: In 2NF all non-key attributes are dependent on the whole key

Convert 2NF Relation to 3NF

1. For each pair of non-key domains in the region ask:

   "Does the domain depend more strongly on the other domain in the pairing than it does on the key?"

2. If the answer is yes, create a new relation

Rule: All non-keys attributes are independent of each other

Synthesize 3NF Relations into a Data Model

1. For each relation, draw a box and name it

2. Connect 1: Many relationships between with crows foot on:

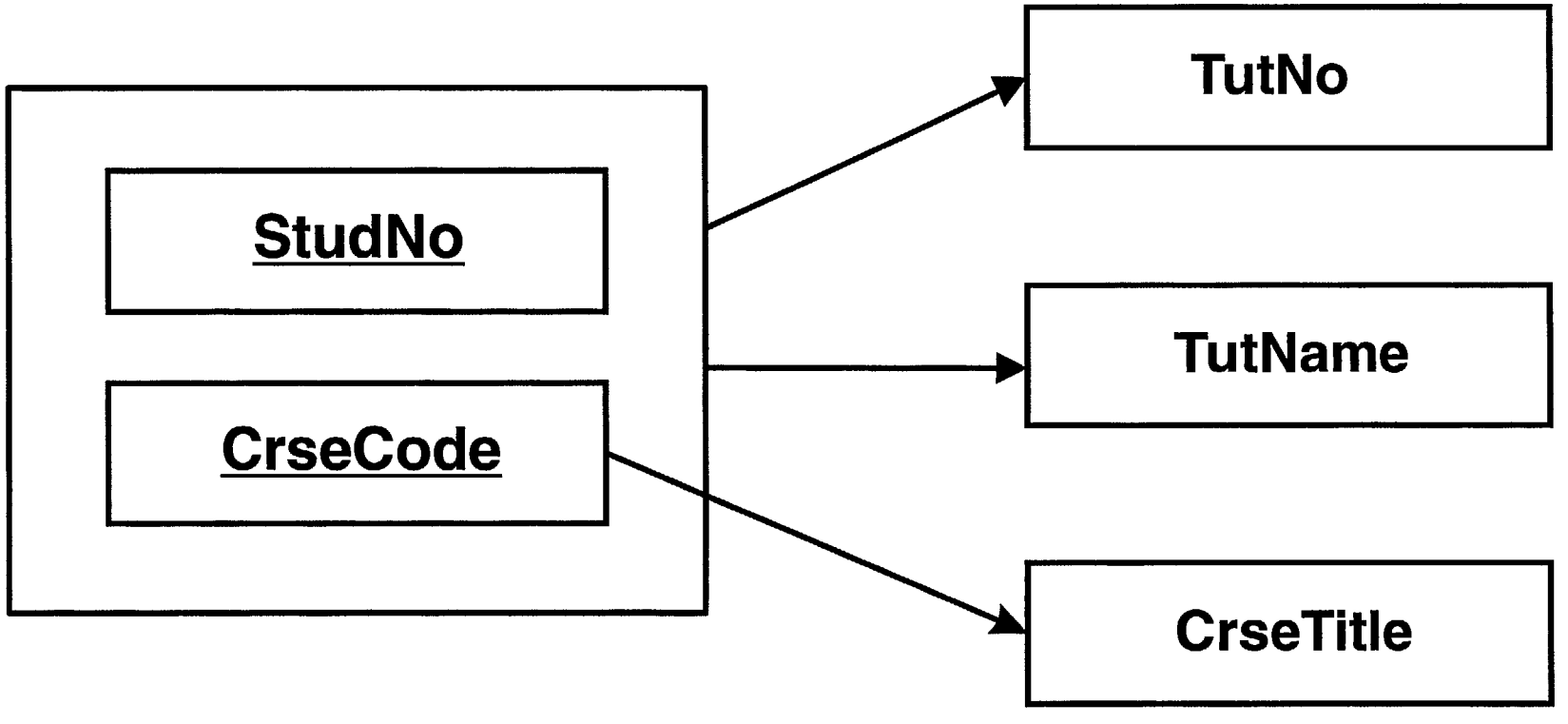
   - box with a foreign key

   - box with co-linked keys

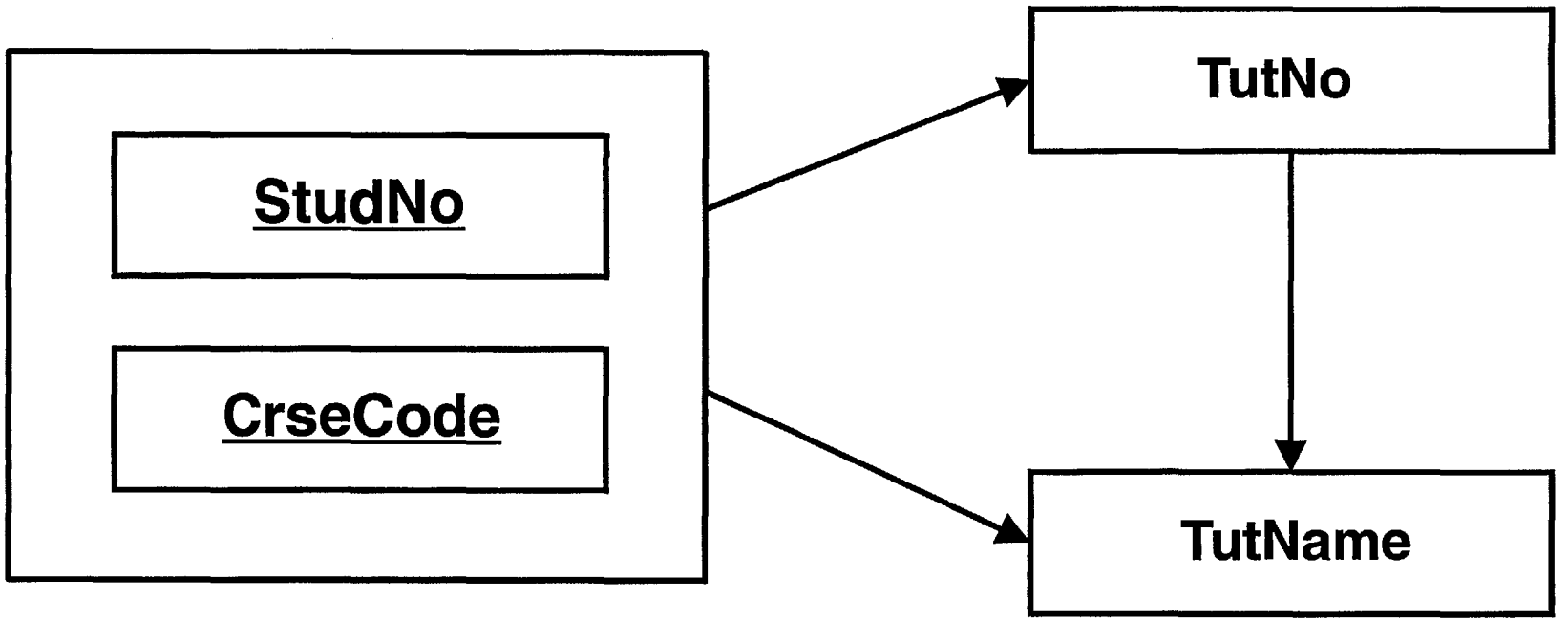
Examples of Normal Forms

1. Normal Form	2 Normal Form	3 Normal Form
STUDCODE	STUDCODE	STUDCODE
STUDNAME	STUDNAME	STUDNAME
ADDRESS	ADDRESS	ADDRESS
SEX	SEX	SEX
STUDCODE	STUDCODE	STUDCODE
CCODE	CCODE	CCODE
CTITLE	TUTCODE	TUTCODE
TUTCODE	TUTNAME	
TUTNAME		
	CCODE	CCODE
	CTITLE	CTITLE
		TUTCODE
		TUTNAME

Example of a Second Normal Form (2NF)



Example of a Third Normal Form (3NF)



Purpose of Logical Data Structuring Technique

Provide an accurate model of the data structures of the organization which will act as a framework for development of new or enhanced systems

Procedures for Logical Data Structuring Technique

1. Select entities within the system environment
2. Investigate and record the associations between entities thereby creating an LDST grid
3. Convert the LDST grid into an LDST chart
4. Produce an LDS or dependence diagram
5. Identify keys for each entity and their relations
6. Add data to each entity
7. Validate the LDS against system requirements and TNF relations

Steps in DFD

1. Record the attributes or data elements, highlight the key identifier

2. Remove repeating attributes from their UNF relation, create a new relation for them

3. Remove any partial key dependent attributes from the FNF relation

4. Remove the non-dependent attributes or fields, which are not currently identified as keys

Objectives of Day Six

1. Design a database structure
2. Design data entry forms on the computer
3. Discuss MIS project initiation
4. Identify main steps in project planning
5. Develop the logframe for an MIS Project

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Schedule of Day Six

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 15. Designing a Database Structure
	Tea/Coffee Break
10:45 – 13:00	Session 15. (Continued)
	Lunch
14:00 – 15:30	Session 16. Forms Design
	Tea/Coffee Break
15:45 – 17:00	Session 17. Management Information Systems (MIS): Project Initiation
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Objective of Session 15.
Designing a Database Structure

1. Design a database structure

Designing a Database File

Create a database file:

1. define the fields

   - primary keys
   - field names
   - field data types
   - field width (lengths)
   - decimal places for numeric fields
   - indexing fields

2. create the database structure

   - enter the fields

3. save the database structure

Data Types

- **Numeric type – N or NUM**

  Fields containing numeric values, e.g., money amounts or quantities to be used in calculations

- **Character or alphanumeric type – C or CHAR**

  A field which may contain text, or a mixture of text, symbols, or numbers

- **Date type – D**

  A field may be used to represent a date in the form dd/mm/yy or mm/dd/yy, etc. Date type fields enable the database to compare dates held in records with a specific date

- **Logical type – L**

  This type of field allows the entry of two possible values, indicated by T (true) or F (false). Sometimes, Y(es) and N(o), respectively may be used instead

- **Memo fields**

  Very large volume of text

Database File Definition Form

Field No.	Field Name	Field Type	Field Width	Dec. Places	Index	Description not entered
1	PFNO	C	10		Y	personal file no.
2	LNAME	C	15		N	last name
3	OTHERS	C	15		N	other names
4	SEX	C	1		N	M=male, F=female
5	DBIRTH	D	8		N	date of birth
6	MARITAL	C	15		N	married, single, separated
7	HQUAL	C	15		N	qualification
8	DISCP	C	20		N	discipline
9	COLLEGE	C	20		N	college studied
10	COUNTRY	C	15		N	country of study
11	DAPPOINT	D	8		N	date of appointment
12	DESIGN	C	15		N	designation
13	STATION	C	20		N	current station
14	BSALARY	N	8	2	N	basic salary
15	CATEGORY	C	20		N	category

Field name: Maximum 10 characters beginning with a letter followed by letters and numbers but no punctuation marks except_no blanks

Field type: C=Character, N=Numeric, D=Date, L=Logical, M=Memo

Field Width: Maximum for character=254, Numeric=20 (others supplied by dBase)

Index: Y for Yes, N for No

Objective of Session 16. Forms Design

2. Design data entry forms on the computer

Designing Data Entry Screens (Forms) - I

1. create the database file

2. plan for the form layout

   - note that you should use only row 1 through 21 for DBase IV and a form can be as wide as columns 0 - 79

   - the top row of the screen (row 0) will display the menu bar and rows 22, 23, and 24 at the bottom of the screen will display the status bar and other messages

3. design elements on a form

   - text such as form headings and field titles
   - boxes
   - lines
   - fields from an underlying database or view
   - new calculated fields not already in the database file or view

Designing Data Entry Screens (Forms) - II

4. controlling input

- there are three ways that you can control what is actually entered into a field on the form so you can trap errors as they occur, before they are actually stored in the database

- you can control input using Template Characters, Picture Functions, and Edit Options

Template Characters

A field template marks the place where actual data will appear. The template types for different data types are:

NUMERIC –	9999999.99
CHARACTER –	XXXXXXXX
DATE –	MM/DD/YY
LOGICAL –	L.

Template characters control the individual characters that are typed into a field

Picture Options and Edit Options

Picture functions affect the entire field

Edit options allow you to set or define:

- different editing options
- default values
- maximum and minimum values allowed in some fields
- range of values
- logical formula that determines whether a value can be entered into a field
- unaccepted messages

Designing Data Entry Screens (Forms) - III

4. multiple page forms

   - use the PgDn and PgUp keys to scroll though additional pages on the forms design screen

Forms Design/Plan

Agriculture Research Information System
Human Resources Databases
Data Entry Screen

Personal Number: XXXX

Surname: XXXXXX **Other Names:** XXXXXX

Date of Birth: DD/MM/YY **Sex:** X

Date of Appointment: DD/MM/YY

Station: XXXXXXX **Basic Salary:** 99999.99

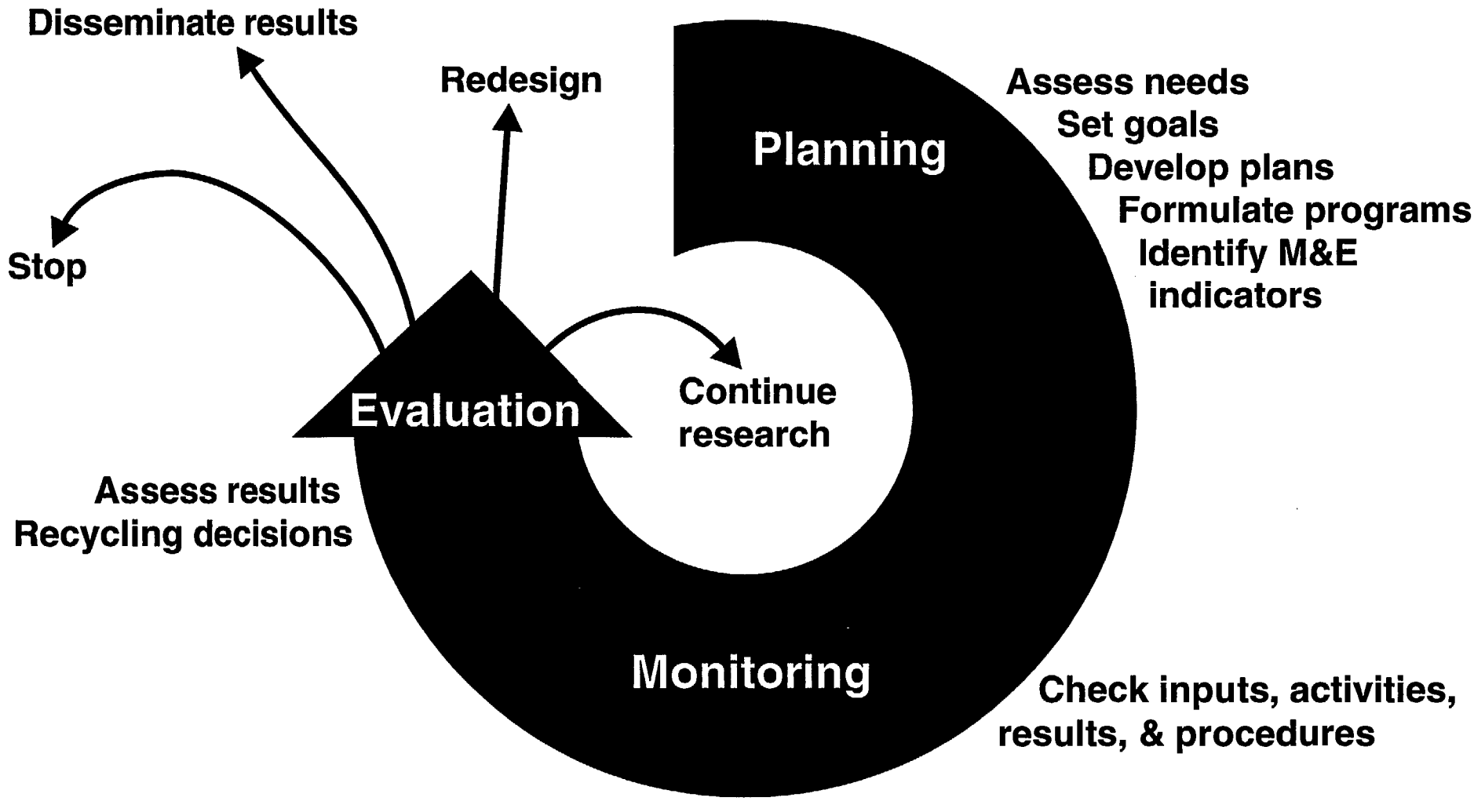
Objectives of Session 17.
MIS: Project Initiation

3. Discuss MIS project initiation

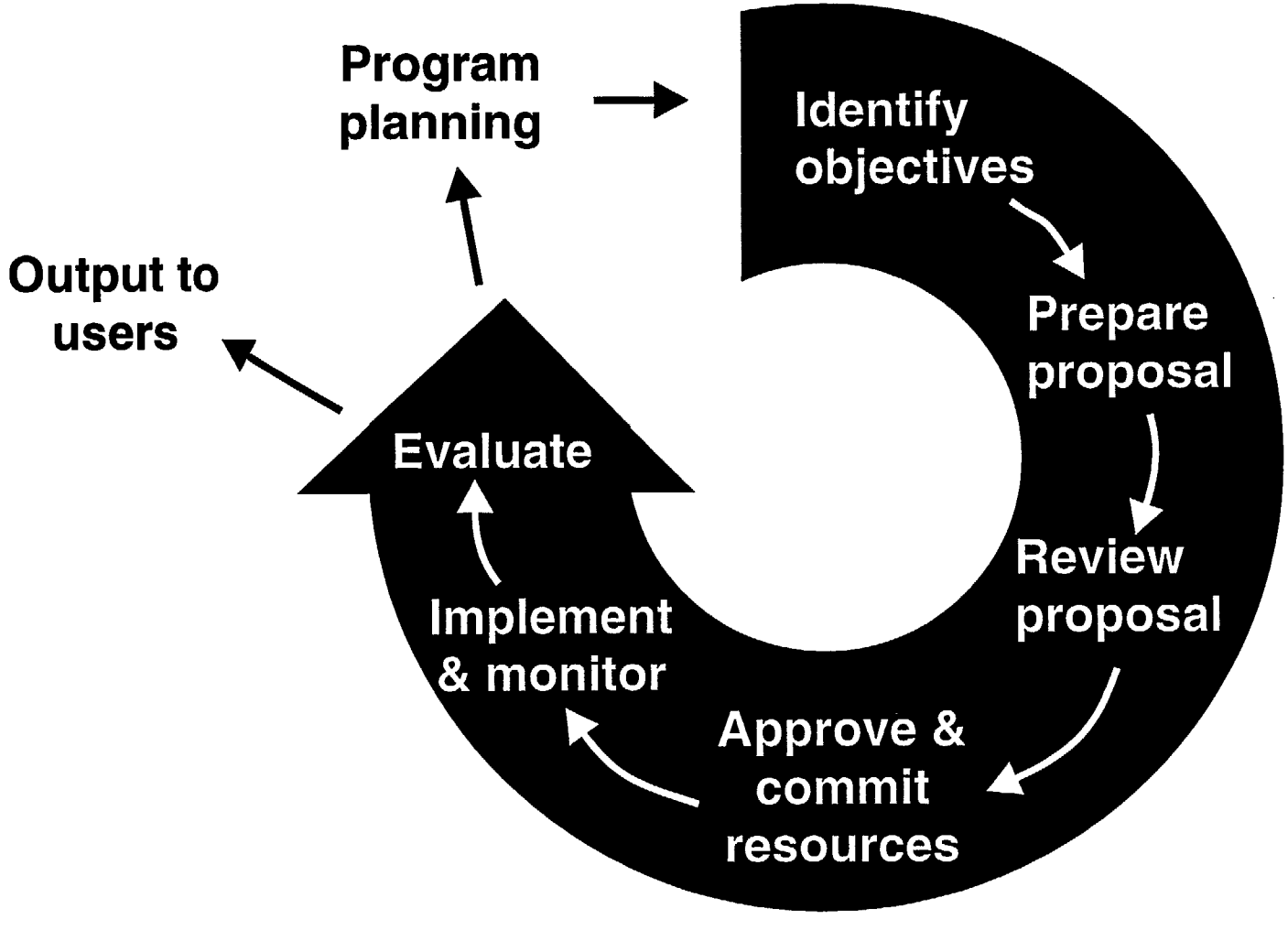
4. Identify main steps in project planning

5. Develop the logframe for an MIS project

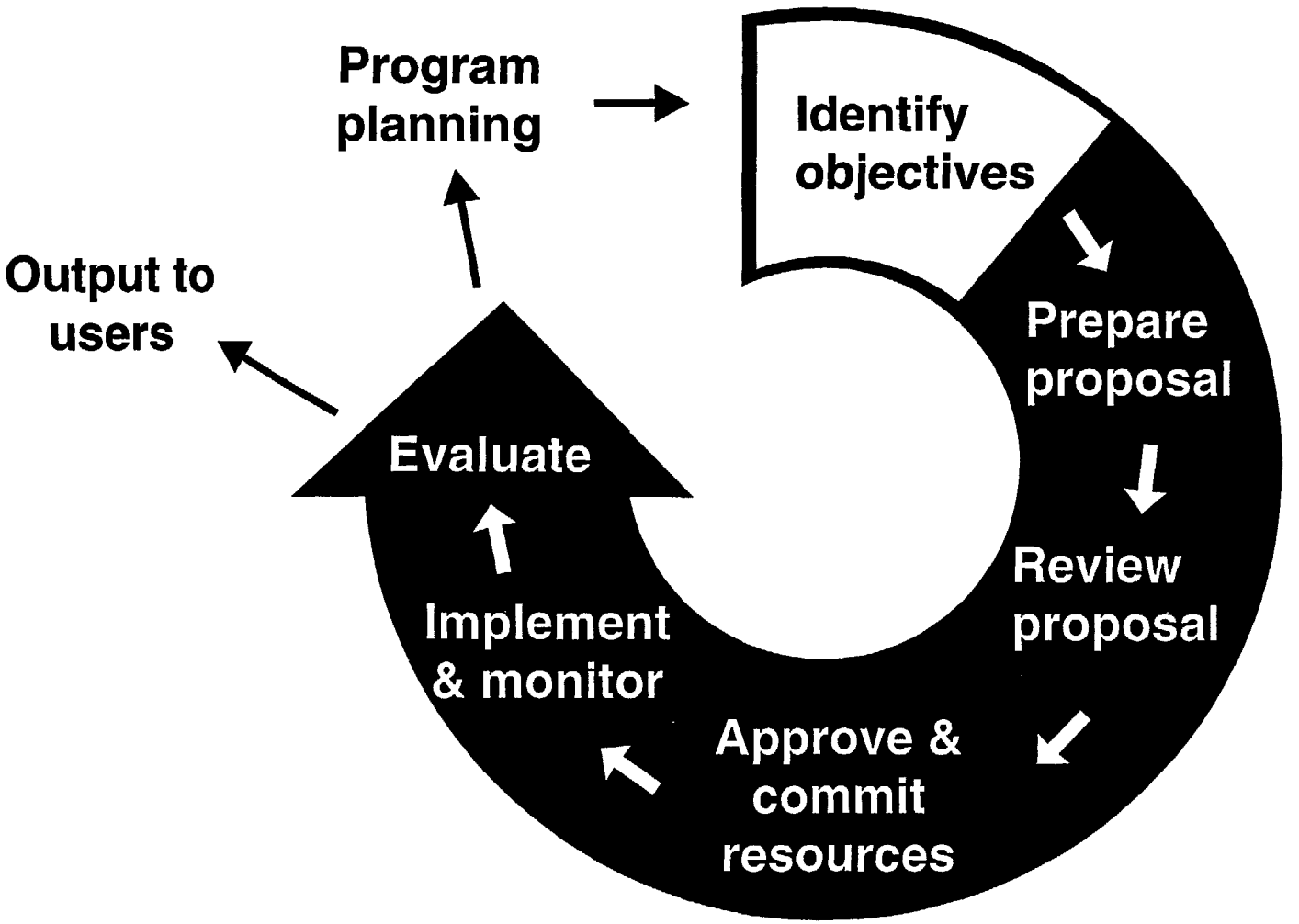
The Management Cycle



Project Cycle



Project Step 1: Identify Objectives



Objectives Should Be:

- Clear
- Logical
- Realistic
- Attainable
- Problem-oriented
- Measurable

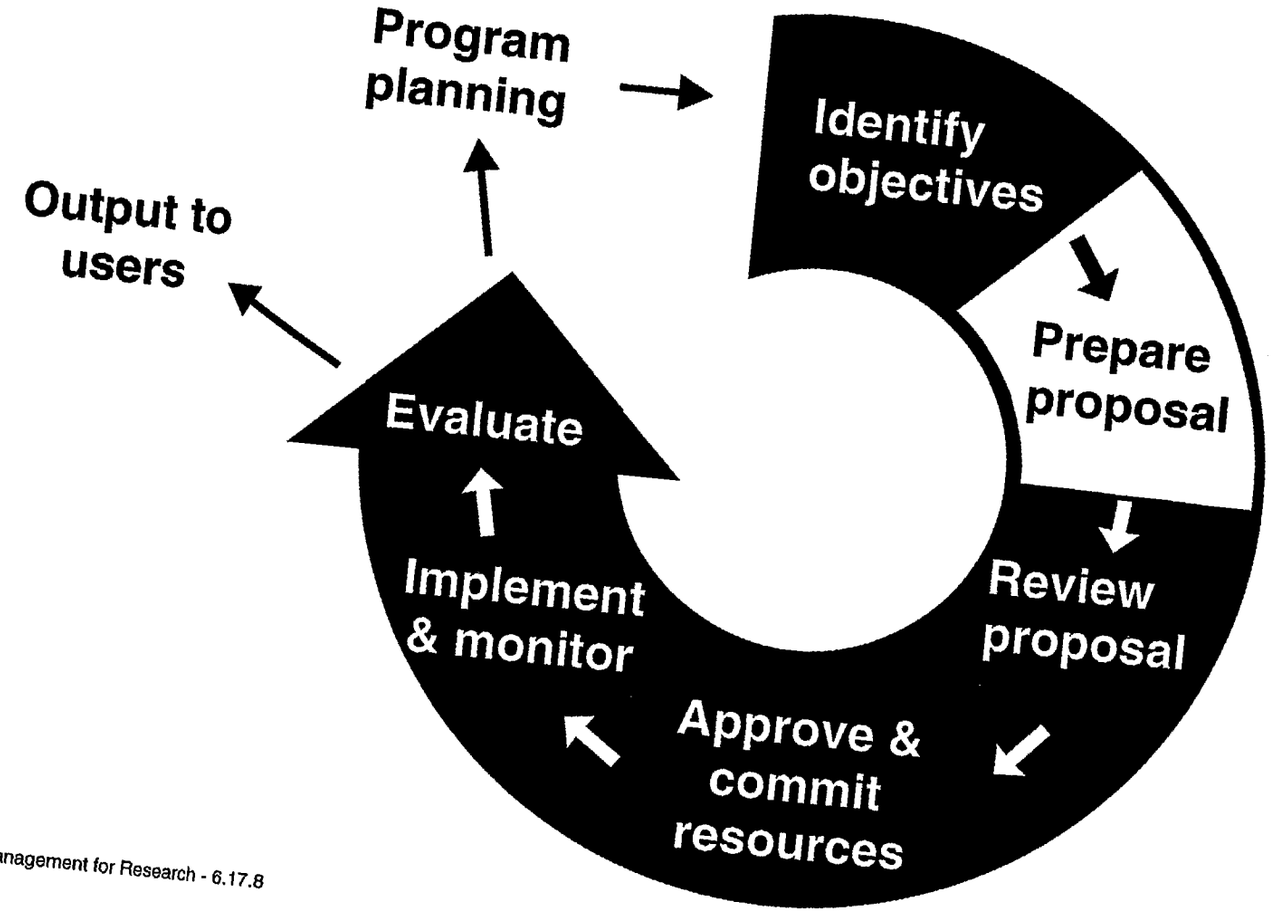
MIS Project

- Represents a constraint and path to solve it
- Is a coherent set of activities with:
  - Rationale
  - Goal
  - Objectives
  - Outputs
  - Action plan
  - Beneficiaries
  - Limited time frame
  - Budget

Uses of Project Proposal

- First document about project
- Lays out basis for M&E
- States clearly objectives, methods, resources & management
- Defines relationship of project to program
- Ensures effective & efficient implementation

Project Step 2: Prepare Proposal



The Project Proposal Contains:

- Objectives
- Justification/rationale
- Expected outputs
- Methodology
- Resources and time schedule
- M&E methods

The Proposal Layout Should Include:

- Abstract
- General information
- Technical description
- Annual work plan
- Budget
- Personnel
- M&E method

The Logical Framework

A tool to aid in:

- Planning
- Monitoring
- Evaluation

of MIS project

Logical Framework Matrix (1)

	Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal				
Purpose				
Outputs				
Activities				

Logical Framework Matrix (2)

	Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal		Measures of goal achievement	Sources of information Methods used	Assumptions affecting the purpose-goal linkage
Purpose		End of project status	Sources of information Methods used	Assumptions affecting the purpose-goal linkage
Outputs		Magnitudes of outputs Planned completion date	Magnitudes of outputs Planned completion date	Assumptions affecting the inputs-outputs linkage
Activities		Nature and level of resources Necessary cost Planned starting date	Sources of information	Initial assumption about the project

Objectives of Day Seven

1. Discuss concept and types of queries in a database

2. Practice general steps in the process of queries design in the computer

3. Discuss creating professional-looking reports

4. Practice dBase IV reports

Schedule of Day Seven

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 18. Database Queries Design
	Tea/Coffee Break
10:45 – 13:00	Session 18. (Continued)
	Lunch
14:00 – 15:30	Session 19. Database Reports Design
	Tea/Coffee Break
15:45 – 17:00	Session 19. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Objectives of Session 18. Database Queries Design

1. Discuss concept and types of queries in a database

2. Practice general steps in the process of queries design in the computer

Database Queries Design

Querying a Database

Process of selecting specific records in a database

Queries design screen

EMP.DBF	PFNO	SNAME	OTHERS	DOB	SEX	DOA	BSAL

File Skeleton

Calculated Field

View Skeleton

NEW	PFNO	LNAME	DOB				

Query Design Screen

The File Skeleton displays the database structure as you created it

- set the CRITERIA or FILTERS

This technique is called: *Query by Example* (QBE)

View Skeleton

Indicates the fields you want to see and in what order

Keys:

F5 - adds field to the view skeleton
- deletes fields in the view skeleton

F4 - next skeleton

F3 - previous skeleton

Tab - next field

ShiftTab - previous field

Filter Conditions

List only records that meet specified conditions,

e.g.:

Employees who have doctoral degree

In the File Skeleton use field HQUAL "PHD"

Combining Search Conditions

=	Equal to
<=	Less than or equal to
<	Less than
>	Greater than
>=	Greater than or equal to
#or<>	Not equal to

Relational operators/Logical operators

.AND.	"PHD",	<"40"
.OR.	"PHD"	=<"40"
.NOT.		#"40"

Working with Dates in dBase IV (1)

In the control center select:

Tool
Settings
Options

Century OFF --------> YY

ON --------> YYYY

Date Order

D/M/Y
M/D/Y
Y/M/D

Working with Dates in dBase IV (2)

Date separators:

Slash	/
Period	.
Hypen	-

Examples of Dates by Country

Dates:

American	mm/dd/yy
USA	mm-dd-yy
ANSI	yy.mm.dd
British	dd/mm/yy
French	dd/mm/yy
German	dd.mm.yy
Italian	dd-mm-yy

Date Functions

Date()	Current system date
Year()	Year 1994
(Month()	Month in characters - March
Month()	Month in numbers 1-12
Day()	Day of month (03)
(Dow()	Day of the week in characters
Dow()	Day of the week in numbers

Dates in Queries

Use curl brackets { }

<{01/01/50}	research scientists who were born before 1950
<{01/01/55}, >{01/01/50}	born after 1950 but before 1955

Condition Box

Suppose you want to *Query* for anyone with

discipline of

PATHOLOGY, or *ENTOMOLOGY*

and stationed in either TAFORI or TAFIRI

"PATHOLOGY"
"ENTOMOLOGY"

STATION = "TAFORI". = OR.STATION = "TAFIRI"

Calculated Fields

- Create the field
- Add it to the view F5

example:

Suppose that there is an increase in the basic salary of 10% across the board

New salary = 10% basic salary + BPay
NS = B*10% = B(1+0.1)
= B*1.1

To display data for Employee, Name, Basic Salary and New Basic Salary

1.	Emp.NAME	Basic Pay	New Pay
1:	xxxxxxx	9999	9999
2:	xxxxxxx	9999	9999

Calculated Fields (continued)

How many research scientists are over 45 yrs today?

- Create a query with a condition box that reads:

  DATE( ) - DBIRTH> = 45x365days

  The command tells DBase to display records for which today's date minus the DBIRTH=Date of Birth is equal to or greater than 45 yrs (45x365days)

  Note: Date calculations are in number of days

  or

  (DATE()-DBIRTH)/365>=45 (years)

Using Functions

1. Grouping by expression

by -) field value e.g. SURNAME
-) expression value
-) record count

Functions used in grouping:

Functions	Returns	Data type
C MONTH ( )	The month of a date	date
YEAR ( )	The year of a date	date
C DOW ( )	The days of the week	date
LEFT ( )	Left most characters	character

Using Functions (continued)

2. Grouping by first letter

   LEFT (SNAME,1)

   - the 1 indicates that only the first letter is to be used
   - for breaking groups, records must be put into alphabetical order
   - any index expression such as surname and others

3. Grouping by month

   C MONTH ( )
   C MONTH (DOA)
   INDEX ON DOA OR
   SNAME + DTOS (DOA)

Objectives of Session 19. Database Reports Design

3. Discuss creating professional-looking reports

4. Practice dBase IV reports

Database Reports Design

Reports

A printout of selected data

arithmetic operations, headers, footers,
and page numbers
can be added on the page

Two different reports:

1. Quick Report
2. Custom Report

Report Bands

Printout of selected data, consisting of bands.

Bands: areas that control specific sections of the report

examples are:
- report intro band
- page header band
- page footer band
- report detailed band
- report summary band

Types of Report Bands

1. Page Header

   - the space at the top of each page that typically contains information such as page number, date and column titles of your data
   - printed once at the top of each page

2. Report Introduction

   - contains materials that appear at the beginning of the report
   - printed once, it can be a cover letter explaining the data that follows

Types of Report Bands (continued)

3. Report Detailed (body)

   - shows the data from the records in the database file or view of the body of the report

4. Report Summary

   - contains information that appears at the end of the report
   - concluding remarks, totals are included here

5. Page Footer

   - contains running titles for the report at the bottom

Report Design Screen – An Example

Page Header Band

HRM: List of employees

Surname	Other names	Salary

Report Intro Band

Detail Band

xxxxxxxx	xxxxxxxx	99999.99

Summary Band

Number of Employees: 9999 Total: 99999.99

Page Footer Band

Group Bands in Report – An Example

Page Header Band		
Surname	Other names	Basic Salary
Report Intro Band		
Group 1 Intro Band		
Department: xxxxxxxx		
Detail Band		
xxxxxxxx	xxxxxxxx	99999.99
Group 1 Summary Band		
Total Department Staff: 9999		Salary: 99999.99
Report Summary Band		
Total Employees: 9999		Salary: 99999.99
Page Footer Band		

Grouping Reports

- adding calculated fields
- subtotals using group bands

groups by:

- specified number of records
- whenever the field data changes
- by a dBase expression

examples:

- every zone records
- putting all disciplines together
- grouping by PHDS

Objectives of Day Eight

1. Discuss database management: security, recovery, and integrity

2. Know how to use a spreadsheet

3. Appreciate the use of spreadsheets

4. Be aware of additional features available with some of the spreadsheet packages

Schedule of Day Eight

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 20. Database Management: Security, Recovery, and Integrity
	Tea/Coffee Break
10:45 – 11:00	Session 20. (Continued)
11:00 - 13:00	Session 21. Introduction to Lotus 1-2-3
	Lunch
14:00 – 15:30	Session 21. (Continued)
	Tea/Coffee Break
15:45 – 17:00	Session 21. (Continued)
17:00 – 17:30	Feedback on the Day's Activities and PAPA

Objective of Session 20. Database Management: Security, Recovery, and Integrity

1. Discuss database management: security, recovery, and integrity

Database Administration and Management

Objective:

Ensure that data is administered to provide a focal point for defining, manipulating, and controlling all elements of the database system

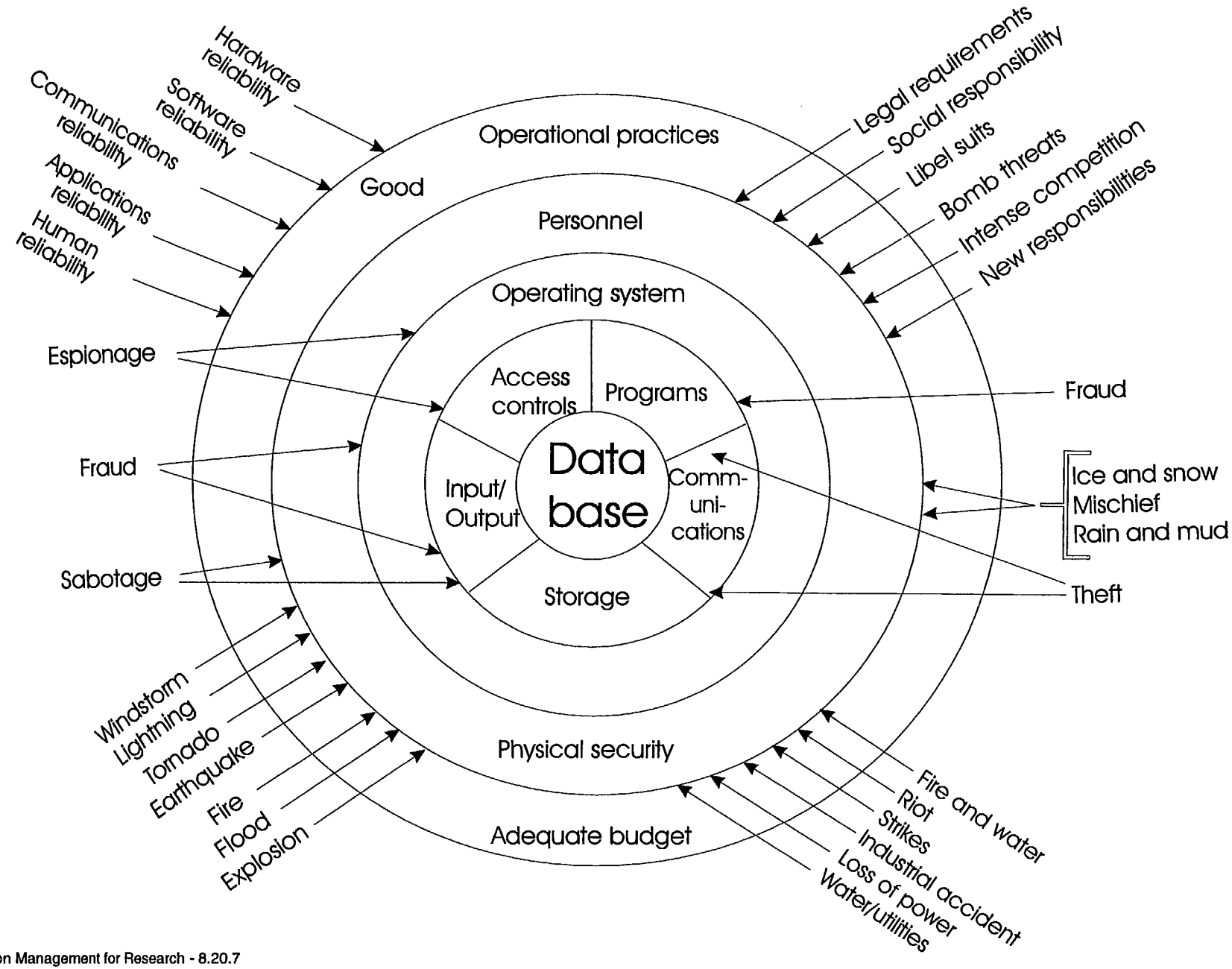
Success Factors for Database Management

- Top-level management commitment
- Data and information requirements planning
- Authority vested in database administrator
- Proper selection of staff
- Realistic, flexible view of DEIVIS and DBA
- Use of action-oriented and results-oriented approach
- Improved information to users

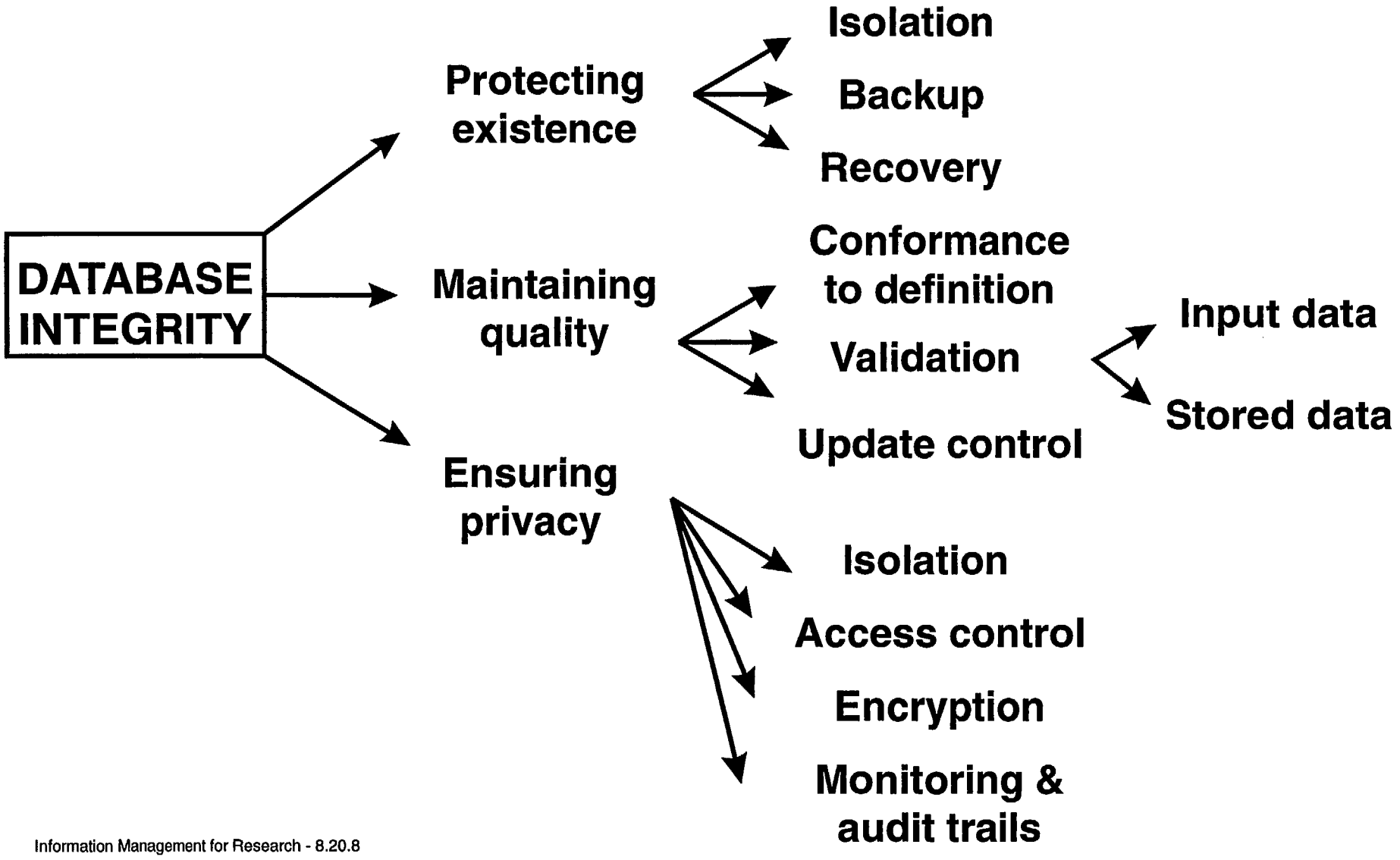
Database Integrity Threats

- Lack of privacy/confidentiality
- Damage to database
- Inaccuracy and inconsistency of data

Threats and Their Usual Defenses



Facets of Database Integrity



Database Integrity

Integrity

Quality of the state of being complete

... unimpaired; wholeness; soundness; perfect condition

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The Process of Backup and Recovery

Backup seeks to protect the existence of the physical database and to re-create the data whenever loss or destruction occurs.

Backup is the process of maintaining an historical record of any of the following:

1. Past states of the database DUMP
2. Changes to the database IMAGE LOG
3. Transaction which caused a change in the state of the database TRANSACTION LOG

The Process of Backup and Recovery (continued)

Backup enables reconstruction of all parts of the database in the event of loss or destruction of the data.

Reconstruction or RECOVERY of a database can take one of two forms:

1. RECOVERING the lost current state of the database: BRINGING FORWARD

2. RECOVERING a valid prior state of the database: PULLING BACK

Bringing Back or Roll Forward

ROLL FORWARD involves bringing forward a valid prior state of the database by redoing or reinstating the update processing since recording (dumping) the prior state.

The extent of damage may entail restoration of the entire database.

Bringing Back or Roll Forward (continued)

ROLL BACK is necessitated by the unsuccessful completion of or erroneous action of an update process. This involves roll back from the current erroneous (contaminated or otherwise unstable) state of the database by undoing or recovering the changes back to the point where the update processing began.

For maximum protection, the backup data should be stored immediately on permanent storage media remote from the database.

Backup Strategies

1. Dual recording of DATA - simultaneous on-line recording of all updates

   Useful when recovery must be accomplished in a very short time

2. Periodic dumping of DATA

   i.e. making a copy of the entire database

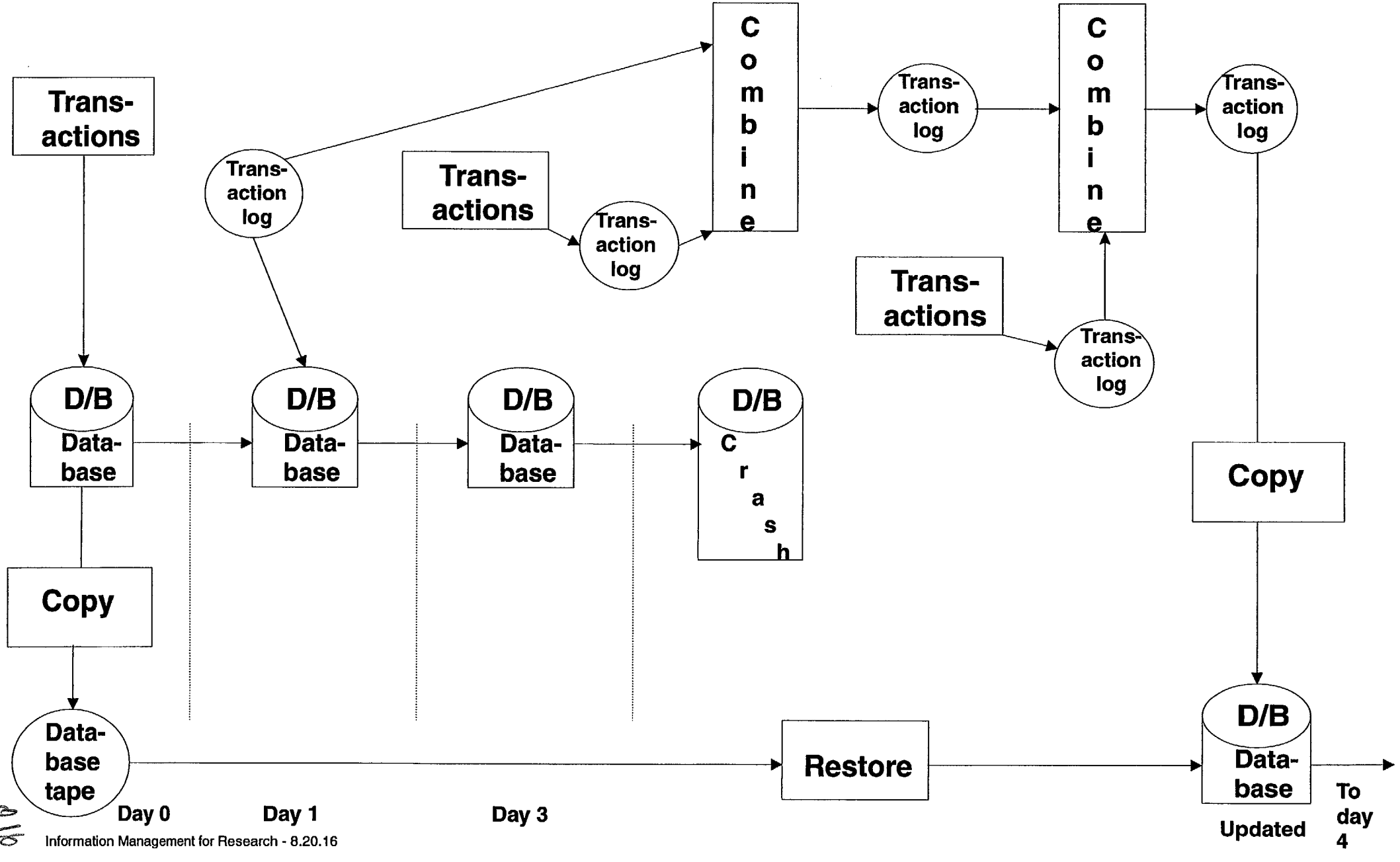
Backup Strategies (continued)

3. Logging input transactions

   Logging before and/or after images of all changes made to the database

4. Logging transactions which cause change to the database

Backup Procedure in a Database Environment



Quality Control and Concurrent Update

Data quality refers to data being:

1. Accurate
2. Current – stored data is up-to-date
3. Complete – knowing what data is relevant and should be collected

Database Quality Control

Accomplished by the following functions:

1. data validation
2. update authorization
3. concurrent update control
4. update synchronization

Access Control and Encryption

- Prevent unauthorized or inadvertent disclosure of information

- Contribute to data security – the protection of data from unauthorized disclosure, alteration, or destruction

- Seek to prevent unauthorized access and update, including destruction

Access = retrieval and modification

Threats to Data Security

Data may be:

- Inaccurate, falsified, disclosed, or lost before, during, or after processing

- Threats to data security can be intentional or accidental. People can exploit loopholes, abuse privileges to intentionally, or maliciously gain access to confidential data

- Accidental disclosures can result from hardware, software, or human failures, or natural disasters

Shareability

demands:

some mechanism to control

WHO does

WHAT

to WHAT Data

Direct Access Control (Logical Access System)

3 Stages:

1. Identification of the user usually through the ID code

2. Authentication to verify a user's purported identification, usually through the use of a password

3. Authorization of certain actions on certain data objects: defining access privileges, table set up

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Indirect Access Involves

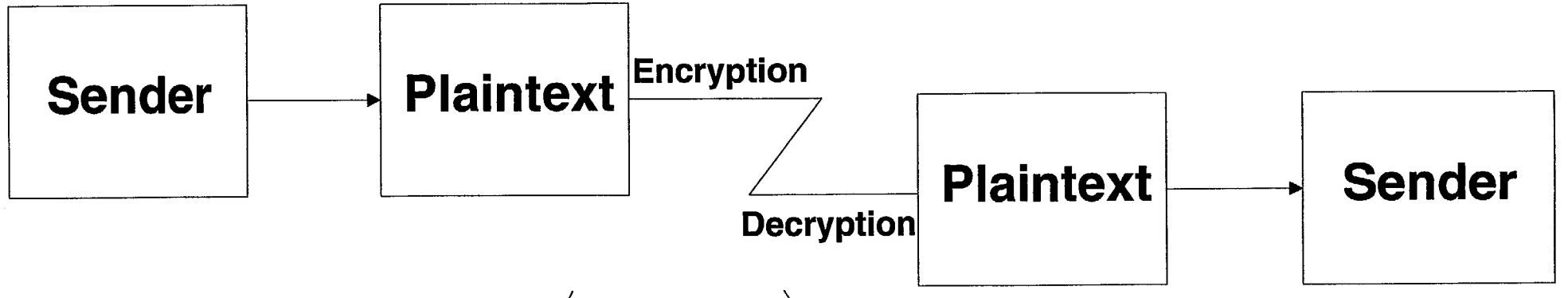
1. Flow controls on data movement from one place to another

2. Influence controls on statistical outputs from confidential data on individuals

3. Encryption of transmitted or stored data

4. Monitoring of system activities and user interactions

Encryption/Decryption

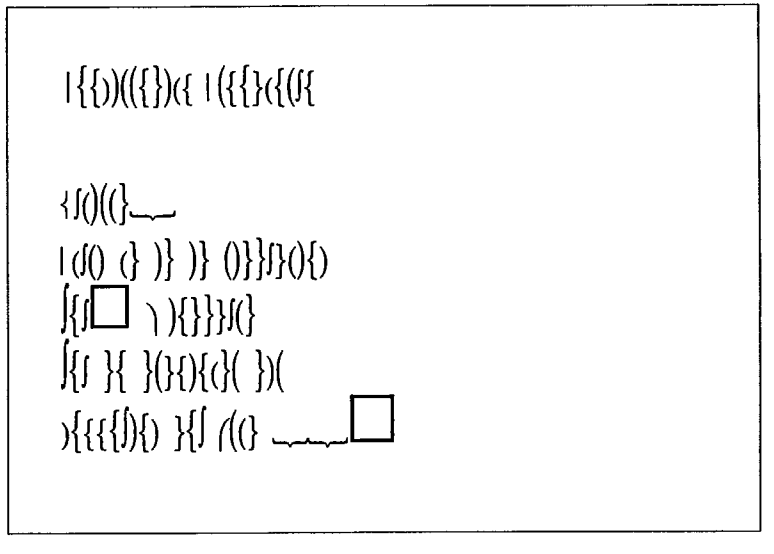


Plaintext

Confidential Memorandum

Subject:
Much as it is disturbing you, I instruct you to terminate the following row Feb. 23.

Encryptic Version



Total Computer Security Programs Involve Control External to the Computer System

(Physical and Administrative)

- Physical access controls
- Personnel screening on hiring
- Application program control
- Fire and flood detectors and inhibitors
- UPS
- Fences, perimeter surveillance system
- Looks on computer centers
- OS control

Objectives of Session 21. Introduction to Lotus 1-2-3

2. Know how to use a spreadsheet

3. Appreciate the use of spreadsheets

4. Be aware of additional features available with some of the spreadsheet packages

Spreadsheet

- A tool for organizing, manipulating, and analyzing data
- It is set up as a grid of rows and columns
- Each piece of information is stored in a cell: a space one row high and one column wide

Example of a Spreadsheet

	1	2	3	4	5	6	7	8
1								
2								
3								
4		Cell						
5								
6								
7								
8								

Row

Column

Objectives of Day Nine

1. Discuss the features of INFORM-R
2. Analyze INFORM-R
3. Evaluate the usefulness of INFORM-R in your organization
4. Discuss database development, management report production, and analysis
5. Discuss issues related to information management systems based on the field trip
6. List strengths and weaknesses of the information management systems used in the organization you visited
7. Suggest relevant recommendations to minimize or overcome the weaknesses to apply in your own environment if applicable

Schedule of Day Nine

08:30 – 09:00 Opening of the Day's Activities

09:00 - 10:30 Session 22. INFORM-R – Computer Demonstration

Tea/Coffee Break

10:45 - 13:00 Session 23. Database Development, Management, Report Production, and Analysis

Lunch

14:00 – 17:00 Session 24. Field Trip

Tea/Coffee Break

17:00 – 17:30 Feedback on the Day's Activities and PAPA

Objectives of Session 22. INFORM-R Computer Demonstration

1. Discuss the features of INFORM-R

2. Analyze INFORM-R

3. Evaluate the usefulness of INFORM-R in your organization

Objective of Session 23. Database Development, Management, Report Production, and Analysis

4. Discuss database development, management, report production, and analysis

Objectives of Day Ten

1. Report on database development, management, report production, and analysis

2. Plan actions for future activities in information management

Schedule of Day Ten

08:30 – 09:00	Opening of the Day's Activities
09:00 – 10:30	Session 23. (Continued)
Tea/Coffee Break	
10:45 – 13:00	Session 23. (Continued)
Lunch	
14:00 – 15:00	Session 24. Participant Action Plan Approach (PAPA) and Workshop Evaluation
Tea/Coffee Break	
15:00 – 15:30	Final Remarks and Closing

Objective of Session 25. PAPA

2. Plan actions for future activities in information management for research