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United Nations Industrial Development Organization

Expert Group Meeting on Project Planning
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and Related Machinery

Vienna, Austria, 13 - 18 November 1972

INFORMATION SYSTEMS FOR PROJECT PLANNING AND
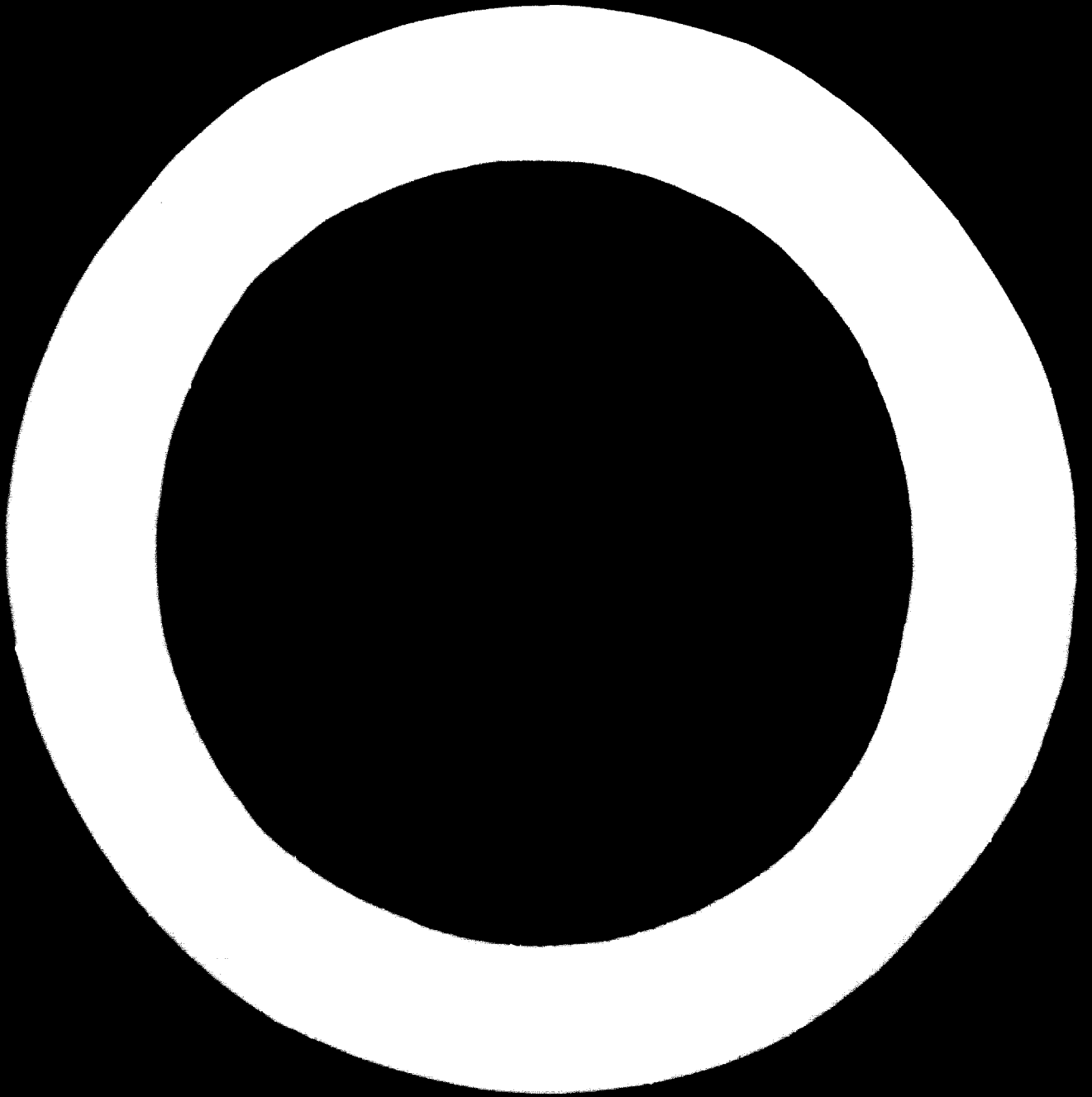IMPLEMENTATION WITHIN DEVELOPING COUNTRIES [1]

by

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Scope and Purpose

This discussion paper presents, in brief, some of the key factors and issues involved in establishing effective systems for preparing, processing and displaying the information needed by the responsible managers and involved decision makers during the detailed planning for execution, and during the actual execution, of industrial development projects within developing countries. The phases of project conceptualization, justification and authorization are not within the scope of this discussion.

The purpose of this paper is to provide a partial structure for the discussions and resulting recommendations expected during the Expert Group Meeting.

Information Needs

Information needed by managers and decision makers to plan and implement developmental projects within long-range development programmes is listed below. The numbered items may be considered basic modules of a PMIS:

1. **Programme/Project Definition**

   - **Programme/Project Structure:** A systematic, understandable definition of the Programme at hand and each of its Projects (preferably using the Project Breakdown Structure approach).

   - **Responsible and Performing Organisations:** Identification, for each element of the Programme and Project Breakdown Structures, of the responsible and performing organisations, with the cognisant person within each organisation named, to include authorizing, approving and decision-making persons and organisations outside the sponsoring agency.

2. Programme/Project Action Planning and Control

. Master Plans and Schedules: Graphic display charts for the overall Programme and for each Project showing, on a calendar scale, the scheduled and actual start, completion and milestone events for the Programme, each of its Projects and their major elements, with key inter-dependencies clearly shown.

. Work Statements and Action Plans: Statements of work for each task identified in the Project Breakdown Structure; detailed chronological bar charts, event-activity or work precedence charts or diagrams showing the logical and sequential inter-dependencies between all elements of the project and including all important authorizations, approvals and decisions, as well as major Project interface points.

. Work Schedules: Schedules showing the start and completion dates of each task, and occurrence of related and Project Milestones, plus additional detail as required by the person responsible in order to exercise appropriate control.

. Progress Reporting: Reports and records of actual accomplishment compared to the plans and schedules, preferably using the same documents described above.

3. Resource Planning and Expenditure Reporting

. Task Funding and Critical Resource Budgets: For a given Project, funding and critical resource (skilled manpower, scarce equipment, facilities, materials, etc.) budgets for each element of the Project Breakdown Structure, with identification of the source for each.

- Expenditure Records: Records of actual expenditure of funds or other resources for comparison to budgets and schedules.

4. Work Authorization and Resource Control

- Work and Resource Expenditure Authorization and Control: Documents (contracts, purchase orders, work orders) authorizing, under contract or otherwise, the expenditure of funds or other resources and the performance of defined tasks to accomplish the project, with stated limits for critical resources to be expended.

- Expenditure Records: Records of authorized expenditures for comparison with actual expenditures of critical resources.

5. Product Information

- Product Descriptions and Specifications: Documents describing the intermediate and end products to be created by the Project (facilities, equipment, operational systems, documents, services, training, organizations, consumable products, materials, etc.). Included are intermediate and final product specifications and drawings, as-built drawings for facilities, operating manuals, etc.

- Product Control Information: Records of changes in product design, specifications or descriptions.

6. Environmental and Political Information

Summaries of current factors related to the Project environment (funding sources, organizational capabilities, etc.), and the political climate, interests and needs that may affect the objectives or execution of the project.

Information Uses

Durin, the planning and implementation of developmental projects,
the information listed may be used in one or more of the following
basic ways:

1. For decision-making with regard to allocation of critical
   resources between projects and within a given project,
   when conflicts exist.

2. To persuade and inform authorizing, approving and decision-
   making authorities (officials, agencies, investors, public
   opinion, special interest groups) so that proper actions
   will be taken in a timely manner to enable the project to
   proceed.

3. For use in actually managing the project during its execution.

4. For use in preparing proposals and plans for future pro-
   grammes or projects of a similar nature.

Important Desirable Characteristics of Project Management Information Systems

1. Ability to interrelate (or integrate) as many types of
   needed information as possible on one project and for a
   number of projects.

2. Ability to identify critical elements of information:
   a) Critical path (most time-consuming) tasks or activities
   b) Critical resources, and the involved tasks and time
      periods when delays or conflicts will be caused by
      shortages of them
   c) Critical authorizations, approvals and decisions
   d) Critical tasks or activities common to more than one
      project
   e) Critical deviations from plan or budget in accomplishment
      or expenditures of funds or resources

    f) Critical environmental or political information which may threaten project success.

3. Ability to be implemented and operated with available staffs and budgets.

4. Ability to combine manual and computer-based procedures in a practical way, and evolve or grow in a modular fashion as more advanced information processing capabilities are required.

Some Important Issues to Discuss

1. ## Organizational and Management Issues

   How to assure that:

   a) The organizations sponsoring the programme and each project are clearly identified, and that a Project Manager is designated for each.

   b) All organizations contributing to, affected by, or capable of delaying or killing the project are identified and their roles defined.

   c) The proper organizational location for sponsorship of development and implementation of the PMIS is found.

   d) The proper, ultimate location of the Project Planning and Control Function is established, and the development and staffing of this function is planned and implemented during PMIS development, in support of and used by the Project Manager.

   e) Required data processing support is provided to the Project Planning and Control Function.

   f) The Project Manager fully understands the need for, operation of, and utilization of the PMIS available to him.

g) Funding for project management staff and for PMIS development, adaptation and operation is included as part of the project cost and adequately funded, budgeted and controlled.

2. **PMIS Design and Development Issues**

How to assure that:

a) A logical, evolutionary, modular approach to the PMIS is established.

b) The use of computer-supported systems is introduced at the proper time and in the proper manner.

c) Manual and computer-supported systems or procedures are properly combined.

d) Incompatibilities with existing information systems which must be connected to or feed PMIS are identified and eliminated to establish properly functioning interfaces.

e) The most suitable computer-supported systems or procedures are selected and implemented for each given situation.

f) The proper mixture of skills are involved in the design and development of the PMIS.

g) Cognizant managers and users are involved in the design and development of the system.

h) The PMIS design and development is planned and controlled using an effective project management approach.

i) The PMIS really meets the needs of the project manager and the involved decision-makers.

3. PMIS Implementation Issues

How to assure that:

a) The people with project responsibilities fully understand the need for preparing the planning and budgeting information required to manage the project, for entry into the PMIS; and that these people are willing to devote the effort needed to actually prepare valid planning information and report valid progress information.

b) All phases of the project, and all areas of activity which should be included in the project scope and plans are, in fact, so included, regardless of questions of authority or responsibility.

c) The project plans represent the way in which the work will actually be done.

d) A plan is established and followed which will assure that the PMIS is introduced into an ongoing organization in a well-co-ordinated manner.

e) Initial implementation of a specific PMIS within a given environment is made using a project (as the prototype vehicle) which is of appropriate size, complexity and stage of maturity so that success of the PMIS is enhanced.

4. PMIS Operation Issues

How to assure that:

a) The PMIS results will actually be used in the management process.

b) Planning and data changes and revisions can be made, under appropriate control, so that the information produced is current.

c) Improvements in the PMIS can be introduced without disruption of the project or the existing information content of the system.

d) The continued discipline required to maintain the planning information, report progress and expenditures, and operate the system will be maintained.

Some Observations Regarding Implementing and Using the IBM Project Management System

It may be of interest to the Expert Group to review some ITT Corporation experience with the IBM computer programme product named PMS. The capabilities and features of PMS are available elsewhere. In general, the IBM PMS is a very powerful set of programmes which deserves serious consideration by anyone responsible for computer programme selection in support of PMIS.

1. ### Data Processing Operations
    Medium or large-scale computers (IBM 360-40 or larger, 128 core) with Operating System (OS) 360 capabilities are required. Unless experienced OS 360 support is available, extreme difficulty will be experienced.

2. ### Version 3 Versus Version 4
    Version 3 is basically as good as Version 4 except for the Resource Allocation Processor (RAP) and the ability of the NETWORK Processor to handle precedence diagrams. If RAP is to be used, Version 4 is definitely worth the additional rental cost; if precedence diagrams are used, Version 4 is mandatory.

3. ### Documentation
    The system documentation is generally superior to earlier IBM programmes of this type. Even so, considerable study is required to gain full knowledge, from the user viewpoint,

of all important OS Job Control Language (JCL) statement (cards), PMS control cards, data cards and diagnostics.

4. **Initial Checkout**

If knowledgeable OS 360 support is available, with an adequate machine configuration, two to three months will probably be required to complete initial checkout and be ready to input data on a large programme or project.

Establishing PMS requires generating a system reflecting the exact machine configuration and data requirements of the specific application. This requires a number of system and data decisions, each of which takes a certain amount of study.

The sample problem provided by IBM gives reasonable assurance that the system is operational. However, tests should be conducted with the user's own data to be sure all factors have been considered and understood. Such tests should be made with reasonable sized networks and data files: for example, RAP tests with networks of less than seven or eight activities will generate ABEND's (abnormal end of run). This is typical of problems not identified in the documentation.

5. **Resource Allocation Procedure (RAP)**

This module performs as specified in the documentation. Care should be exercised to minimize network size, number of zero time activities, and number of resources, to prevent excessive run time. Zero time activities without completion dates are carried in the files and can cause excessive run time. For this reason, it seems impractical to use RAP on large networks when the "Time Now" feature of the NETWORK Processor is used. ("Time Now" allows inputting zero time to complete on all completed activities and uses the "Run Date" as the "Time Now" date for the start of all activities preceded only by zero-time activities.)

6. Report Processor

This is a very powerful programme, useful as a general report processor. Non-programmers can quickly learn to design special reports and write their own programme to produce them. The various data selection, sort masking and report formatting capabilities are excellent, and very useful when combined with the external report control cards, which can limit and select a wide variety of data and parameters.

General PMIS Implementation Plan

Exhibit 1 shows the general sequence of steps to implement the six PMIS modules previously described, using the IBM PMS 360 or similar system.

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Exhibit 1: General PMIS Implementation Plan

*Denotes Use of IBM PMS or Similar System

1. Programme/Project Definition
   - Prepare Breakdown Structures
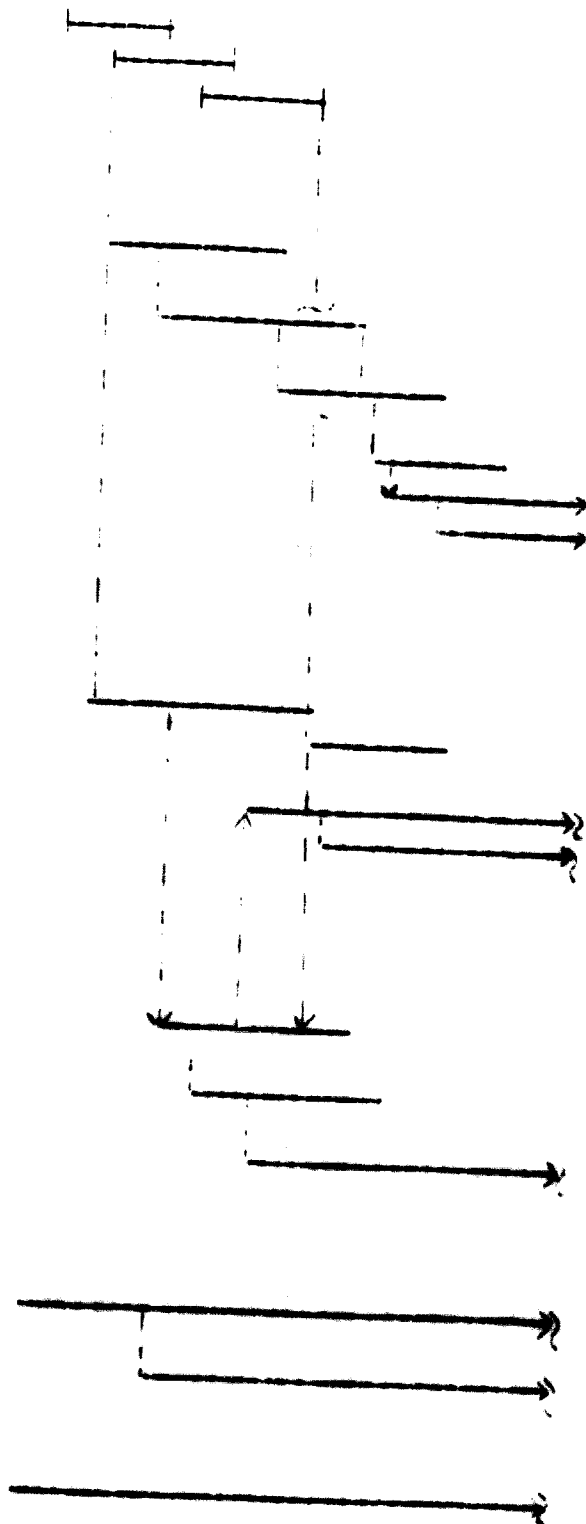   - Identify all Organizations
   \# Input Data into PMS Cost Processor

2. Action Planning and Control
   - Develop Master Plans and Schedules
   - Prepare Work Statements and and Action Plans
   \# Input and Process Data - PMS Network
   - Prepare Work Schedules
   - Report Progress
   \# Input and Process Progress Data - PMS Network
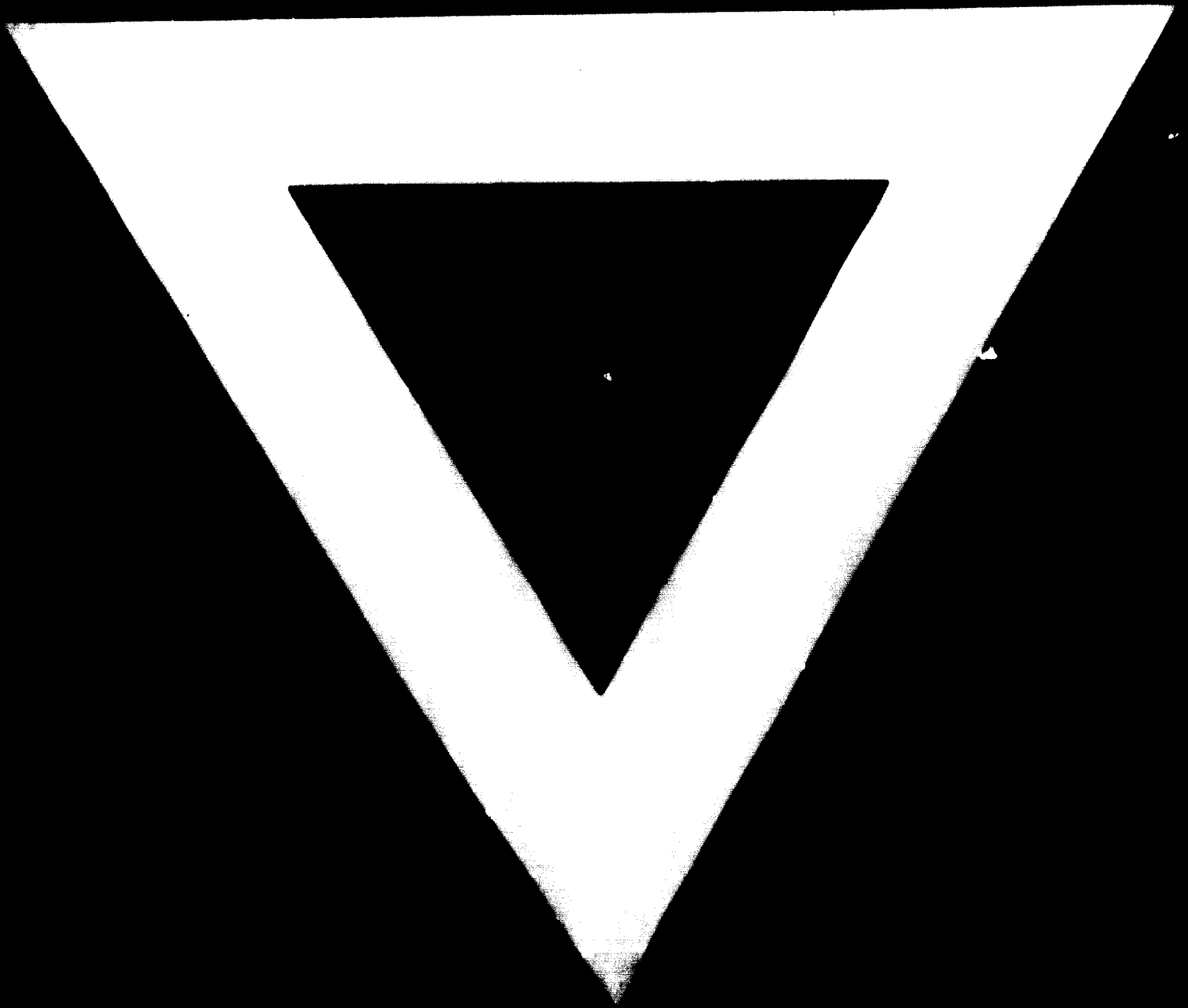
3. Resource Planning and Expenditure Reporting
   - Establish Budgets
   \# Input and Process Data - PMS Cost Processor
   - Report and Record Expenditures
   \# Input and Process Accounting Data - PMS Cost Processor

4. Work Authorization and Resource Control
   - Release Contracts and Work Orders
   - Maintain Expenditure Authorization Records
   \# Input and Process Data - PMS Cost Processor

5. Product Information
   - Establish and Maintain Product File
   - Control and Record Changes

6. Environmental and Political
   - Establish and Maintain Records