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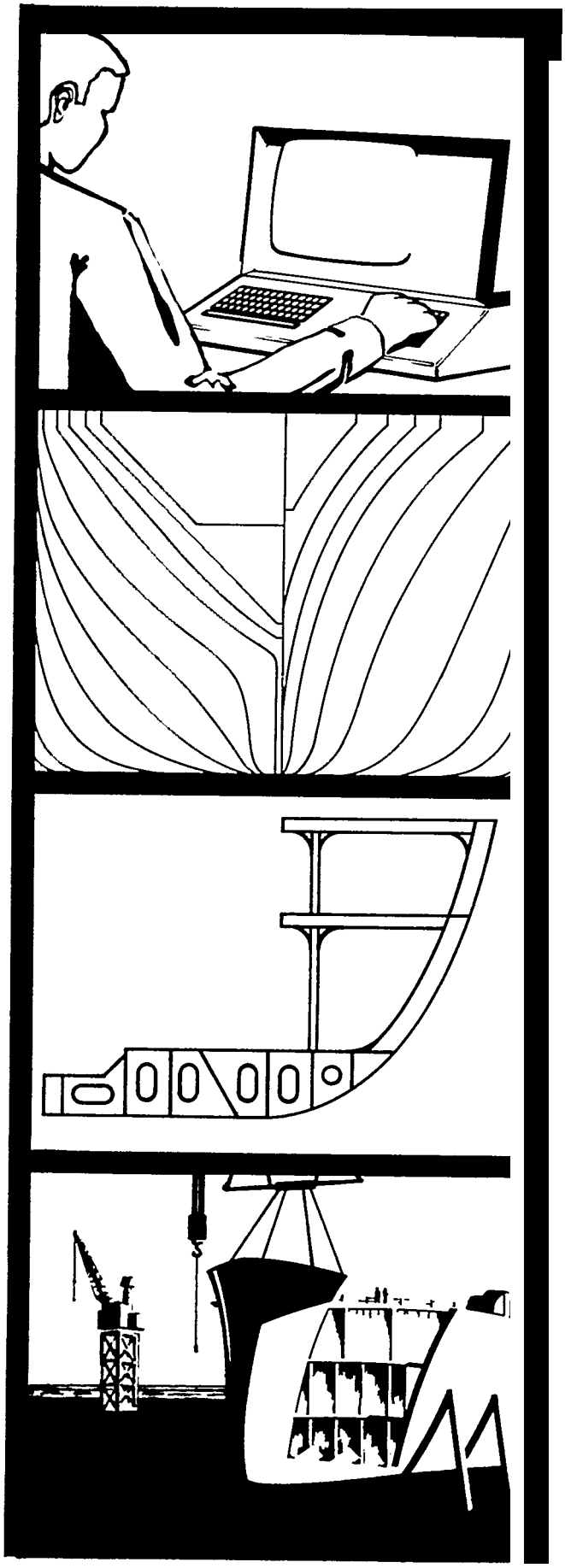

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IMPROVED SHIPYARD CONTROL WITH TOMAS (TOTAL MANAGEMENT SYSTEM)

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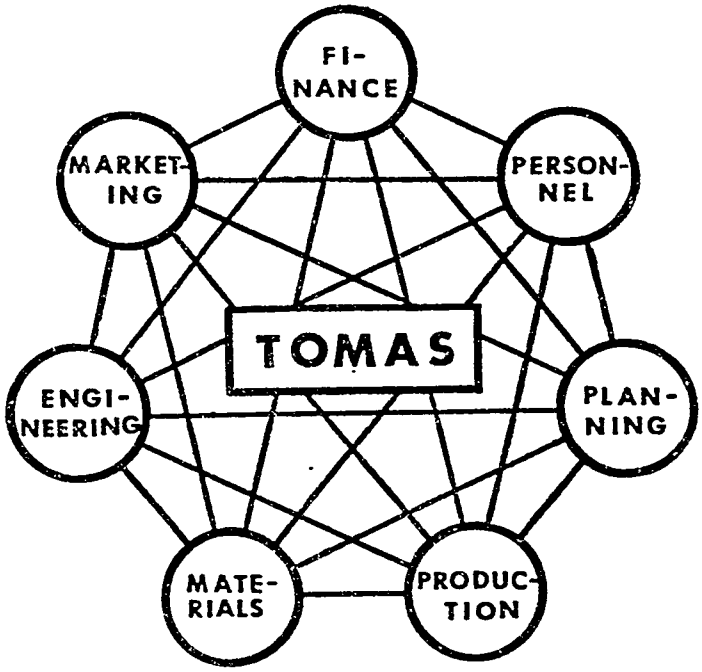
ToMaS

"ToMaS" - AUTOMATING THE CONSULTANT'S TASK?

"Automation.....it is not a nightmare of push-button machines and soul destroying anonymity. It is, rather, a conception of how work should be organized."

Roger Falk
The Business of Management



1.

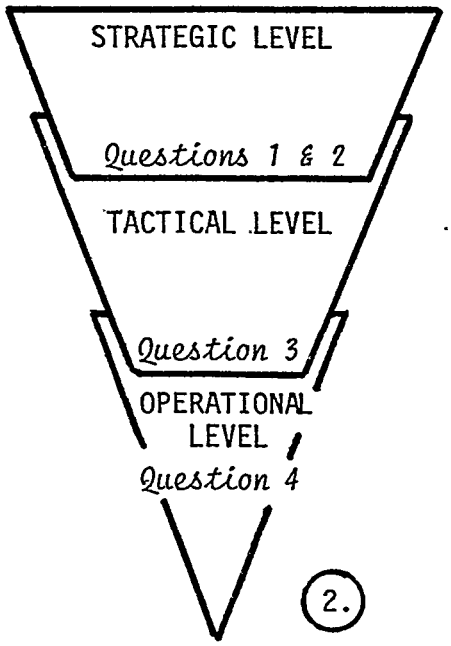
1. PREAMBLE

In common with any business enterprise, the tasks of management in a shipyard may be specified within three levels:

1. The strategic level - to establish objectives for the shipyard.

2. The tactical level - to translate the shipyard's objectives into plans, schedules and budgets.

3. The operational level - to coordinate and control the shipyard's operations against plans, schedules and budgets.



For objective management to be of benefit to the shipyard, there must be continual and critical review and modification of the shipyard's strategy and tactics, the questions which need to be answered being:

1. Knowing the external environment and the shipyard's past performances, what are the realistic alternative strategies?

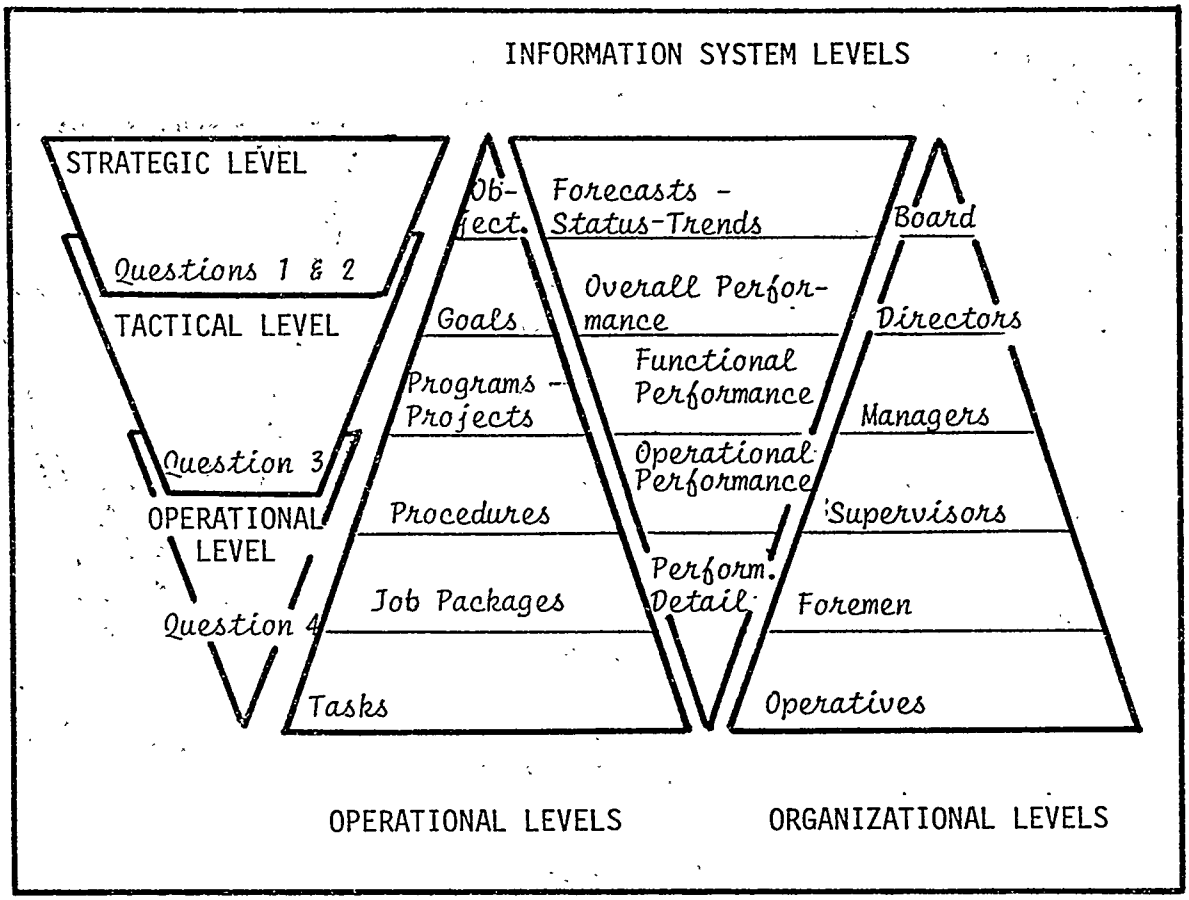
2. Which of these alternative strategies provides the best achievable goal for the shipyard?

3. What is the most cost effective application of the shipyard's resources to achieve this goal?

4. How can we organize the work content at the operational level within this application of the shipyard's resources?

This concept of objective management with its three levels, in general dictates the transverse levels in a shipyard's organizational structure and since we have concluded that continual and critical review and modification of strategy and tactic is essential we further conclude that the organizational structure must be fluid, that is a cost effective shipyard at any time will be organized to achieve its current objectives.

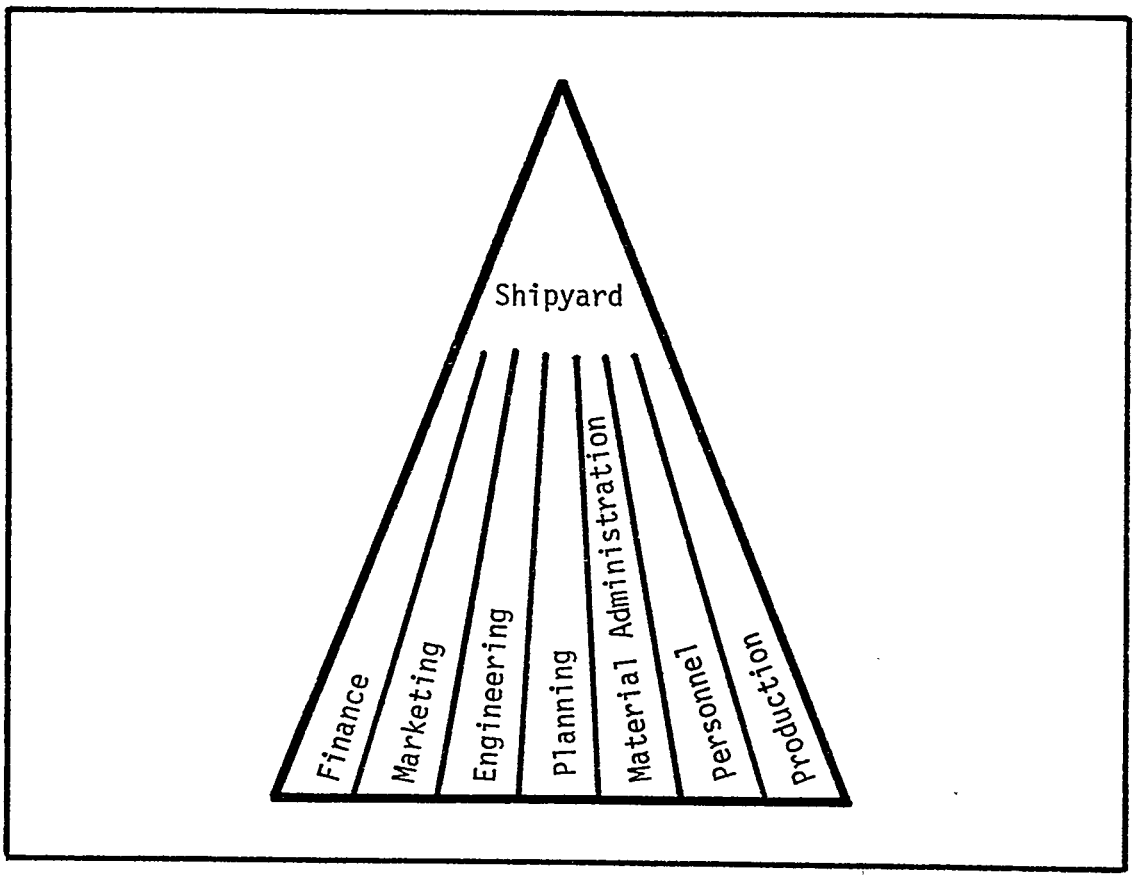
The integration of a shipyard's organizational levels with its management and operation can be demonstrated diagrammatically, the questions referenced on the diagram being the four questions introduced above:



3.

The objective management task of answering these four questions is dependent on the availability of information in the correct form at each level. We can, therefore, conclude further that the systematic flow of information, both transversely and vertically within the organizational structure is essential to the operation of the shipyard within the defined objectives.

Whilst organizational structure will vary from shipyard to shipyard as a result of each yard's individual objectives and will vary within each yard with changing objectives over time, certain basic functions can be identified which remain relatively static and which have relatively static information requirements. These basic functions are presented diagrammatically below.



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2. WHAT IS ToMaS?

ToMaS (Total Management System)IS A SHIPYARD MANAGEMENT MODEL THAT HAS BEEN DEVELOPED FROM A-DETAILED ANALYSIS OF THE INTEGRAL FUNCTIONS OF A SHIPYARD .

Background

As consultants working with administrative/organizational routines and administrative data processing within the shipbuilding industry, SRS has seen the need for a systematic analysis of the functions and information systems in the shipyard.

This is why the ToMaS project was. initiated.

ToMaS is now an unique detailed refetience “tool” for administrative control in the shipyard.

Goals of the ToMaS Project

Phase 1:

To analyze and describe the functions-and the information systems of a shipyard, i.e.,

- flow of information and goods between the shipyard and its environment (authorities, suppliers, etc.)
- flow of information and goodsbetween the functions of the yard
- information processing within the functions.

We made the results of the analyses "general, " i.e., independent of any particular organization structure.

To obtain this we considered the shipyard as consisting of functions rather than organizational departments.

The material from this phase is an useful reference framework for studying administrative routines and finding information processing alternatives (manual/EDP).

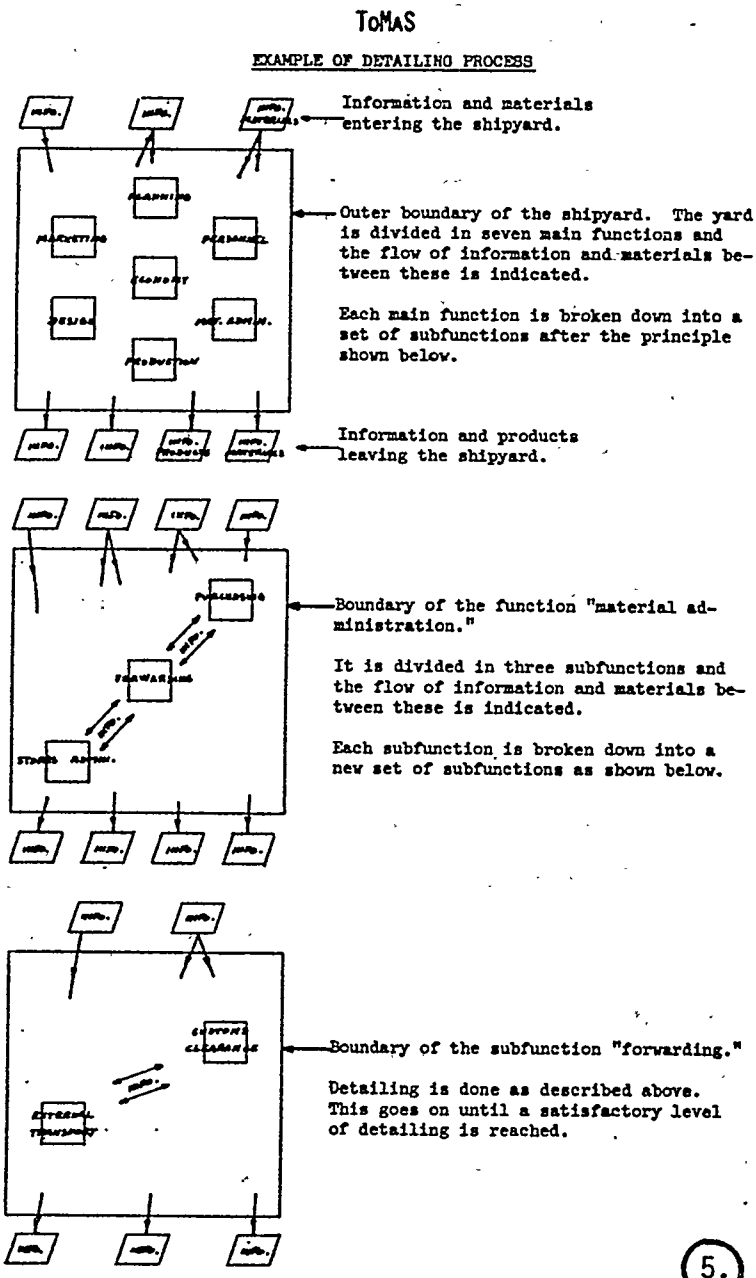
Phase 2:

On the basis of the material from Phasel, to suggest development projects for EDP solutions for suitable parts of the administrative information systems (in addition to existing EDP systems like MAPLIS, PLASIS, etc.).

To summarize, ToMaS is an integrated yet modular and flexible model of the shipyard's management functions and information systems. The information systems are hybrid: alternatives for manual execution, EDP or combination of these are possible.

Project Work Method

The analysis work in the ToMaS project is done according to the ISAC method (Information Systems for Administrative Control*). The main principle of this method is to start with a rough description of the enterprise (shipyard) and its interrelations with the environment, and break the enterprise down in functions and sub-functions. The analysis will, for each level of detailing, add new information about the field we are studying.



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* Developed in Sweden in cooperation by the Royal Technical University and the Stockholm University.

The Initial Project **Work**

The prestudy was concentrated on finding the logical main functions of the shipyard and giving a rough description of the interrelations (flow of information and goods) between the shipyard and,its environment and between the main functions.

The following seven main functions were decided upon:

PLANNING

MARKETING

PERSONNEL

FINANCE

ENGINEERING

MATERIAL ADMINISTRATION

PRODUCTION

ToMas is now composed of seven part projects, one for each main function.

3. MORE ABOUT ToMaS

As a conclusion for what said before, we can repeat that flexibility of operation can be enhanced if the functional divisions and complementary information systems have the same boundaries; the organization may change but the basic functions. will remain and will have the same tasks and corresponding information requirements.

What Do We Mean by Information?

We should be aware from the outset that when we use the terms "information" or "information flow" in the ToMaS context, that we are not merely referring to, for example, a document by name and title.

We should be aware of the total change in the nature of information which a document carries with, for example, the addition of an authorized signature.

We should be prepared to consider and answer the basic questions:

1. WHAT ? Information needed
2. WHERE ? Source, destination
3. WHO ? Sender, receiver
4. WHEN ? Date, frequency
5. HOW ? Transmission method

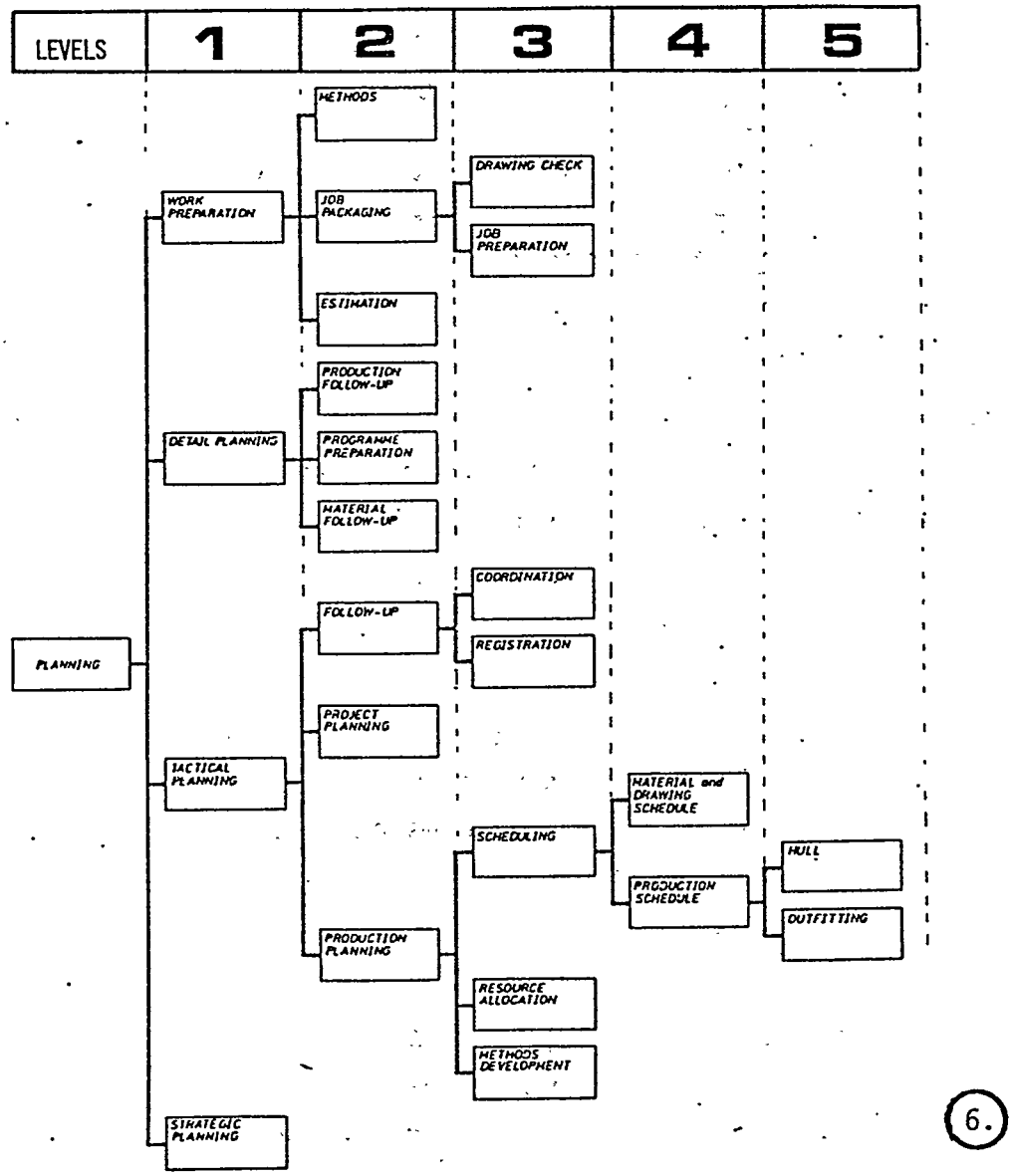
We should be aware that our information bearer carries information of both an identifying and informative character. Lack of any one of these aspects simply means that the model is incomplete and ambigous.

We will attempt to demonstrate the fidelity of the ToMaS model by providing some examples.

4. EXAMPLE 1

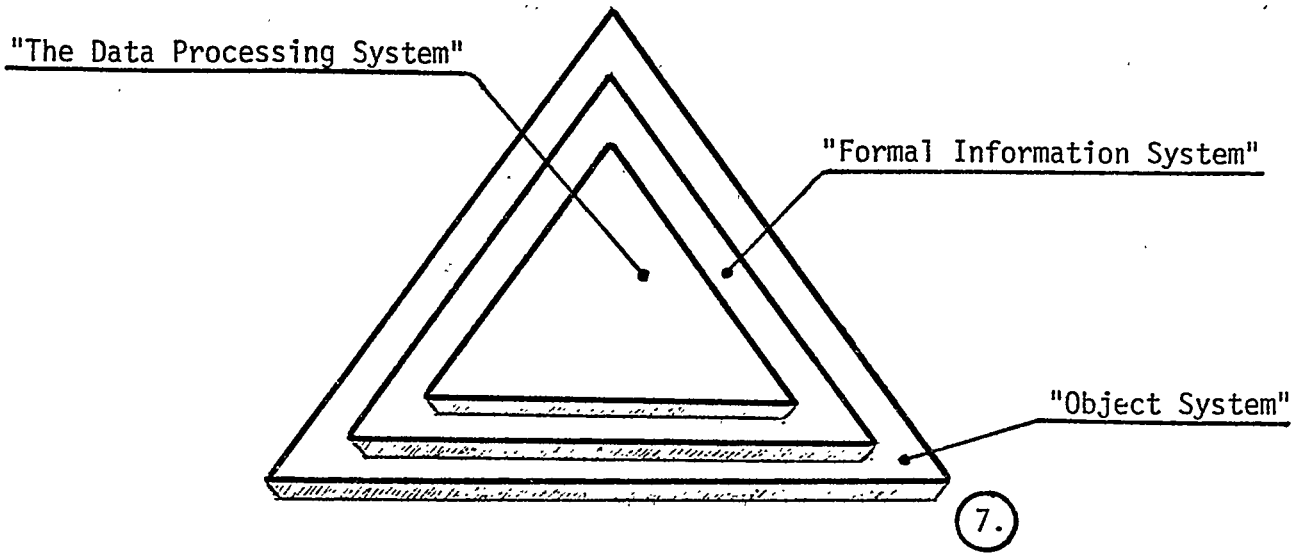
Functional Breakdown of the PTanning Function

We notice that the ToMaS model provides, in this case, five levels of sub-division of the Planning Function. Each sub-function is further specified by a family of charts and matrices, the most important of which are presented as further examples.



6.

Two of the types of charts utilized in the model are referred to as "Object System" and "Formal Information System" charts respectively. To establish them in context to each other we use the simple diagram below:



"Object System"

An information system exists to serve a larger system, this larger system we refer to as an object system. Examples of object systems can be a shipyard, a function. A family of objects systems charts specifies an object system.

"Formal Information System"

The formal information which flows within an object system is only a part of the total information flow. Information also flows informally by, for example, direct contact between people. It is often neither economic nor desirable to formalize the informal flow of information.

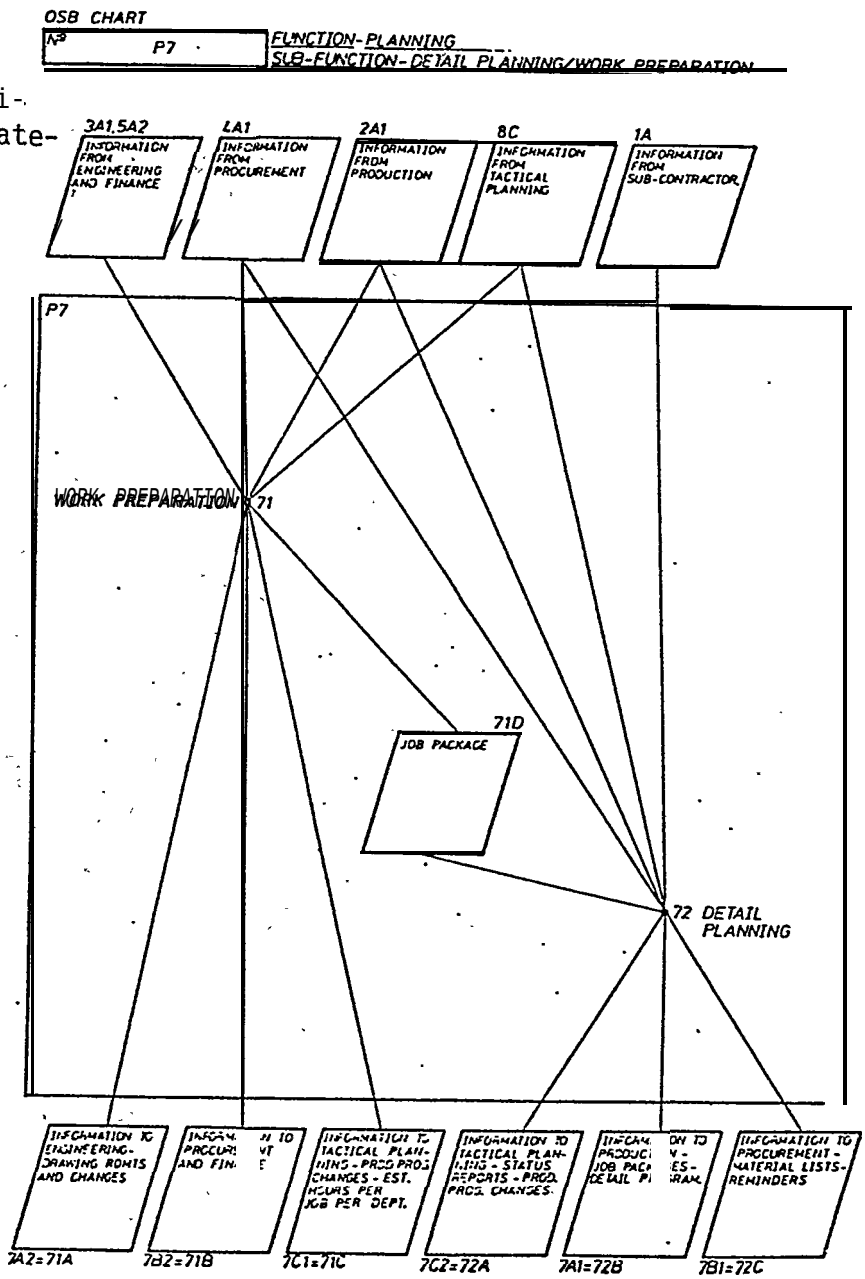
"The Data Processing System"

The data processing system, be it manual or computer aided, is simply an implementation of the abstract information system. Whilst the ToMaS model provides the system analyst with invaluable assistance, special data processing system have no place in the model itself, otherwise the organizational independence of the model is invalidated.

5. EXAMPLE 2

Detail Planning and Work Preparation.

In the example chart we notice that:



1. The chart bears the identification P 7 which immediately indicated that

   a. The chart belongs to the family PO

   b. Since there is one digit in the identification, it represents a sub-function in the first level or subdivision of the planning function.

   c. The chart is a detail of node 7 on chart PO.

   - The large square and its contents represents the object system, "detail planning and work preparation."

   - The parallelogram symbols represent units of information and those outside the large square represent the environment in which the object system operates.

4. Flow is invariably from top to bottom on the chart.

5. The nodes 71 and 72 will be further detailed on charts P71 and P72.

6. The coding of the information units will also cross reference between charts in the same family. For example 2A1 on this chart will be found to be a part of 2A on chart PO.

Each chart is invariably 'accompanied by a more detailed specification of the information units and next level sub-functions.

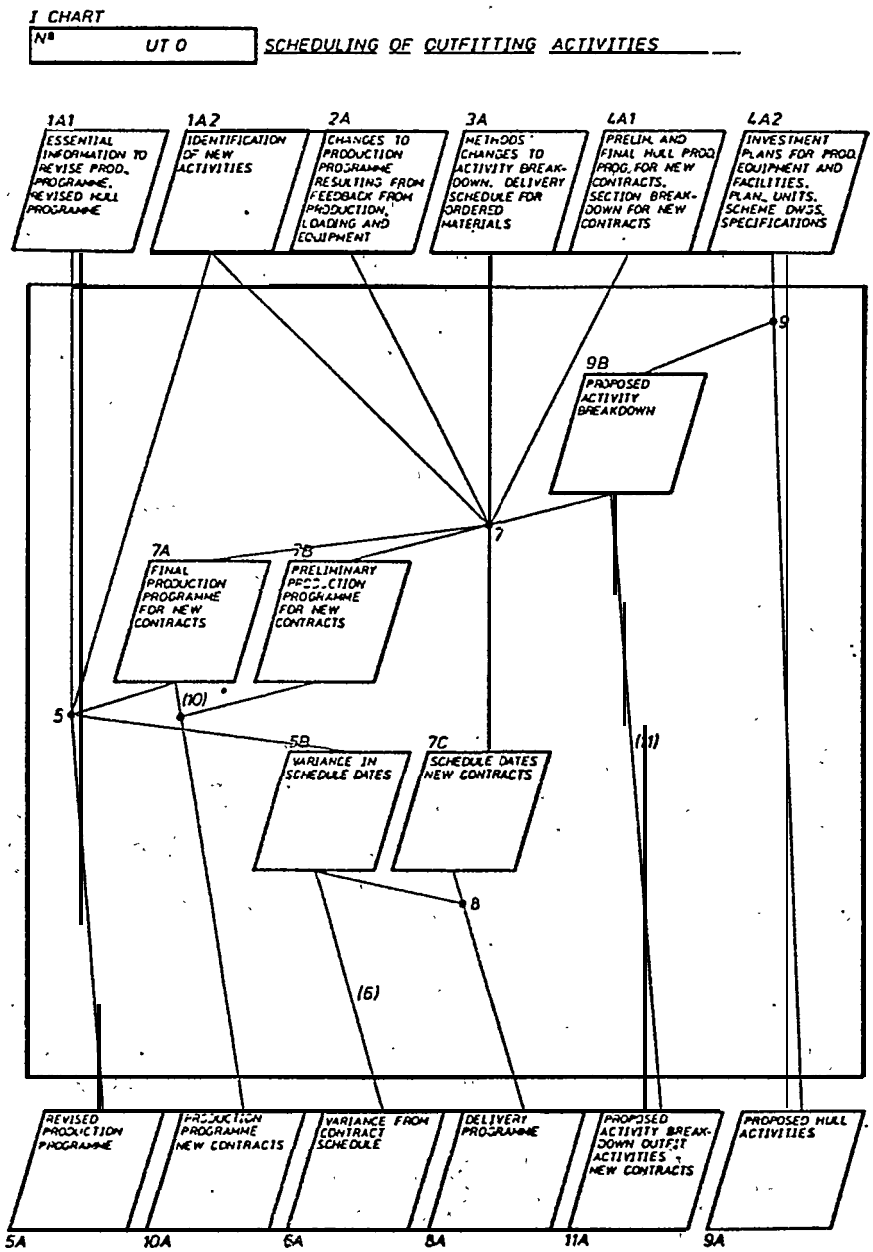
6. EXAMPLE 3

Scheduling of Outfitting Activities

The form of this example chart is very similar to the form of the object system chart, however, there are significant differences:

1. The nodes represent in this case some form for information processing.
2. The flow lines represent precedence - for example, to produce 5A, revised, production program, lA1, 1A2 and 7A must be available,- the routine to produce the revised production program being represented by node 5.

The information system charts are specified in detail in much the same way as the object system charts.



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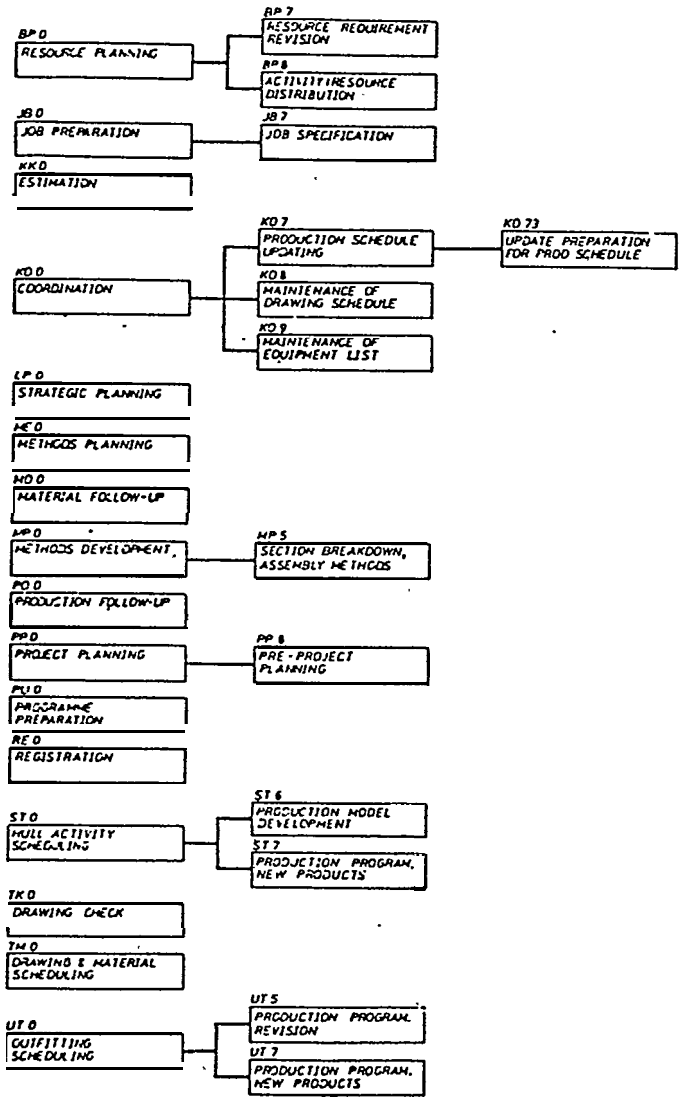
7. EXAMPLE 4

Information System Charts - Planning Function

The extent of detail present in the ToMaS model can be appreciated by correlating this example with the first example and the seven ToMaS basic functions.



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8. STEPS IN THE ToMaS ANALYSIS

The SRS organization and management team are regularly engaged to study and recommend reorganization or indeed new organization-in shipyards. Normally this type of exercise will be conducted in three phases.

1. Pre-study phase, with the object to study and document the scope of the exercise based on agreed terms of reference.
2. Detail planning phase, recommend and agree the new organization structure with the client and prepare detailed plans for all aspects of its implementation.
3. Implementation phase, implement the new organization and establish all systems essential to its operation.

The ToMaS model has definite advantages to offer in all phases over and above the general advantages of quality, consistency and economy. In phase 1 the model provides the project team with a functional frame of reference to guide the study of the existing organization and its systems, ensuring

that all aspects are studied in the minimum elapsed time

a basis for comparison

common terminology

a documentation form which is designed to aid the type of analysis required at this stage.

In phase 2 the development of recommended organization structure in detail implies a detailed knowledge of the relationships between all functions and sub-functions at all levels such that they may be organized,to achieve the yards objectives. To man each organizational unit effectively requires not only knowledge of the units task but also knowledge of what it will receive and what it will provide. The management of the consulting project itself requires that the total effort can be broken into sub-projects without ambiguous interfaces. The object system charts together with their specifications provide an effective answer to these aspects of the overall task.

The characteristic of phase 3 is invariably the study and implementation of practices and procedures within organizational units as a number of individual projects with individual project teams. The danger here is the creation of ambiguity in the interfaces between the resulting procedures. The ToMaS object system models are unambiguously interfaced thus if applied diligently, this danger is reduced to insignificance. However, the object system charts are not sufficient in detail to ease the task of writing and implementing the individual routines themselves and the review and adaption of individual data processing systems.

The information system charts represent the bulk of the ToMaS documentation and take the form of chart families with detail descriptions.