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SYSTEMS AND SYSTEMS DESIGN 1/

Systematic Approach to the Development of Business Information Systems

by

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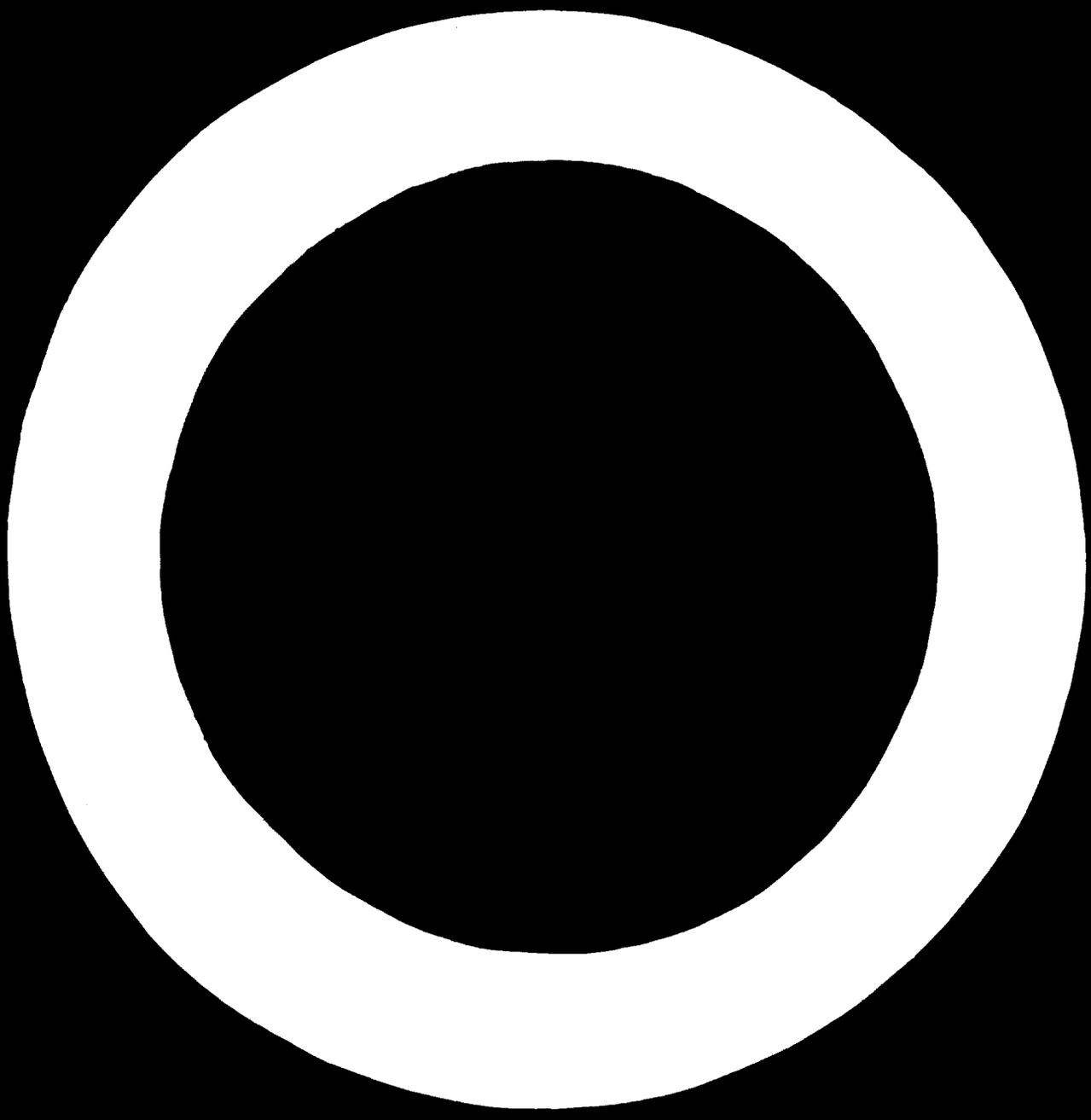

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General

By system is understood: a set of components among which some or other form of interaction exists. According to a still more general definition, a system is an 'organised whole". A business should also be regarded as a system. As an object of systems design the main emphasis is on the business as a controlling system.

A business as controlling system usually is extremely complex and voluminous. One of the reasons for this is the functional specialization of both human beings and tools The resulting functional allocation of tasks requires a complicated system of co-ordination and communication. As a result, it is very difficult to see through the business in all its components and relations.

In systems design it is necessary to have an overall view of the business as a whole. This may be accomplished by approaching this whole from various points of view. In doing so, the sets of components which have to be studied separately should however be viewed in their interrelation. These requirements may be met by distinguishing the following aspects of the business as a system:

- the information system,
- the organisation system,
- the processing system,
- the instruction system.

The information system

General

Once the preliminary studies (the general preliminary study, and the feasibility study) have been completed, the Business Information System (B.I.S.) is designed, by which in this respect is understood "an integrated system of all information processing, files, and information flows for the control of the business".

There is some resemblance between a B.I.S. and a bookkeeping system. The files and information flows are found in a bookkeeping system in the form of an account schedule and a booking schedule. An essential difference is that the contents of the bookkeeping system is limited to financial data, whereas the information system contains all, i.e. also the quantitative and qualitative data.

Before dealing with the set-up and the elaboration of a B.I.S. more extensively, attention will be paid to the B.I.S. itself, which, as the goal of our study, has great influence on the approach. This will be done by describing a model of a business information system.

Model of a business information system

The position and the structure of the model will be treated first, followed by a discussion of the procedure for using the model (see Appendix I and Ia; chart and explanation).

Position vs. other firms and organizations

The model shows first of all the position of the firm in the whole of firms and organizations in our society. On the left are the suppliers of machines, raw materials, manpower, etc., on the right are the purchasers of the various products. At the top – the relations with regard to the funds as e.g. owners, money suppliers, taxes, banks and giro services etc. At the bottom – the other organizations which influence the operation of the business and therefore influence the B I.S. This latter category includes among others the Government, employees, and employer unions.

Information processing (activities)

Information processing serves, directly or indirectly, the purpose of controlling the business. In general, it relates to activities, represented in the chart by circles. The central activity is the one of the general management of the business. The management of the business has therefore been situated in the centre of the model. Normally the management is delegated to groups of activities such as acquisitions, purchase, recruitment, production of semi-finished products, production of end-products, sales, receipts, and payments.

Apart from the general management in the model, five types of management have been included, i.e. for "provision for production means", "production", "marketing products", and "acquiring/spending funds".

The information processing is not carried out just for the benefit of the management, but also for the execution of activities. Consequently, five processing groups for the benefit of management have been included in the model. Their structure runs parallel to the five groups mentioned before.

This specification and its order are consistent with the value cycle within the business which plays an important part in the operation of the model. It is left undecided whether the processings (including the decision forming) are prepared or carried out by men or by machines.

Files (situations)

It is necessary that, for the benefit of the managing and executive activities within the business, data is available with regard to all sorts of "situations" in the business, among which are: files, registers, etc. (indicated by squares in the graph). In this respect by "situations" is understood the situation of the means available to the business, and of the relations as opposed to the external relations as e.g.

suppliers, employees, machines, raw materials, manpower, semi-finished products, products, clients, funds. These "situations" may be systematically divided into the following groups: production tools, products, clients (claims), funds, and suppliers (debts). They are not only a basis for the activities, they are also the result of these activities. Therefore, in the model, the situations have been included as the links between the various activities. In conjunction with the activities, they constitute a complete and closed series of the values cycle.

As in regard to information processing a distinction can be made between information files for the benefit of management and of those for the executives. For management are primarily concerned with control data; executives are mainly concerned with technical data.

Information flows

All information processing results directly or indirectly in one or several information flows (messages, requests, orders, etc.). These may be incoming flows for processing, and also outgoing flows, the result of the processing (indicated by arrows in the chart. External flows are indicated by arrows and form symbols).

In the model have been included:

- information flows outgoing from the management (in the form of budgets and orders);
- information flows incoming to the management (in the form of execution statements and results);
- planning data from the user to the supplier (market to production; production to provision, etc.);
- data regarding situations, i.e. from situations to activities (stock of products to production, stock of production means to provision, etc.);
- information flows outgoing from the business (orders, order confirmations, sales invoices, etc.);
- information flows incoming into the business (orders, purchase invoices, etc.);
- incoming flows of technical data (raw materials, suppliers, products, clients, etc.);
- the quantitative and financial data resulting from the external flows (receiving/sending of shipping statements and invoices).

Procedure for using the model

It is assumed that the model works according to the principle of management by exception. For this purpose standards are built into the model in advance with regard to all activities. These may be sales and cost budgets, quantitative plannings,

quality standards, organization prescriptions, etc. Only deviations from the fixed standards which do not fall within the tolerances are directly reported to the management in the form of result surveys, reports, etc. Inserting the standards, and reporting on the results could be regarded as the loading/unloading of the model.

Practical example of the procedure with the purchase of raw materials:

- The "general management" submits purchase budgets (sales and costs) and other standards to "provision means";
- "Production" provides "provision" with the planned amounts of raw materials to be processed;
- "Provision" receives real stock of raw materials from "production means";
- "Management of provision" decides raw materials should be supplemented, and orders "execution of provision" to purchase;
- "Execution of provision" prepares and ships the order (possibly after prior request for offer), and receives for this purpose first the technical data on raw materials as well as name etc. of the suppliers of "production means" and "suppliers";
- "Execution of provision" receives shipping notice and the invoice and forwards the raw materials received and debts to be paid to "production means" and "suppliers";
- Execution of provision" reports on the purchase to the "management of provision";
- "Management of provision" periodically reports on the purchase results (sales and costs) and other data to the "general management".

When the actual purchases of raw materials are so different from the planned ones that they do not fall within the tolerance limits, this is reported to the "general management". They then decide whether the actual purchases should be changed to conform to the plans, or that the plans should be changed. The latter would be carried out with due regard to the other leading functions.

Integration of information processing, information files, and information flows

The example described for the procedure for the purchase of raw materials shows the relationships in a part of the information processing system, files and flows, and how they are integrated. For the example showed only the purchase procedure, and indeed only part of it. However, by means of a systematic scrutiny of the relationships it is possible to establish a direct or indirect relationship between all processing activities, files and flows from the B.I.S.

With the aid of this model it becomes possible to establish systematically the relationships between data which are at first sight independent of each other. Thus the model gives an insight into the possibilities of integration with the execution of the information processing, with the integration of processing activities, and the integration of files, as well as their relationships to one another.

The organization system
(still to be worked out)

General

Model

The processing system
(still to be worked out)

General

Model

The instruction system
(still to be worked out)

General

Model

2. Dividing the systems study into sub-analysis

Introduction

In administrative automation the interest is shifting more and more from programming toward systems design, and from systems design in its narrower sense (procedures) toward the designing of what are known as Business Information Systems. One of the reasons for this is the fact that the more recent computers are becoming increasingly suited to integrated application. It is precisely this integration that makes high demands on systems analysis

A general survey will now be given of the great diversity of activities which have to be carried out in designing and introducing integrated systems. Methods and techniques used in analysis will also be dealt with. Among other things an analytical system will be discussed which has been especially designed for creating comprehensive integrated systems. Activities associated with creating new systems can be divided into three groups:

- preliminary analysas
- systems analyses
- realization

The present systems analyses step is the most important. Therefore most attention will be paid to them. However, it is desirable to devote some attention to the preceding analyses as a starting-point or background for these systems analyses. Before dealing in detail with the various sub-analyses we will first make a general survey of these.

General preliminary analysis

The general preliminary analysis serves to obtain an insight into the desirability or otherwise of further analyses such as a feasibility study, systems analysis and so on. The degree of acquaintance of the systems analyst with the firms objectives, functions, size, and organization plays an important role in this connection. If an external systems analyst is involved, he must be briefed fully to enable him to use this information effectively.

Next, an inventory is made of the organization's weaknesses Of course special attention is devoted to those weaknesses which can be overcome with the aid of automation. Finally conclusions are drawn, the problem is defined, and a decision made as to whether further analysis is required. In drawing conclusions care should be taken that the consequences associated with overcoming the weaknesses will not, in turn, nullify the advantages.

Feasibility study

In this context, the feasibility study is viewed as a study of

the economic efficiency of an alternative system using electronic equipment. It resolves itself into a cost comparison between the existing system and the most advantageous alternative system. This study should provide an answer to two questions, namely:

- is it desirable, now or in the near future, to change over to automation?
- if so, at what level of automation should further study be aimed?

The first step is a very general recording of the existing system, and determining the costs of this system - the latter by determining the costs of those departments which could be changed through automation. An alternate system is then developed for the most important procedures, and savings obtainable by the introduction of these systems determined. The latter two steps require a very great deal of experience on the part of the analysts. Then, the costs of exploitation of the computer are calculated, and compared with the total savings. In many cases the result of this analysis will be determined by these advantages of automation which it is impossible or very difficult to measure.

Preparation for systems design

As previously stated, designing an integrated information processing system makes high demands on systems analysis. Therefore it is desirable to make thorough preparations for this analysis. Hence the insertion of a separate stage in the series of sub-analyses is discussed here. The first topic would be: the staff necessary for the analysis. This would include the steering group, the possible working groups, the individual experts, and the executives that will eventually be involved.

Another important point is the methodology of the analysis (subjects to be studied, staging, angle of incidence and the like). In this respect the objective of the analysis should be taken into account, which is the designing of an extensive, complex, and integrated system. Finally, the analytical techniques to be used will have to be determined beforehand. This is valid not only for analytical techniques, recording and designing techniques, but also for techniques of transfer of knowledge or communication.

Designing the information system

The first step in the actual system analysis is designing the Business Information System (B.I.S.). In this context B.I.S. is understood to mean an integrated system for all information collection and information flows within the firm. This analysis is initiated with an analysis of the need for information. The present need as well as the future need are part of this analysis.

In addition to the information itself, attention must be paid to frequency, numbers, form and presentation, and so on. After - and partly also during - this analysis the data obtained is structured, and the B.I.S. established. This could be called, as in bookkeeping, designing an account schedule (information collection), and a booking schedule (information flows).

Designing the organization system

In this sub-analysis the information processing organization is designed, i.e. the organization of hardware and staff. One could put it this way: the production means with which the information determined (the product) should be produced. Regarding hardware this means determining the configuration, choosing the specific equipment and the manner of its exploitation. Therefore here it is the choice of hardware-analysis that is under discussion, and is viewed mainly as a separate sub-analysis. Designing the personnel organization consists of restructuring the new, the changed, as well as the permanent functions into a new organization structure, and of writing out new job descriptions. Furthermore the requirements for the new functions must be re-phrased, functions re-allotted, and possibly new staff recruited. Finally, the man/machine co-operation must be organized.

Preparation for systems elaboration

Choice of hardware is followed by a re-orientation in the analysis. The analysis aimed up to this moment at the whole firm can now be sub-divided into part-projects for evaluation purposes. Now also can other analysts be engaged. Now that hardware has been chosen, the information, training and instruction as far as they are machine-dependent can be realized. Furthermore it is desirable - in view of the further division of the analysis (e.g. into procedures) and the engaging of more staff - to start paying more attention to the planning and the arrangement of the analysis. Analytical techniques and the documentation to be used can also be determined now.

Designing the processing system

A method must be elaborated for each procedure - of course, in conjunction with the other procedures. This is the analysis in which the flow of information throughout the firm is determined and recorded in so-called flowcharts; these flowcharts are not only produced for the information which will be processed by a computer, but also for the information which has still to be processed manually.

In this analysis also information carriers are designed, this is in addition to determining the information flows. This concerns machine-dependent information carriers (punched cards, output forms, etc.) as well as forms to be completed by hand (among which punched documents, etc.)

Designing the instruction system

This is the final stage of the actual systems analysis, i.e. writing out detailed instructions for hardware and staff. As far as the hardware is concerned this means programming. In addition to the procedures which were designed during the preceding sub-analysis in which the information flow within the firm was determined, in regard to programming the information flow within the computer is then determined. Instructions are written either directly in machine-language, or in a problem-oriented programming language to be translated by the machine.

The detailed instructions for manual operations are growing less and less important since it is precisely these routine operations which require detailed instruction that can be carried out better by a computer.

Realization of the designed system

Designing the system is followed by its implementation which is usually termed introduction. The introduction is an important stage which formerly sometimes did not receive sufficient attention, with all the consequences that this entailed. The introduction can be divided into two parts, the part involved in the building up of the executive organization and the part involving the actual conversion.

Preparing the executive part of the organization comprises: equipping the computer room, instructing executives, and providing the necessary new documents.

The conversion consists mostly of converting existing files into their new form. In addition it comprises what is known as "parallel-running" during which activities are carried out in one or more cycles on the basis of the old as well as the new system in order to avoid risks. Conversion in general is a difficult period, during which many problems - some of them unexpected ones - have to be solved.

Supervision of the realized system

Supervision of the introduced system may be viewed as the final stage in automation. It consists, first of all, of testing the introduced system against the planned system. This test concerns the information itself (quality and speed) as well as the costs of producing the information. Divergences between planning and achievement may lead to changes in the planning or to a better understanding of the limitations of the planning.

Another aspect of supervision is systems maintenance. In regard to programming this function has already for years been regarded as an important one. Maintenance is effected by means of a system of rules governing changes in information needs or additions to the equipment.

Continuity of analysis activities

In recruiting specialized automation staff the question formerly often asked was: what are we to do with this staff when, in a few years automation has been achieved?

In practice the answer to this question appears to cause fewer problems than one expected at first. First it seems that most of the time one has been too optimistic in estimating the total time needed for the implementation of an automation project. Secondly, the greater possibilities of the hardware enable greater integration to be achieved; this considerably lengthens the time needed for preparation and introduction. Furthermore the supervisory stage calls for specialized staff after the introduction of automation. And finally, because of the rapid development of the hardware replacement on the basis of economic obsolescence can be made at an earlier stage than was at first expected.

These developments enable automation staff in most cases to tackle the next analysis as soon as their jobs in the current automation project have come to an end. A number of bigger firms in the Netherlands cannot even wait for this. The result is that two teams work simultaneously, and their work overlaps.

The problem of under-utilization because of lack of continuity no longer appears to exist. Automation is growing into a more and more continuous process in which the completion of one analysis is at the same time the start of the next one.

3. The automation study as a system (the implementation of automation-projects)

Definition of the problem

The greater possibilities offered by computers with regard to integration as well as to programming languages is having a great influence on systems work.

Thus interest is shifting more and more from programming towards systems design, and from the design of partial systems towards the design of integrated systems. The latter especially makes high demands on systems analysis. Instead of the incidental application of individual techniques a systematic approach should be found, with an integrated application of appropriate techniques.

In this paper an attempt will be made to do this in the form of a design method for management information processing systems.

Systems analysis in the automation process

The activities in the field of automating the management information processing may be divided into three groups, i.e.:

- activities prior to the design
- activities concerned with the design
- activities concerned with the realization of the designed system.

The activities concerned with the design are the subject of this part of this paper. However, it is desirable first to devote some attention (as the starting point or background) to the position of systems analysis in the total process of automation.

In devising the design method it is assumed that the designing begins only after it has been decided that it is desirable for the sake of switching to automation now or in the very near future. It has then also been decided toward what level of automation the analysis should be directed. The above is the result of two preliminary studies, i.e. the general preliminary study which leads to the conclusion that an analysis aimed at automation is desirable, and a feasibility study closely related to the first one, which concludes that automation is desirable.

The introduction of the designed system also falls outside the scope of the design method, as well as the subsequent control of the introduced system. The actual design phases are followed by two phases to round off the total process of automation. In the first phase - the introduction phase - the structure of the new departments is dealt with, as also the instruction of the executives, and the conversion of the old system into the new one. The last phase - the controlling phase - consists of testing the new system operating it, and, finally refining it.

Starting points for the design method

Before dealing with the form and contents of the design method it is desirable to discuss the factors which determine this form and contents. These include, among others, the:

- aim of the study
- object of the analysis
- order of the analysis.

Aim of the study

What is the aim of our study - an information processing system or a controlling system?

In view of the great possibilities offered by computers, among other things, with regard to the controlling of a business, the choice must be - a controlling system. The most important aspect is not the choice between one type of system or another, but much more the idea of emphasis. In order to make optimum use of the computer its possibilities should be used as much as possible. In other words, a check should be made as to what management activities can be prepared or taken over by the computer. It will be clear that in designing a control system the information processing system is included.

Another characteristic of this controlling system is that, in general, it is complicated and bulky. The cause of this should be looked for in the specialized nature of the job, and the functional organization which will be carried through on the basis of this. The latter entails many problems of co-ordination. These problems grow bigger when production means specialized in certain types of jobs have greater capabilities. This makes it desirable to expand the range of products in order to make full use of the available capacity. The co-ordination problems do not only concern the various operations of one product, but also the various operations of several products. It will be clear that the above considerably increases communications, and consequently also the complexity and the volume of the information processing.

On the strength of what has been said before the first starting point for devising a design method may be defined as follows: "The aim of the study is to design control systems; these are generally complex and bulky. In the study special attention must be paid to the management activities as well as to the manifold and frequent relations existing in this kind of system."

Object of the analysis

Designing controlling systems implies that the first phase of the study i.e. the analysis, should be centred on management activities. These management activities should be analysed against the background of the executive activities. In a

thorough analysis it may be desirable to go as far back as the primary functions, or possibly even the objectives of the business.

When analysing the management activities the main subject is management information, i.e. the information required for controlling (in the broader sense of the word). In terms of information processing one could also refer to this information as "final information". The intermediate information is not yet important when analysing the need for information; it becomes important only in the information processing stage. In order to be able to produce this final information (output) initial information (input) also is required, as well as the rules to be applied in the production of the information.

The above shows that management information is the object of the analysis. It should, in the first place, be looked for with the managing personnel. This is contrary to the analysis of the old information processing system.

Quite a number of objections may be brought up against the latter procedure.1/

In the first place, this system has to be adapted to qualitative and quantitative changes which have occured in the activities since the design of the old system. Therefore, to the designer, the system should be the goal, not the starting point.

Another argument which rejects analysis of the old system procedure as the starting point for the new one, is based on the fact that the difference between the old and the new system grows bigger through the use of electronic equipment (especially where "controlling" in the narrower sense is concerned.)

So it is not an imaginary danger that solutions, which are not obvious at first but which often are very interesting ones, are overlooked. One could even put it this way: the greater (more advanced) the possibilities for the design of a new system, the greater the chance that they will not be realised when the old system is taken as the starting point

Finally there is an objection which every experienced systems designer has had to deal with, i.e. the fact that "analysing" the existing system in practice often results in a very detailed "registration" of the existing situation. Consequently, apart from the expense, much costly time is lost.

For especially in designing advanced systems one is often able to use only a very limited portion of the old data which have been gathered at the expense of so much time and trouble. The

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1/ This does not refer to involving the old system in the introductory and feasibility studies which precede the actual study.

most important function that we think this form of "analysis" may still have is to bring the young and inexperienced systems designers "into the picture" with regard to the systematics of information processing. The same applies to analysts who have to design a system for an, to them, unfamiliar industrial process, in other words, for a process in a field they are not an expert in.

Therefore, in our opinion it is necessary in the first instance, to concentrate in the study concerning a new system on the management activities themselves, as well as on the problems and needs directly resulting from these activities. In case one would wish to check how the old system works this may still be done incidentally. One has then in any case gained in that only a limited part of the old system has been analysed and that this may be done in a more direct way and with greater effect. One of the results of this approach is that analysis and design are no longer carried out separately. And rightly so, since the designing of new systems implies an integrated way of thinking: analytical and synthetical.

Therefore our second starting point is: "The object of management information, and the initial information and rules that go with it. It is of little or no use to begin with a full and detailed analysis of the old system. If desired, however, during the designing stage of the new system, partial but directed analysis of the old system may be carried out."

Order of the analysis

The analysis may be carried out from various starting points, and in various orders. Two important possibilities are: by procedure, and by department. Both procedures have some advantages and disadvantages. The most important of these are as follows:

Advantages of analysis by procedure:

- it is centred on the integration of operations
- it is centred on the integration of files
- it gives better insight into the initial, the intermediate, and the final information
- it enables a complete and exact procedure to be achieved more easily
- independent from existing organization
- it enables duplication to be discovered more quickly.

Advantages of analysis by department:

- it promotes better relations with line personnel
- it gives better insight into the relationship between procedures
- it enables informal administration practices to be uncovered more quickly
- it ensures that line personnel is disturbed less frequently.

A further look at the advantages of both of the procedures that have been described reveals that it is certainly worthwhile to make use of both of them. With the "by procedure" approach it is in particular the insight into the various possibilities for integration which is important; with the "by department" approach it is the main advantage of the better relation with the line personnel. An attempt should therefore be made to find an approach which provides the advantages of both orders as much as possible. The way in which this is done depends on a number of circumstances, and it should therefore be determined in each case.

Form and contents of the design methodology

On the basis of the above considerations, it may be concluded that there is a point in using a design method for control systems. This method should be based on the principles developed above. Furthermore, it should be so flexible as to be capable of application in every situation. In view of this last requirement we should, perhaps, speak of an approach rather than of a system or method. This approach is given as a survey.

Information, organization, processes and methods

In elaborating the approach, the starting point was that in the system study four main phases could be discerned. These main phases relate to:

- the business information
- the control organization
- the control processes
- the control methods.

In this connexion, processes concern the working methods of groups of people and machines, and the methods concern the working methods of individual human beings and machines.

Each one of these four studies produces a specific part of the total control system, controlling (production) means included. The study of business information is devoted to the information systems and the form and presentation of information.

The aim of outlining the control organization is to elaborate an organizational system in which the care of equipment and personnel is included. The result of outlining the control processes is a process system, which includes different types of information carriers. The outlining of the control methods results in a methodical system, method-dependent expedients included.

The division into four main phases given above is based on the fact that each one of those phases forms a more or less complete sub-study. The result of each of those studies, however, has a determining influence on each of the subsequent studies.

Analysis, design and choice

The four sub-studies have the same basic pattern as regard approach. Each of them begins with an analysis of the controlling activities (analysis) and continues with the design of the controlling system (design), on the basis of which the controlling means are finally chosen (choice). These three phases concern respectively:

Sub-studies	Analysis	Design	Choice
Information	Main tasks	Information objects	Presentation information
Organization	Tasks	Tasks links	Equipment/ personnel
Processes	Operations	Operation links	Information carriers
Methods	Actions	Working areas	Expedients

Outline of procedure

The three phases (analysis, design and choice) are also identical in their working methods, even if only in a limited way. All three start off with the outline of data to be studied and do this in chronological order, for each working place within the organization, and each kind of work. In the analysis a chronological order is chosen, because this provides the optimal number of guarantees that the activities can be studied, as much as possible, in their functional relationship and as apart from the existing system as possible It is obvious that designing starts off with an outline of the system elements obtained by analysis according to organizational place. It is this outline that provides the structure (the framework) of the system. The reason for an outline by kind of work at the beginning of the choice-procedure is that it is more practical to combine identical kinds when a number of choices had to be made.

After having given an outline of the data comes elaboration. This is different for each of the three phases. As regards

controlling activities, these consist of the following: for each of the four main phases:

- determining the necessary controlling activities (main tasks, tasks operations, actions);
- determining the nature of these activities (kinds of information, kinds of responsibility, kinds of operations, kinds of action);
- classifying those activities according to system elements (information objects, task links, operation links, working areas).

In connexion with the design of the control system, elaboration implies for each of the four main phases:

- stating nature of the activities per system element (kinds of information, kinds of responsibility, kinds of operation, kinds of action);
- stating the conditions connected with the activities per system element (regulations, competences, critical points, place determinations);
- adjusting the mutual activities quantitatively (time schedule, occupation scheme, operation planning, action planning).

In connexion with the control means elaboration, for each of the four main phases, it consists of:

- determining the requirements, starting from the system element (information objects, task links, operation links, working locations);
- determining the characteristics of suitable control means (information, equipment/personnel, information carriers, expedient);
- choosing the most suitable control means (information, equipment/personnel, information carriers, expedients).

Other characteristics of the method survey

In each of the four main phases the survey is divided, after the analysis, into two parallel studies.
In the first main phase (study business information) this division concerns the distinction temporary/permanent information; in the three following phases - the study of the controlling organization, processes and methods.
This division relates to the distinction equipment/personnel, and is made because study aspects and techniques for both of these groups are so different that an identical approach is not easy to achieve.
This approach forms a closed system, beginning with an analysis of the activities derived from the enterprise's objectives, and ending with the choice of the simplest expedients.
The elaboration is such that all steps in each of the four studies are linked together by the data to be studied.
This implies that the data can always be logically transmitted from one kind of study to the following one. It is obvious that as more and more data are included, changes in the outline will be necessary. The results of each of the four studies are used according to a certain system of analysis, as well as the design and the choice of each of them.

The interrelationship between the four main phases is thus guaranteed, from which the final result will benefit. For the benefit of integration of the study itself all data are coded, in chronological order, as well as according to organisational place and kind. This makes it possible for the study to be executed with a high degree of uniformity (routine) and with the same tenor. This is of particular importance when the study is made by a team.

This design approach is not meant to be a methodology to be applied in detail to every situation. In many cases some parts of the system will be sufficient depending, on the one hand, on the kind and volume of the study, and, on the other hand, on the knowledge and experience of the designer.
An experienced designer, having knowledge of the specific business, will be able to design large parts of his programme without a detailed study. However, designers having to work with less experienced assistants, will find considerable assistance by applying an integrated and standardized design method.

Possibilities and limitations of the design methodology

The design methodology developed above is applicable widely and has many advantages. It also has some disadvantages. A list is now given of the most important application possibilities, as well as of the advantages and disadvantages.
Application possibilities are:

- manual, for use in the execution of the study (checklist, instruction, etc.);
- basis for study arrangement (planning, and follow-up control);
- starting point for the division of tasks between the analysts (sub-studies, and possibly phases);
- classification system for documentation of study (by project, by project group, incidental data, etc.), (standardised study forms);
- starting point for the training of analysis (information, education, instruction, etc.);
- basis for the calculation of study costs, (study budgeting, etc.);
- first step in the conversion of the study into a routine job (engaging grade analysts, automation of study, etc.);
- standardization of systems studies (comparison of study internally and externally, etc.);

Advantages of design methodology:

- shorter preparation time for the study (approach, techniques, etc.);
- better insight into the study for management (project manager, senior systems designer, etc.);
- simplicity of replacement of analysts (illness, transfer, discharge);
- better access to studies of complex and voluminous integrated systems.

Disadvantages:

- the methodology suggests a uniformity in importance of and time devoted to the various phases (in the first instance it gives a wrong impression);
- adapting the study to the situation is not easily possible (forced procedure, unnecessary work, etc.);
- adapting the approach to the analyst is not easily possible (no optimum result, feelings of unrest, etc. dictatorship of the system).

Some of the possibilities mentioned above will now be treated briefly.

Documentation of the survey

For example, in addition to the outline, a system of study forms has been developed. These forms are so standardized that the whole survey can be completed with only four forms. Those forms have been designed for analysis, design and choice. The design of all these study forms is basically the same, so possibly one basic form could be used. Only the number of columns is variable. Forms allow for completion by hand (without drawing expedients) as well as with a typewriter. Size is DIN A4, all lines and columns are standardized to normal typewriter-spaces.

Other documentation functions

Apart from the usefulness of a model as a documentation manual in the system itself, this approach can be applied also as a basis for other documentation work. For instance for storing system data in general, as well as for recording of the data of a specific concern. Such documentation data (general or from a specific concern) forms a very effective check-list for the system designer. The 'element design' of the approach, when applied to a specific concern forms an organizational guide in a broad sense, that is, including working instructions and control programmes.

Training of system designers

In training system designers this approach can be used to form a counter-weight to training programmes which, up to this moment, are set up very fragmentarily and incidentally. Especially in respect of the ever growing possibilities for integration of new equipment, a training programme centred on the development of integral systems is certainly advisable.

Automation of systems study

The possibilities of automating the system study itself has not been achieved yet. However, it can be expected that in the near future certain elements of the system study will be capable of being automated to lesser or greater extent. For this purpose a thorough and logical method for outlining a system is a primary condition.

4. Model of a systems study

In order to illustrate the procedure with the systems study discussed above, an application has been elaborated in the form of a case. With reference to the four sub-studies of the systems study this case consists of four parts. In each one of these, one of the four systems already discussed is set up and elaborated. Here, usage is made of the classification system and the standard study form (Appendices III and IIIa).

The case is described hereafter; the completed study forms have been inserted as an appendix. (Appendix IV)

Design of the information system (Appendix IVa)

The purpose of this study is to design a business information system; it concerns exclusively the information itself.

The first phase "analysis of the activities" is centred on an inventory of the information objects, i.e. the system elements of the information system. It begins by determining the procedures, and their classification in chronological order. Then, an inventory is made of the jobs per procedure, which also are classified chronologically. Finally, a check is made, per job, of what information is required in order to process the job in question, and to what objects this information relates. The information objects are divided into "temporary" objects (activities), and "permanent" objects (situations).

During the second phase: "design of the system", the elements of the system revealed during the analysis are put together into an information system.

First of all the temporary information object (activities) are classified according to their organisational position. (In many cases the value cycle within the business will prove to be a practical order.) The permanent information objects (situations) are dealt with in the same way. Next, the need for information is specified for each temporary information object (activity) per job (in general an information carrier). It is also checked in what way the intended information will be obtained; this will be either from a file of a permanent information object (situation), or from an operation.
Finally a specification is drawn up for the information contents and the information gathering of the files with respect to the permanent information objects (situations).

During the third phase: "choice of means" the form and the presentation of the information is determined. First an inventory is made of the requirements as defined by the user of the information. Then the various possibilities are gathered and evaluated by the analyst. Finally the user and the analyst consult each other on what choice to make, and the chosen form and presentation is recorded.

Elaboration
The business information system to be set up according to the design system is elaborated, and recorded with the aid of the documentation system which is appropriate to the design system in question. This system consists of a classification of the phases and the sub-phases of the design system, and a set of standard analysis forms.

Classification is based on a decimal coding system consisting of three digits (see Appendix III). The analysis forms are standard, this enables the complete analysis to be carried out using only a limited number of forms (4). These four forms have been laid out for analysis, design and choice. The main lay-out, as well as the distance between lines and between columns is the same for all forms, so that one basic form may be used (see Appendix IIIa Basic Form Systems Analysis). At the bottom of Appendix IIIa is indicated how the basic form is adapted to the analysis phase.

Determining the main procedures (phase 1.1.1., sectioning form)
The first step in the analysis is the division of the total business activities into main procedures. The most important criterion in this division is that as few communication lines (information flows) as possible should be cut through in order that in the analysis, more or less complete business departments may be used as units. In many cases the structure of the model described above (B.I.S.) may serve as a practical example. The main procedures found are arranged in chronological order and coded, and entered on a heading form. See Appendix IVa form phase 1.1.1. subject 0.

Inventory of information objects (phase 1.1.2., analysis form)
The necessary main jobs are determined for each main procedure and entered in chronological order on the analysis form. For each job is given the time intervals, the chosen moment within these periods, and the number of times the job is carried out. A check is then made for each job in regard to what information is needed in order to carry out the job, and to what objects this job is related.
For example: in selling, products information is required e.g. in the form of an order confirmation. On this order confirmation data is given regarding the client (permanent object 'clients'), the products (permanent object 'products'), and the order itself (temporary object 'sales'). The information objects found are entered in the heads of the columns, while the horizontal lines indicate for each job what objects occur with what jobs. A mnemonic code in the upper part of the column indicates whether the objects belong to the temporary or the permanent category (i.e. activities or situations), as well as on what level they are (managerial, instruction, or execution). See form phase 1.1.2 subject 111/4.

Mutual structuring of information objects (phase 1.2.1. and 1.2.6., heading forms)
The objects found are arranged, separately for temporary and permanent ones, in a systematic order such that the structure of the information system is revealed. Here the main lay-out will mostly follow the value cycle. The object levels (management, instruction, execution) are expressed in the records using separate columns for the various levels. The position of the objects in the total structure is indicated by a decimal code. See form phase 1.2.1 subject 0 and phase 1.2.6 subject 0.

Specifications and gathering of information to be provided (phase 1.2.2., design form)
The information to be provided is specified for each temporary information object (activity) per job. For each information object a design form is therefore prepared containing all the jobs for which information is required regarding the object in question. These jobs are obtained by selecting from the analysis forms all the jobs referring to the intended object. In the column "specification of need for information" the information carrier is stated against each job, and also its contents. Then against each information unit is indicated how this information was obtained, e.g. name and address of client from the file (permanent information object) of clients, number of products from the order form, possibly as the result of applying of decision rules etc. After the indication of the file, the coding (position and structure) is stated; when decision rules are being applied, the decision tables are added. The completed design form gives a clear picture of the possibilities for the integration of both operations and files and of the files per operation to be joined together. See form phase 1.2.2. subject 121/41.

Specification and gathering of information to be stored (phase 1.2.7., design form)
The information to be stored per permanent information object (situation) is now specified. For this purpose, a design form is prepared for each object containing all information units to be stored with respect to the object in question. These information units are obtained by scanning the "gathering" column of the design forms for the temporary objects, according to the so-called exhaustical method, in order to find the code of the permanent object to be specified. Each time this code occurs the preceding information unit is copied into the design form stating the job and the information carrier that go with it. Each information unit is entered only once in the form, but the job and the information carrier are repeated.

Then, against each information unit is indicated how this information was obtained. As far as the alphabetical data are concerned these will be mostly covered in special change forms; the numerical data are entered mostly along with some form of processing information. The contents of the files which have been created in this way completely satisfy needs: all necessary information is available, and no superfluous information is stored. See form phase 1.2.7. subject 126/41.

Choice of form and presentation of the information
(Phase 1.3.2., 1.3.3., 1.3.4; choice form)

The first step in this choice is to determine the requirements of the user. The user will generally phrase his demands in a rather vague way, without any, or much knowledge of the possibilities and the limitations of the hardware. In general no forms will be completed for this purpose during the analysis. To illustrate this phase, however, an example of such a form has been added to this paper. On the left are given the various subjects covered by the form followed by a specific definition of the choice. See form phase 1.3.2. subject 121/41.

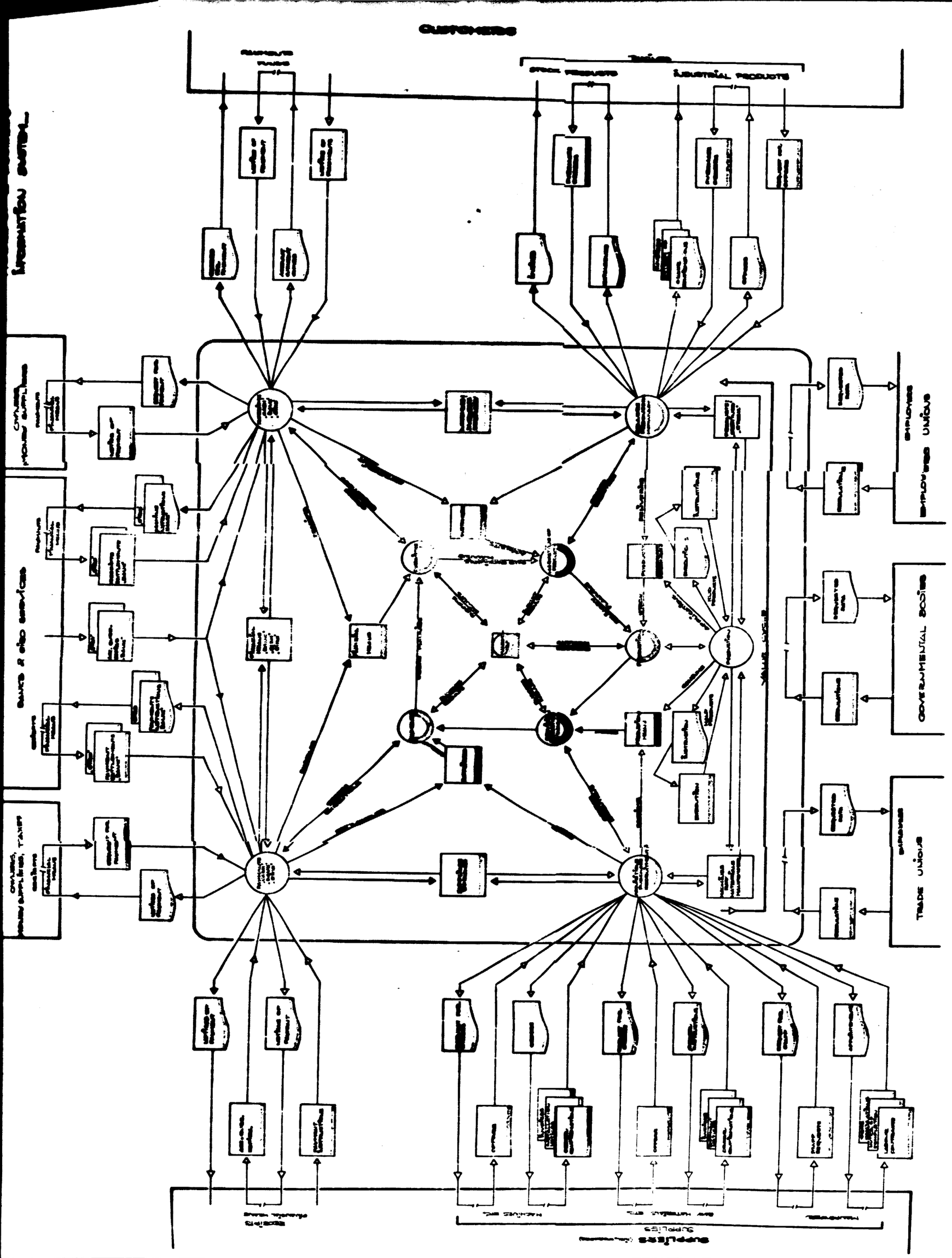
In order to be able to judge how far the user's requirements regarding the form and presentation of the information can be met, the analyst must be well aware of all the possibilities. Although it is desirable that he knows these various possibilities from his own experience, and that he has full knowledge of the advantages as well as the disadvantages, it may be desirable to have a full systematic survey carried out. To illustrate this point such a survey has been added to this paper. On the left are given the various subjects that are covered followed by the specific possibilities per subject in the next columns. See form phase 1.3.3. subject 121/41.

In the end the choice lies between, on the one hand, meeting the user's requirements, and on the other hand, the possibilities of the system. The reasons for the choice should be stated on the analysis forms. The chosen form and presentation should be so defined in such a way that the intentions of the systems or forms designer are explicitly clear. See form phase 1.3.4. subject 121/41.

Design of the organization system
(Appendix IVb)

Design of the processing system
(Appendix IVc)

Design of the instruction system
(Appendix IVd)


CUSTOMERS
INFORMATION SYSTEM
SUPPLIERS

MODEL OF A BUSINESS INFORMATION SYSTEM

Appendix Ia

Explandion of symbols

information processings

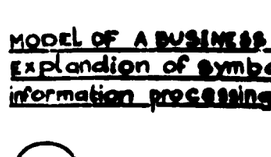
= production of policy information

= production of management information

= production of execution information

Files

= data on "activities" (temp. inf obj)

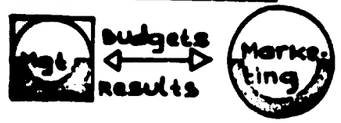


= data on "situations" (perm.inf obj)

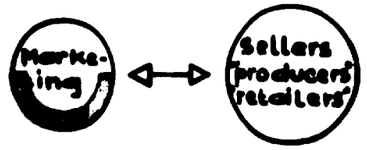
= data bank 'management'

= data bank 'execution'

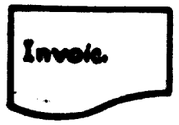
Information flows



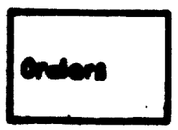
= sales and cost budgets (—►) and results (◄- -)



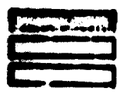
= information re instructions (—►) and executions (◄—)



= outgoing from the business

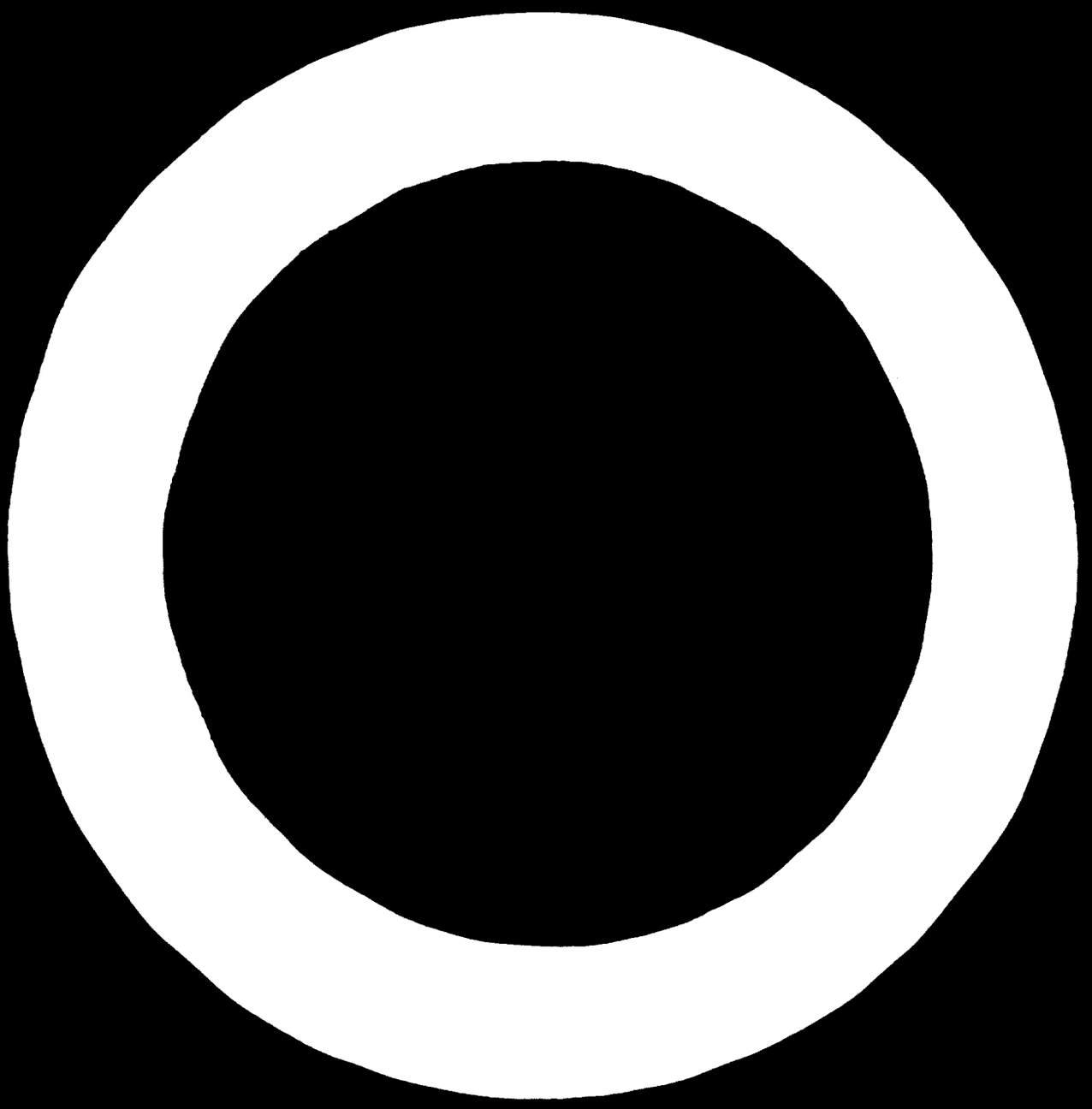


= incoming into the business

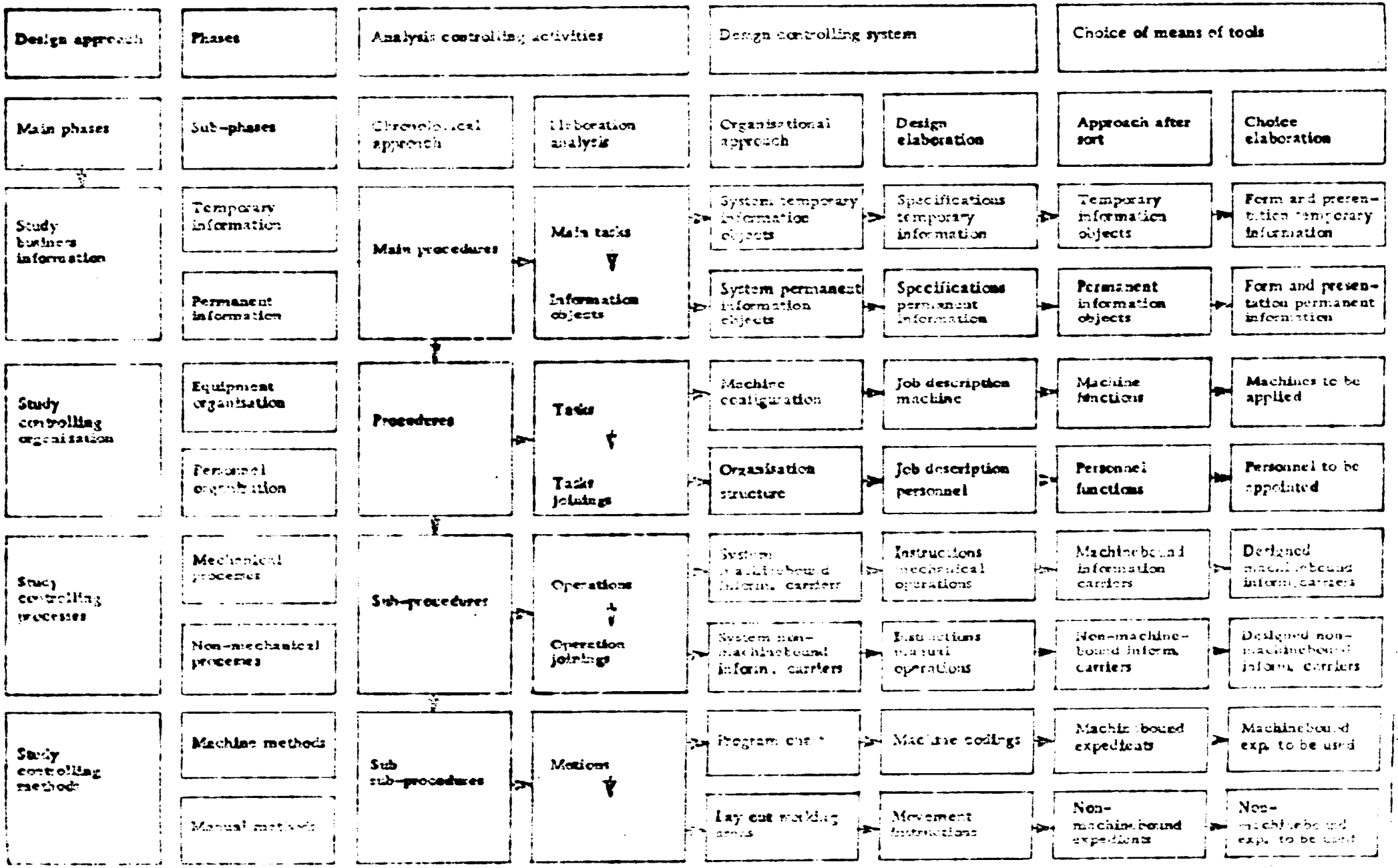


Explanation of colours:

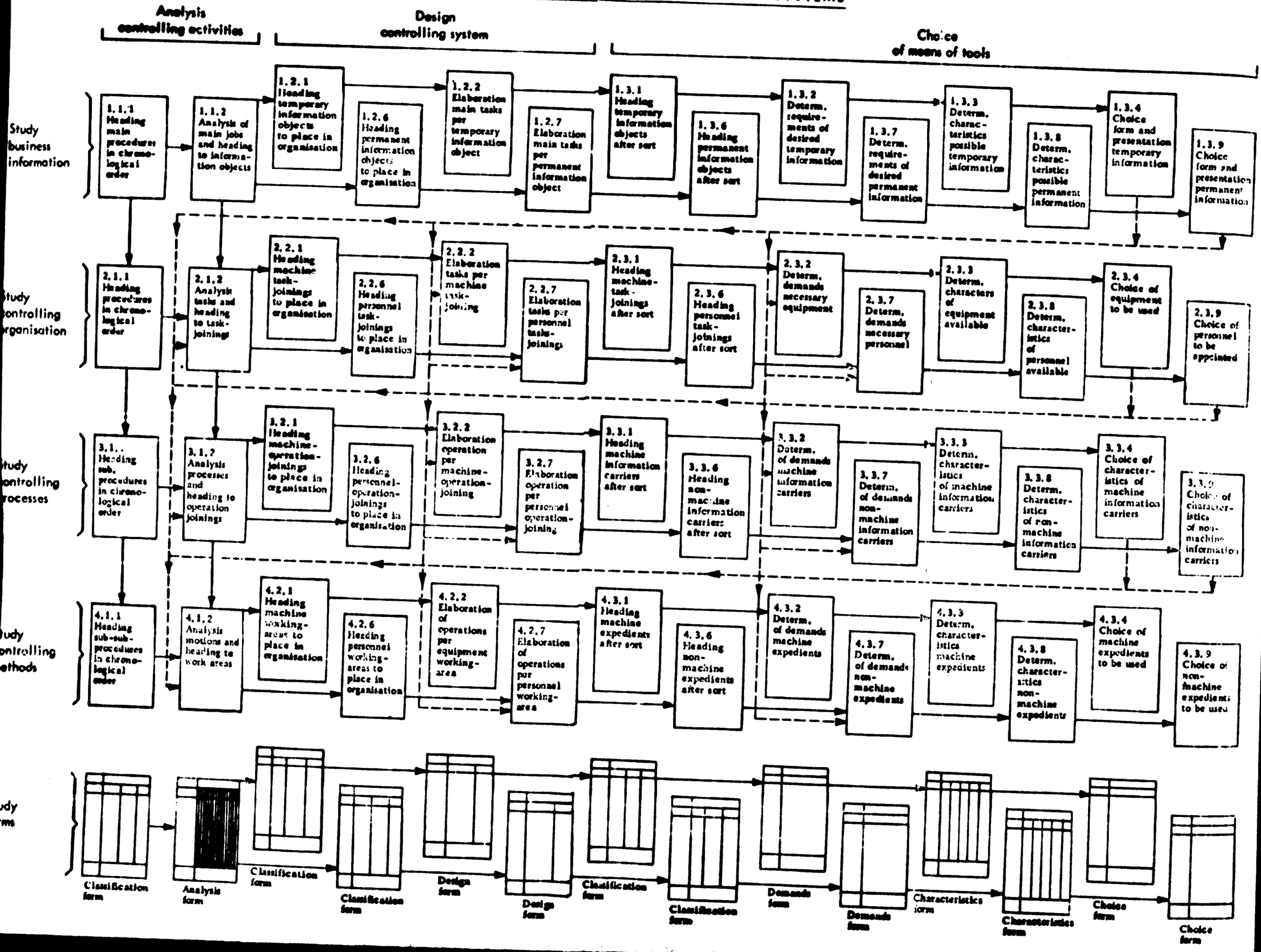
Red = data bank 'management'
Blue = data bank "execution"
Green = external information flows



DESIGN APPROACH FOR CONTROLLING SYSTEMS



DESIGN APPROACH FOR CONTROLLING SYSTEMS



Phase :

Subject :

Code number :

Sub-phase :

Description of subject :

code sequence	Description	frequency number per period	code : chem./organ./type

Explanation :

Notes :

Basic-formula system study

... Management information | Subclass: ... to information ... | A... N...
... Marketing ... | Description of subject: ... elaboration of sales planning ... surveys
... number: ...

code	Description	frequency number per period	code: chron./organ./type	Management (total planning) PA		Marketing of products (sales planning) MA		Retailers EA		Wholesale dealers ES		[illegible] products [illegible]		Sales retailers EA		Sales wholesale [illegible]		Marketing of product [illegible]		[illegible] MS		Destined products [illegible]	
	Elaboration of sales planning	Q-0		√		√																	
	[illegible]ertising	Q13				√		√		√															
	[illegible]ing stock products	D-- 3?0						√				√		√											
	[illegible]ing stock products	D-- 350						√				[illegible]		√											
	[illegible]ing stock products	W2 [illegible]0						√				√		√						√					
	[illegible] destined products	D-- [illegible]								√						√						√			
	[illegible] destined products	D-- 175								√						√						√			
	[illegible] destined products	W2 4?0								√										√		√			
	[illegible]distribution of sales surveys	[illegible]3														√		√							

[illegible]ection: Periodical [illegible]
[illegible]ns/--
[illegible] (0 through 2?)
[illegible] (1 through ?)
[illegible] (1 through [illegible])
[illegible] (1 through 1?)
[illegible] week (1 through 26)
[illegible] (1 through 52)
[illegible]dental/--

Notes: [illegible]
PA [illegible]
MA [illegible]
EA Exe[illegible]
PS P[illegible]
MS [illegible]
ES Executing stations

Phase : Analysis Management Information

Sub-phase : 1.1.1 Heading main procedures in chronological order

Description of subject : The total activities of the business starting with preparation of prov production and marketing up to and including ev luation

code sequence	Description	frequency number per period	code : chain/organ./type	Main procedures	Procedures	Sub-procedures	Sub-sub-procedu
			1	Preparation activities			
			2	Execution production means			
			3	Production			
			4	Marketing			
			5	Arrangement payments and penalties			
			6	Evaluation activities			

Explanation :

Notes :

Phase : 1.2 Design information system

Subject : System activities

Form number : 121[illegible]

Sub-phase : 1.2.1 [illegible] activities to [illegible]

APPENDIX [illegible]

Description of subject : System for all activities [illegible] information objects.

Activities [illegible] information objects

code	Description	frequency	number per period	code : chron./organ./type	Policy data	Management data	Execution data
				0	Management		
				1		Payments	
				11			Cash payments
				12			Payments by bank
				13			Payments by giro
				2		Provision production means	
				21			Purchases of durable prod. means
				22			Purchase of raw materials
				23			Personnel recruitment
				3		Production	
				31			Production of spare parts
				32			Assembling [illegible] products
				33			Assembling [illegible] products
				4		Marketing production	
				41			Sales retailers
				42			Sales wholesale
				43			Sales producers
				5		Receipts	
				51			Cash receipts
				52			Receipts by bank
				53			Receipts by giro

Explanation :

Notes :

Phase : 1.2 Design information system

Subject : Sales retailers

Code number : 120/41

Sub-phase : 1.2.2 Elaboration main tasks per temporary information object

Description of subject: Specification need for information regarding sales retailers (per maintask)

APPENDIX

maintasks				elaboration maintasks	
code sequence	Description	frequency number per period	code : chron./organ./type	Specification of need for information	Obtaining information
1	Sales stock products	D--300	43	Orderconfirmation	
				- name and address retailers - codes products	- retailers (120/51) - stock products (120/41)
				- description products - number of products	- stock products (120/41) - sold - too small stock
				- date of confirmation - date of delivery	- constant - requested and too late finished
2	Delivering stock products	D--350	44	Notice of shipment	
				- name and address retailers - codes products	- retailers (120/51) - stockproducts (120/41)
				- description products - number of products	- stock products (120/41) - sold - too small stock
				- name of shipper - date of notice	- retailers (120/51) - constant
3	Invoices stock products	W-2 80	45	Invoice	
				- name and address retailers - codes products	- retailers (120/51) - stock products (120/41)
				- description products - number of products	- stock products (120/41) - sold - too small stock
				- product prices - product discounts	- stock products (120/41) - numbers x prices
				- gross total amount - discount percentage and - amount	- subtotals products - percentage x gross amount
				- nett total payment - terms of payment	- gross amount - discount - retailers (120/51)
				- date of invoice - date of claim	- constant - retailers (120/51)

Explanation : period/moment

D = continuous

D = Days (1 through 24)

W = Weeks (1 through 52)

M = Months (1 through 12)

Y = years (1 through 3..)

I = incidental/-

Notes :

Basic formula system study

Phase : 1.2 Design information system

Subject : System situations

Number : 126/0

Sub-phase : 1.2.6 Heading situations to position in organisation

Description of subject : System of all situations(permanent information objects)

APPENDIX 2.3

Description	frequency number per period	code : chron./organ./type	Situations (permanent information objects)		
			Policy data	Management data	Execution data
		0	Management		
		1		Funds	
		11			Cash
		12			Banks
		13			Giros
		2		Suppliers	
		21			Suppliers durable production means
		22			Suppliers raw material
		23			Personnel
		3		Production means	
		31			Durable production means
		32			Raw materials
		33			Manpower
		4		Products	
		41			Stock products
		42			Destined products
		43			Part products
		5		Customers	
		51			Retailers
Explanation :		52	Notes :		Wholesales
		53			Producers

Phase : 1.3 Choice of presentation information

Subject : Sales retailers

Code number : 121/41

Sub-phase : 1.3.3 Determination characteristics possible temporary information

Description of subject : Characteristics of the form and presentation of the possible temporary information regarding sales on retailers

Code sequence	Description	Frequency number per period	code : chosen/organ./type	specific characteristics						
1	Information aspects			Quality	Quantity	Value	Result	Place	Origin	Destina
2	Periodical of preparation			Continuous	Daily	Weekly	Monthly	Quarterly	Halfyear	Year
3	Also out within period			Incidental	Hour/day	Day/week	Day/month	Week/Quarter	Week/ Halfyear	Week/y
4	Number of information units			Documents	Posts	Per frequency	Per year	Average	Spreading	
5	Type of writing			Handwriting	Typewriting	Original	Copy	Capitals	Small characters	
6	Size of paper			Vertical	Horizontal	A-series	B-series	Mach. input	Mach. outp.	Folded
7	Nature of document			Normal	Cardfile	Postcard	Internal use	External use		
8	Representativity			Broad	Capital/ small	special paper	Special characters			
9	Transport of documents			By post	Together with goods	Internal	Place or Area code	Window envelope		
10	Document filing			Filing code		Size		Perforation		Duratn
11	Quantity of information per information unit			Posts/ Documents	Characters/ post	Lines/ documents	Characters/ Line			
12	Nature of information			Nr of faults	Size of faults					
13	Course of time occurr./inf.			Average	Minim.	Maxim.				
14	Mechanically legible			Code indications	Type of machine		Machine/ Man	Type of machine		
15	Coding of information				Code Correct.	Code numbers	Symbols	Colours	Mechan. sign	Combi
16	Flexibility inform./docum.			Information	Variable heads	Place of inf.	Size			
17	Various characteristics			Number of copies	Graphic variations					

Explanation :

Notes :

Phase : 1.3 Choice of presentation information
Subject : Sales retailers
Number : 121/41

Sub phase : 1.3.4 Choice form and presentation temporary information

APPENDIX IV.6

Description of subject: Choice of form and presentation of the temporary information regarding sales on retailers

Lines of characteristics			Specific choice
Description	frequency number per period	code : stream/organ/type	
Order reconfirmation	D--300	43	
Quality of writing			- in machine writing; original copy; characters normal size
Format paper			- A4, if necessary adapted to the dimensions of the machine
Lay-out presentation			- not too much different from the actual invoices
Transport of documents			- addresses with at least 2 lines and not more than 50 characters, each
Number of information per confirmation unit			- 20 items (lines) per confirmation with not more than 50 characters per line
Time interval action/inform.			- transport not later than 2 days after date of sales
Coding information			- coding by means of number code consisting of area, salesman, serial number
Various requirements			- 3 copies to be made: for client, salesman and accounts dept.
Advice of shipment	D--350	44	
Quality of writing			- in machine writing; can be double carbonized; capitals
Quality documents (paper)			- moisture and dirtproof (straw, and smooth paper)
Transport of documents			- no external requirements for addressing
Lay-out filing			- format and if possible layout similar to order confirmation
Number information per confirmation unit			- similar to order confirmation
Time interval action/information			- notices of shipment to be prepared before shipment (not more than one day)
Various requirements			- 3 copies to be made: for client, shipping dept and administration
Invoice	W--260	45	

Explanation :

Notes :

APPENDIX

Phase : [illegible]

Subject : stock products (execution data)

Code number : [illegible]

Sub-phase : 1.2.? Elaboration main tasks per permanent information object

Description of subject : Specification of need for information re stock products (execution data, divided per information object)

main tasks					Elaboration main tasks	
code ter	Description	frequency	number per period	code: chron./organ./type	Specification of need for information	Obtaining information
					CODE	
1	Selling			43	- order confirmation	- coding instruction
	Delivering			44	- notice of shipment	
	Invoicing			45	- invoice	
					DESCRIPTION	
2	Selling			43	- order confirmation	- design form
	Delivering			44	- notice of shipment	
	Invoicing			45	- invoice	
					PRICE	
3	Invoicing			45	- invoice	- calculation form
					APPLICABILITY	
4	Advertising			42	- sales letters	- design form
	Making offers			42	- offers	
					SPARE PARTS	
5	Planning use of spare parts			31	- planning list of parts	- item list
	Handing out parts			33	- handing-out slips	
					OPERATIONS	
6	Planning used manpower			35	- planning list of operations	- operations card
	Handing out work			37	- work slips	

Basic-formula system [illegible]

Explanation :

Period/moment

C = [illegible]
D = day [illegible]
W = [illegible]
M = [illegible]
Q = quarter [illegible] (1-15)
H = halfyear/week (1-26)
Y = year/week (1-52)
I = incidental/-

Notes

For specification of the management data for the stock products see study form 12/?. This implies a.o. the following data: planned deliveries and stocks [illegible] and moments, performed deliveries and stocks, real deliveries and stocks, production times, storage- and instruction costs, [illegible]

Phase : 1.3 Choice of presentation information

Subject : Sales retailers

Code number : 121/41

Sub-phase : 1.3.2 Determ. requirements of desired information

APPENDIX

Description of subject : Requirements with regard to form and presentation of the desired information regarding sales on retailers

Types of requirements				Specific requirements
code sequence	Description	frequency number per period	code : choice/degree/type	
	Order confirmation	D--300	43	
5	Quality of writing			- under all circumstances clearly legible for clients
7	Format of paper			- usual format for this type of document
8	Representativeness			- should not frighten client by adaptation to machine
9	Transport of documents			- should be able to be shipped by post
11	Quantity of information per information unit			- should be sufficiently great for 90% of the orders
13	Time interval action/information			- shipment to client as soon as possible
15	Coding information			- area and agent should clearly show from confirmation
17	Various requirements			- agent gets copy of confirmation
	Notice of shipping	D--350	44	
5	Quality of writing			- not necessarily beautiful but clearly legible
7	Quality of documents (paper)			- should remain intact under bad circumstances (moisture and dirt)
9	Transport of documents			- no requirements, may be enclosed with the goods
11	Storage of documents			- preferably the same dimensions as the order confirmation (file together)
13	Quantity of information per information unit			- as order confirmation
15	Time interval action			- should be shipped with the goods
17	Various requirements			- receipt is signed for on shipping notice
	Invoice	W-2 800	45	

Explanation :

Notes :

APPENDIX 5.1

Phase : 2.1 Analysis of organisation

Subject : Marketing

Code number : 111/1

Sub-phase : 2.1.1 Heading procedures in chronological order

Description of subject: Marketing, starting with preparation of sales planning until and including clearing of sales

code sequence	Description	frequency number per period	code : decade/keyword/type	procedures: Main Procedures	Procedures	Sub- procedures	Sub-sub-procedures
			1	Preparation activities			
			2	Provision prod. means			
			3	Production			
			4	Marketing			
1			41		Salesplanning		
2			42		Advertising		
3			43		Orderhandling		
4			44		Delivery		
			45		Invoicing		
			46		Clearing		
			5		Arrangement payments and receipts		

Explanation : 6

Notes :
Evaluation activities

Phase : 2.1 Analysis of organisation

Subject : Orderhandling

Code number : 211/45

Sub-phase : 2.1.2 Analysis tasks and heading to task-joinings

Description of subject: Order handling start e.g. with acceptance of orders until and including oversteppings of credits

code sequence	Description	frequency number per period	code : chem./organ./type	Tasks / Desk joinings: Salesman P	Ass. salesman P	Ass. sales clerk P	Sales manager P	Stock-bookkeeper P	Punching machine E	Punching typist P	Verify punching-machine E	Verify punch.-typist P	Sorting-machine E	Operator (comput.) I	Aggregating-machine E	Interpreter I	Computer E	Computer-operator P	Decollator E	Ass. operator comp. P	Burster E	Check man P	Desk joinings P
1	Acceptance of oral orders	C--126	31	E																			
2	Acceptance of orders by telephone	C--250	32		E																		
3	Acceptance of written orders	D-9 300	33			E																	
4	Pre-processing of cover-form	D10 670	34				P																
5	Checking of art. in stock	D11 -7k	35					C															
6	Writing forms noted	D11 -80	36			E	T																
7	Punching article cards	D12 -6k	37						M	E													
8	Verify punching article cards	D12 -6k	38								M	C											
9	Sorting article cards	D13 -6k	39										SER										
10	Reproducing art. cards	D13 -6k	310											E	A								
11	Sorting article cards	D13 -6k	311										S	E									
12	Interpreting article cards	D13 -6k	312											E	P	I							
13	Printing order-confirmations	D14 650	313														A	E					
14	Separating duplic. of order confirm.	D14 650	314																F	E			
15	Folding of copies of order confirm.	D14 650	315																	E	F		
16	Checking of order confirmations	D15 650	316																			S	
17	Judgment oversteppings of credits	D15 -40	317				D																
18	Shipping order confirmations	D16 616	318																				F
19	Typing corr. of oversteppings of cr.	D10 -40	319			E	I																

Explanation : Frequency/environment
C = Continuous/-
D = Day/hour (-6k)
W = Week/2 w. (-2w)
M = Month/-
Q = Quarter/-
Y = Year/-
E = Existential/-

Notes : Type of personnel tasks
T = Taking cognizance
I = Initiative
D = Decision
P = Preparation
E = Execution
A = Administration
S = Supervision
F = Final judgment

Type of equipment tasks
M = Manual processing
A = Automatic proc.
C = Calculating
S = Sorting
C = Collecting
I = Interpreting
P = Printing
F = Form handling

Basic-formula system study

Phase : 2.2 Design of organisation

Subject : Machine organisation

Code number : 2.2.1/0

Sub-phase : 2.2.1 Heading: mach. task-joinings to place in organisation

Description of subject : System of all task-joinings re machines
(machine configuration)

code sequence	Description	frequency number per period	code : chron./organ./type	MACHINES Task joinings main groups (machine-configurations)	Task joinings groups (machine-combinations)	TASKJOININGS Task joinings (machines)
			1	Preprocessing equipment		
1			11 111		Punching equipm.	Tapepuncher
3			112 113			Cardpuncher (num) Cardpuncher (alph.)
4 5			114 115			Cardpuncher (prog) Card verify puncher
6 7			116 117			Reproducer Converter
8			12 121		Sorting equipm.	Sequence sorter
9			122 2	Processing		Collator
			21	equipment	Input equipm.	
10 11			211 212			Card reader Document reader
12			22 221		Processing equipm.	Comp. unit
13 14			222 223			Core memory Disc memory
15			224 23		Output equipm.	Card sorter
16 17			231 232			Card puncher Tape puncher
18			233 24		In/Output	Line printer
19			241 3	Peripheral		Magn. tape unit
			31	equipment	Card equipment	
20			311 312		Form equipment	Interpreter
21 22			321 322			Decollator Burster

Explanation :

Notes :

Phase : 2.2 Design of organisation

Subject : Printer

Code number : 221/233

Sub-phase : 2.2.2 Elaboration tasks per machine task joining

Description of subject: Specification contents of tasks for printer (separate per task)

code sequence	tasks: Description	tasks: frequency number per period	tasks: code : chosen/largest/type	elaboration tasks: Specification of contents of task		elaboration tasks: Dependency of other tasks
1	Addressing envelopes	Q13 10k	415	-lines per address -characters per line	2 40	-punching address-changes
				-text alphabetically -format A 5		
2	Preparation of order confirmation	D14 ---	431	-lines per confirmat. -characters per line	20 50	-calcul. total amount -conclus. credit value
				-text alphanumerically -format A 4		
3	Preparation of shipping notice	D-9 ---	445	-lines per notice -characters per line	10 35	
				-text alphanumerically -format A 4		
4	Preparation of stock lists	D17 -2k	449	-lines per day -characters per line	600 30	-conclus. limited stock -punching 'to order'
				-text numerically		
5	Preparation of invoices	W-2 500	457	-lines per invoice -characters per line	36 60	-calcul. amounts -punching 'to credit'
				-text alphanumerically -format A 4		
6	Preparation of lists of balance	W-2 ---	466	-lines per week -characters per line	400 45	-conclud. parts expired -punching 'to remind'
				-text alphanumerically		
7	Calculating gross salaries	W-3 -2k	561	-lines per week -characters per line	2000 110	-calcul. amount -conclud. deviations
				-text numerically		-punching 'gross wages'

Explanation :

Preparation of [illegible]	W-3 ---	309

Notes :

-lines per slip -[illegible] -text alphanumerically -format A	3 45	-calcul. deductions -punching 'net wages'

Phase : Design of organisation

Subject : Personnel organisation

Code number : 2.2.0

Sub-phase : 2.2.0 Heading Personnel task-joinings to place in organisation

Description of sub set : System of all task-joinings (structure of organisation)

code sequence	Description	frequency number per period	code : chron./organ./type	PERSONNEL TASK-JOININGS: Task-joinings main groups (heads of services)	Task-joinings groups (heads of departments)	Task-joinings (Shops)
	President Director		0			
1			01		Personnel Chief	
2			02		Relations man	
3			03		Chief of Secr.	
	Director of research & development		1			
			11	Head of research		
			12	Head of development		
			13	Head of design		
	Director of production		2			
			21	Head of engineering		
			22	Head of organisation		
			23	Head of purchase		
			241	Head of mater. suppl.		
4			241		Ch. of rec. of gds.	
5			242		Ch. of mat. store	
6			243		Ch. of parts store	
7			244		Ch. intern. transp.	
8			245		Chief of tools	
			25	Head of prod. control		
			26	Head of prod.		
9			261		Ch. of prod. parts	
10			262		Ch. of ass. prod. parts	
11			263		Ch. of ass. of prod.	
12			264		Ch. of revision & rep.	
			27	Head of quality control		

Explanation :

Notes :

Inter-formula system study

Phase : 2.2 Design of organisation

Area : Personnel organisation

Code number : 226/0[illegible]

Sub-phase : 2.2.6 Heading personnel task-joinings to place in organisation

Description of subject : System of all task-joinings (structure of organisation)

code sequence	Description	frequency number per period	code : chron./organ./type	PERSONNEL TASK-JOININGS: Task-joinings main groups	Task-joinings groups	Task-joining
	Director of Sales		3			
			31	Head of market research		
			32	Head of advertising		
			33	Head of sales-promotion		
			34	Head of sales-preparation		
			35	Head of sales handling		
11			351 352		Chief of area A Chief of area B	
			353 354		Chief of area C Chief of area D	
			36	Head of distribution		
1			361 362		Chief of prod. store Chief of shipp. dept.	
1	Director of Administration		363 4		Chief of service	
			41	Head of administration		
			411		Chief administrator	
			412 42	Head of automation	Chief of wages adm.	
			421		Chief syst. organ.	
			422 423		Chief mach. departm. Chief of prepar. constr.	
			43	Head of intern. control		
			431 432		Acc. centrl. adm. Acc. decentr. adm.	

Explanation :

Notes :

Phase : 2.2 Design of organisation
Subject : Personnel organisation
Code number : 226/4

Sub-phase : 2.2.6 Heading personnel task joinings to place in organisation
Description of subject : System of task-joinings re book-keeping personnel (structure of organisation)

code sequence	Description	frequency number per period	code : hron./organ./type	PERSONNEL TASK-JOININGS: Task-joinings main groups (Heads of services)	Task-joinings groups (Heads of departments)	Task-joinings (Clerks)
			1	Head of administration		
1 2			11 111		Chief administr.	Stock-administration
			112 113			Debtor-administration Budget-administration
1			12 121		Head of wages adm.	Wages-administration
2			122			Salary-administration
			2	Head of automation		
6			21 211		Chief syst.eng.	Syst. engineer
7 8			212 213			Programmers Documentalists
9			22 221		Chief mach.dep.	Sub. chief punch.
10 11			222 223			Punch typists 1st Comp. operator
14 15			224 225			Comp. operators
17			226			
18			23 231		Chief prepar./ctr.	Prepare clerk
19			232			Controller
			3	Head of intern-contr.		
17			31 311		Accountant contr. adm.	Assist. accounts
18			32 321		Accountant contr.adm.	Assist. accounts

Explanation :

Notes :

Basic-formula system study

Phase: 2.2 Design of organisation

Subject: 1st computer operator

Code number: 2.6/4223

Sub-phase: 2.2.7 Elaboration tasks per personnel task-jobings

Description of subject: Specification of contents of task for 1st comp.oter operator (separate per task)

sequence	Description	frequency number per period	code: chron./organ./type	Specification of contents of task	Dependency of other tasks
	1e she			elaboration tasks	
	General tasks				
	Operating central unit				
	Operation peripheral equipment				
	Keeping log books				
	Recognizing tape defects /faults				
	Testing of programmes				
	Testing of computer Specific				
	t s s				
1	Preparation of order confirmation	D14 W50	431		
2	Preparation of shipping notices	D 9 W0	435		
3	Preparation of steel lists	D17 -2k	439		
	Preparation of invoices	W 2 -03	457		
5	Preparation of balance sheets	W 2 -38	406		

Explanation:

Notes:

Basic-formula system study

Phase : 2.3 Choice of equipment
Subject : Line printer
Code number : 221/233

Sub-phase : 2.3.2 Determination demands necessary equipment
Description of subject. Demands re necessary line printer for information processing department

code sequence	type of demands: Description	frequency number per period	code : chron./organ./type	specific demands
	Amount of text			
1	Characters per line			110 minim. (calculat. gross salaries)
2	Width of spaces			- 60 char. minim. per 21 cm. (preparation invoice)
3	Height of lines			- 30 lines minim. per 29.7 cm. (preparation invoice)
4	Distance between lines			-3 lines minim. (preparation of wages-sheets)
5	Paper jumps			-20 cm. minim. (preparation of shipping notices)
6	Width of document			-15 cm. minim. (envelopes and wages-sheets)
7	Separ. carriage			-wanted: account current copy/list of balances)
	Types of text			
8	Alphabetical characters			-60 minim. (preparation of invoices)
9	Numerical characters			-110 minim. (calcul. gross salaries)
10	Other characters			-e.g. £ and $ (preparation of invoices)
11	Capital/small characters			if possible, not necessary
12	Mechanically legible writing			-not necessary
	Speed			
13	Number of lines			- 20,000/hour minim. (preparation of confirm. of sale)
14	Transport of paper			-much work including big jumps
15	Setting time			-switching 12 times/day aver.
	Various			

Explanation :
16 Off line
17 checks

Notes :
-if possible
-necessary

Phase : 2.3 Choice of equipment

Subject : Line printer

Code number : 221/233

Sub-phase : 2.3.3 Determination characters of equipment available

Description of subject: Characteristics re line printer for information processing department

Sequence nos.	Types of characteristics: Description	frequency number per period	code: chars./organ./type	demands specific characteristics: Line printer needed		Line printer I.B.M. 360/22		Line printer Univac 1004		Line printer Bull Gamma 12	
	Quantity of text										
1	Characters/line			110		100		132	c	120	c
2	Width of lines			60/21=335 mm		3.18 mm	c	2.54 mm	c	2.54 mm	c
3	Height of lines			60/20 cm=5 mm		3.18 mm	c	5.1?	c	4.23/3.18 mm	c
4	Distances between lines			3 m.m.		1/2/3/4	c	/2		1/2/3	c
5	Paper jumps			200 mm min.		up to 450 mm	c	Up to 559 mm	c	up to 450 mm	c
6	Width of documents			150/360 mm		102/359 mm		102/359 mm		80/500 mm	
7	Split carriage			2 tracks		2 tracks	c	no		2 tracks	c
	Types of text										
8	Alphabetic characters			60 m.m.		Alph/num.	c	Alph./num.	c	alpl../num.	c
9	Numeric characters			110 m.m.		numeric		alph./num.	c	alph./num.	c
10	Other characters			a. o. £ + $		21 spec.	c	21 spec.	c	23 spec.	
11	Capitals/small characters			if possible		no		yes		no	
12	Mechanically legible writing			not needed		no	c	no	c	C.M.C.-7	c
	Speed										
13	Number of lines			20.000/hr		150 min.	c	1.200/400 c.	c	300 min.	
14	Paper transport			many jumps		up to 10 lines	c	up to 10 lines		up to 8 lines	
15	Setting time			12 day		2 min.	c	5 min.		3/5 min.	
	Various										

Explanation :

11 Off-line

11 Checks

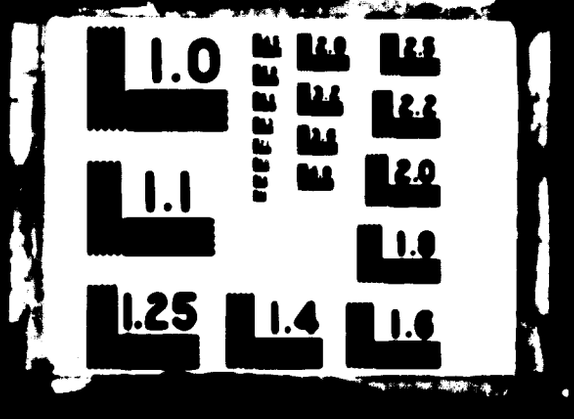
Notes :

if possible	yes	c	no		no		
needed	per char.	c	per pos.	c	per pos.	c	

74.10.16

2 OF 2

0110 6



Phase : 2.3 Choice of equipment

Subject : Line printer

Code number : 221/253

Sub-phase : 2.3.4 Choice of equipment to be used

Description of subject: Choice re line printer for information processing department. (Bull Gamma 12 Comp.)

code sequence	Description	frequency number per period	code : chem./organ./type	specific choice
	Quantity of text			
1	Characters/line			-120 (printingdrum)
2	Width of spaces			-1/10 inch = 2.54 mm
3	Height of lines			-1/6 or 1/8 inch = 4.23 or 3.18 mm
4	Distance between lines			-one, two or three (program controlled)
5	Paper jumps			-various given; 430 mm max. (tape controlled)
6	Width of documents			80 to 500 mm
	Spot carriage			-two paper transporters working independently
	Types of text			
	Alphabetical characters			-yes (alphanumeric only)
	Numerical characters			-no (alphanumeric only)
	other characters			-yes, 23 (£ and $ included)
	Capitalized all characters			-no small characters available
	Machine readable writing			-yes, C.M.C.-7
	Speed			
	Number of lines			-300/min. = 18.000/hr.
8	Paper tape punch			-up to 7 lines without extra time; 1 in turn above 7 lines
	Printing time			-3 minutes 1 track; 5 min. 2 tracks
	Codes			

Explanation :

1 Off-line

2 Checks

Notes :

-not possible

-yes, whether or not has been printed in every position

Phase : 2.3 Choice of personnel

Subject : System analyst

Code number : 220/211

Sub-phase : 2.3.7 Determination of demand regarding necessary personal

Description of subject : Demands re necessary system-analyst for information processing department

code sequence	type of demands: Description	frequency: number per period	code : abbrev./organ./type	specific demands
	General			
1	Age			-between 25 and 40 years, preferably about 30
2	Man/woman			-man
3	Education			-High School necessary
4	Experience			-general business experience in [illegible] branch
5	Talent			-general psychological attitude necessary : be able to work independently
	Specific			
	administrative training			-State Practical Certificate Bookkeeping [illegible] Modern Business Administration
	automation training			-Practical Training Administrative Automation
	administrative experience			-[illegible] experience (3-5 years) in the field of [illegible]
	Automation experience			-[illegible] experience re system [illegible] in the field of punching machines
10	Talent			-analytical ability, inventiveness, fantasy, [illegible]
	Various			
11	Classification			-function classification 5.6; function [illegible]

Explanation :

Notes :

Phase : 2.3 Choice of personnel

Subject : System engineer

Code number : 226/211

Sub-phase : 2.3.8 Determination characteristics of personnel available

Description of subject : Characteristics re system analyst available for information processing department

Basic-formula system study

code sequence	Type of characteristics: Description	frequency number per period	code : chron./organ./type	demands specific characteristics: System anal. needed		W. Jones		D. Smith		H. Miller	
	General										
1	Age			25-30 pref. + 30		35 years	e	30 years	e	40 years	e
2	Man/Woman			Man		Man	e	Man	e	Man	e
3	Education			High school or Latin school		Secondary school	e	Higher El. s.High sch.		High School	e
4	Experience			Own branch		Own branch	e	not in branch		not in branch	
	Talent			Normally independent		Normally independent		Extraord. independent		Limited independent	
	Specific										
5	Administrative training			St.Cert.Econ. event. M.B.A.		Bookk.; 1 yr M.B.A		M.B.A. 2y St.Cadm.	e	M.B.A.	
6	Automation training			P.A.A. or A.M.B.I.		Enrolled for P.A.A.		Enrolled for AMBI		A.M.B.I.	e
7	Administrative experience			Thorough; 3-5 years		Satisfactory		Thorough; 15 years	e	Limited	
8	Automation experience			syst.analysis, punch.mach.		little experience		syst.anal.+ punch.mach.	e	Some experience	
10	Talent			Analytic inventive		everything satisfact.	e	everything satisfact.		Everything satisfact.	
				contact				except cont.		except fantasy	
	Various										
11	Classification			Functions al. DFl. 18.000		Asks to DFl. 13.000		Asks to DFl. 15.000		Asks to DFl. 16.000	

Explanation :

Notes :

Phase : 2.3 Choice of personnel

Subject : System analyst

Cross number : 226/123

Sub-phase : 2.3.9 Choice of personnel to be appointed

Description of subject : Choice re system analyst for information processing department. (Candidate D. Smith)

code type	Description	frequency number per period	code : chron./organ./type	specific Code
	General			
1	age			-30 years
2	Man/woman			-man
3	Education			-Higher Elem. Educ. and Commercial School (evening)
4	Experience			-no general experience in own branch
5	Talent			-extraordinarily independent; limited level*)
	Specific			
6	Administrative training			-M.B.A. and 2 years H. Cert. Books.
7	Automation training			-canceled for A.M.B.I. -machine control
8	Administrative experience			-very extensive administrative experience in various firms (10 years already)
9	Automation experience			-as a thesis an operator in practical training (also has knowledge of soldering)
10	Talent			-analytical talents, as well as inventive qualities, self-actively developed; trained in cost.
	Various			
11	Classification			-asks for a salary of DFL 18.000,--

Explanation :

Notes :

*) according to psycho-technical test

Phase : 3.1 Analysis of processes

Subject : order handling

Code number : 212743

Sub-phase : 3.1.1 Heading sub. procedure in chronological order

Description of subject : Order handling starting with acceptance of orders until and incl. dealing with overstepping of credit

Description	frequency number per period	code: chron./organ./type	procedure: Main Procedures	Procedures	Sub-procedures	Sub-sub-procedures
		4	Marketing			
		41		Sales Planning		
		42		Advertising		
		43		Order-handling		
		431			Acceptance of orders	
		432			Pre-processing of order forms	
		433			Preparation of order confirmation	
		434			Post-processing of order confirmations	
		[illegible]			Dealing with overstepping of credits	
		44		Delivery		
		45		Invoicing		
		46		Clearing		

Explanation :

Notes :

Phase : 3.1 Analysis of processes

Subject : Preparation order confirmation

Code number : 311/433

Sub-phase : 3.1.2 Analysis processes and heading to operation joining

Description of subject : Preparation of order confirmations starting with punching article cards until and including printing order confirmations

processes				process joinings																			
code sequence	Description	frequency number per period	code: class./organ./type	Order form	Article card (first)	Article card (foll.)	Article card (fault)	Article card (new)	Article cards (ready)	Repr. flowchart	Repr. control panel	Art. descript. cards	Interpret. flowchart	Interpret contr. panel	Program cards	Test cards	Order confirm. (protot.)	Test order confirm.	Buyer cards	Order confirm (buy)	Order confirm. (sales)	Order confirm. (admin.)	Logbook
				P	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	P
1	Punching buy./for forms/art./quant.	D12 300	371	O	X																		
2	Duplicate buy. code/form numb.	D12 57k	372		O	X																	
3	Punching art. code/quantity	D12 57k	373	O		X																	
4	Verify punching buy. code/form numb.	D12 300	381	=	V																		
5	Verify punching art. code/quantity	D12 -6k	382	=	V	V																	
6	Re-punching fault cards	D12 250	383	O			O	X															
7	Screening new cards	D12 250	384	=			=	V															
8	Destroying faulty cards	D12 250	385				S																
9	Storing order forms	D12 ---	386	H																			
10	Sorting according to art. code	D13 -6k	391		O	O		O	X														
11	Setting up reproducing-mach.	D13 ---	3101							O	X												
12	Reproducing art. descriptions	D13 -6k	3102						X			O											
13	Sorting according to buy.co./post.n.	D13 -6k	3111						X														
14	Setting up interpreter	D13 ---	3121										O	X									
15	Interpreting punched data	D13 -6k	3122						X														
16	Setting up computer	D14 ---	3131												O	O	X						
17	Check setting up computer	D14 ---	3132														V	=					
18	Tearing off order confirmations	D11 650	3133																O	X	X	X	
19	Updating logbook																						X

Explanation : Repetition/moment
C = Continuous/-
D = Day/hour (0-24)
W = Week/day (1-7)
M = Month/day (1-31)
Q = Quarterly/week (1-13)
H = Half year/week (1-26)
Y = Year/week (1-52)
I = Incidental/-

Notes : Type of operation
X = Undergoes operation
O = Is basis for operation
V = Undergoes check
= = Is basis for check
H = Temporary filing
S = Definitive filing

Operation joinings
E = Equipment
P = Personnel

Phase : 3.2 Design of processes

Subject : Syst.mach. information carriers

Code number : 321/0

Sub-phase : 3.2.1 Heading mach. operations joinings to place in organization

Description of subject : System of all machine operations joinings (survey of information carriers)

code sequence	Description	frequency number per period	code : class/degree/type	MACHINE-OPERATIONS JOININGS: Operations-joinings main groups (procedures)	Operations-joinings groups (sub-procedures)	Operations-joinings (information-carriers)
	Preparation activities		1			
	Provision prod. means		2			
	Production		3			
	Marketing		4			
1			41	Sales-planning		
2			42	Advertising		
3			43	Order handling		
4			44	Delivery		
5			45	Invoicing		
6			46	Clearing		
	Arrangement payments and receipts		5			
	Evaluation activities		6			

Explanation :

Notes :

Specimen system study

Phase : 3.2.0 Design of processes

Subject : Syst. mech. inform. carriers

Code number : 321/43

Sub-phase : 3.2.1 Heading mech. operations joinings to place in organisation

Description of subject : System of machine operations joinings re order handling (survey of information carriers)

basic sequence	Description	frequency number per period	code : chron./organ./type	Operations-joinings main groups (procedures)	Operations-joinings groups (sub-procedures)	Operations-joinings (information-carriers)
	Marketing	4				
			3	Order-handling		
			31 310		Order-acceptance	No mech. inf. carriers
			32		Preprocessing order documents	
			320			No mech. inf. carriers
			33		Preparation of order continuation	
1 2			331 332			Article card Art. descr. card
3 4			333 334			Buyers card Panel instr. repr.
5 6			335 336			Panel instr. repr. Programme card
7 8			337 338			Order conf. (buyer) Order conf. (salesm.)
9			339 34		Post-processing order continuation	Order conf. (admin.)
			340			No mech. inf. carriers
			35		Handling of over-stepping of credit	
			350			No mech. inf. carriers

Explanation :

Notes :

basic formula system study

Phase ... Design of processes
Subject: Article card
Code number: 321/101

Sub-phase 3.2.2 Elaboration operation per mach. oper. joining
Description of subject: Specification of information in article cards (separate per operation)

operations				elaboration of operations	
code sequence	Description	frequency number per period	code circn./organ./type	Specification of information	Obtaining resp. destination of information
1	Punching	D12 500	371	-order number (6) -buyers code (5)	-from order document to first card
				-order date (5) -date of delivery (5)	
				-article code (6) -quantity (2)	
2	Duplicate	D12 [illegible]	[illegible]	-order number (6) -buyers code (5)	-from first card to [illegible] card
				-order date (5) -date of delivery (5)	
3	Punching	D1.	353	-article code (6) -quantity (2)	-from order document to first card
4	Verify punching	D12 500	[illegible]	-order number (6) -buyers code (5)	-from order document to first card
				-order date (5) -date of delivery (5)	
5	Verify punching	D12 [illegible]	[illegible]	-article code (6) -quantity (2)	-from order document to next card
6	Duplicate	D12 250	[illegible]	-well-punched -data	-from faulty card to new card
7	Punching	D12 250	353	-faulty-punched data	-from order document to new card
8	Looking through	D12 250	354	-well-punched data	-from faulty card
9	Destroying	D1 250	355	-faulty-punched data	-from order document
	[illegible]	D12 250	[illegible]		-faulty cards

Explanation :

Notes :

Phase : 3. Design of processes [illegible]

Subject : System, non-mech. inf. carrier

Code number : [illegible]

Sub-phase : 3.2.6 Heading pers.-oper. joinings [illegible]

Description of subject : System pers. oper. [illegible] handling (survey of documents)

code sequence	Description	frequency	number per period	code: chron./organ./type	PERSONNEL OPERATIONS JOININGS: Operations-joinings main groups (procedures)	Operations-joinings groups (sub-procedures)	Operations-joinings (information carriers)
	Marketing	1					
				30	Order-handling		
				31		Order-acceptance	
2				311 312			Not. oral orders Not. order by tel.
				313 314			[illegible]ten orders Catalogue
				315			Order form
				32		Preprocessing order documentat.	
6				321 322			Code surveys Black list
9				323 324			Stock determin. Order "noted"
				3		Preparation order confirmation	
10				331			Logbook
				34		Postprocessing order confirmation	
				340			No pers. inf. carriers
				35		Dealing with overstepping of credit	
11 12				351 352			Credit instructions Survey of payment
				353			Corresp. re over-stepping credit

Explanation :

Notes :

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Phase: 2 Design of processes

Subject: Order document

Code number: 326/4315

Sub-phase: 2.2.2.2 Elaboration of oper. per pers. -oper. joining

Description of subject: Specification of information in order documents (separate per operation)

code sequence	Description	frequency number per period	code: chain/organ./type	elaboration of operations: Specification of information	elaboration of operations: Obtaining resp. destination of information
	Write out manually	D-- 670	(311) (321)	-order date -buyer	-from written, telephone or oral order to order-document in duplicate
			(331)	-article description -number of articles	
				-date of delivery	
	...r of	D-- 670	(311) (321)		-from order document book to original order
			(331)		
	...ting order	D10 670	341	-all information	
	...t for execution	D10 670		-amount of orders -credit limit	-from credit list
	Completing	D11 670	351	-address -buyer's code	-from delivery instructions
				-shipper	
	Checking codes	D11 670	352	-article codes -available stock	-from stock administration
	Writing order ...ument noted	D11 670	353	-order date -buyer	-from order document
				-article description -number of articles	
				-date of delivery	
	To pass on purching dept.	D11 670	361		

Explanation:

Notes:

Basic form - system study

Phase : 3.2 Choice of information carriers

Subject : Punched cards

Case number : [illegible]

Sub-phase : 3.2.2 Determin. of demands re mach. tabulation cards

Description of subject : Demands from organisations [illegible] concerning punched cards to be used

code sequence	Description	frequency number per period	code : chars./argum./type	specific demands
	Size of card			-187 mm (7.3/8") long; 82 mm (3.1/4") high
	Material card			-punched card - cardboard or other special material
	Column card			-80 columns with 12 positions each
	Interpretation of punchings			-normally upper two lines: print punch upper line; fill [illegible] punch, positions; end
	Application of characters reading			-27 columns max. per side
	Description of card			-10 columns minim. before starting columns in question

Explanation :

Notes :

Phase [illegible] use of inform. carrier
[illegible] card
[illegible] 3.1/4.[illegible]

Sub-phase : 3.3.2 Determ. of demands mach. inform. carrier

Description of subject : Demands re article card to be designed for sub-procedure "preparation of confirmation of sale"

[illegible]	Description	frequency	number per period	code : check/organ/type	specific demands
	[illegible] (classification)				-no demands from study "business information" as article card does not contain end information
	[illegible]				for demand from organization (equipment) see standard document demands "punched cards"
	[illegible]				
	[illegible] of card				-same size as article master cards and buyers cards in view of sorting
	[illegible] card				-no specific demands in view of limited use
	Column card				-number of columns to be used is limited (less than 80)
	Interpretation of punches				Interpretation not necessary (cards are not consulted)
	Application of [illegible]				-possibility [illegible] to be taken into account in view of shortage of punch typists
	Inscription of card				-inscription not necessary (punching is being done from order document)
	Expedients for inscription				-card has no function except as a basis for confirmation of sale
	Compressing of data				compressing not necessary number of data to be recorded is limited
	[illegible] of punch positions				-full columns and positions-indication (looking through) except part conc. character rec[illegible]
	[illegible] colour				-card [illegible] (distinction from master cards) print coloured (distinction from [illegible] cards)
	[illegible] corner				corner necessary; no special demands
	[illegible] points				-no further demands

Basic [illegible] system study

Explanation :

Notes :

[illegible]

code sequence	Description	frequency / number per period	code: class./organ./type							
	[illegible]									
	[illegible]									
	[illegible]									
1	Size of card			[illegible]		[illegible] (51 col)				
2	Material of card			[illegible]	[illegible] edge		[illegible]		Metal	
3	Columns on card			[illegible]	2 x 40 [illegible]	2 x 40 [illegible]	[illegible]	[illegible]	Descr. [illegible]	
4	[illegible] of punch			[illegible]	80 col. [illegible]	[illegible]	[illegible]		[illegible]	
5	Application of character reading			[illegible]	[illegible]	Card [illegible]	C[illegible]		Stripe [illegible]	
6	[illegible] of card			[illegible]	Not to be [illegible]				[illegible]	
7	[illegible] for description			[illegible]	Type-writing	address [illegible]			Micro film	
8	Compressing of data			[illegible]	2 x 80 [illegible]	Upper [illegible]	[illegible]		Binary	
9	Indication of punch positions			[illegible]	'Column' bottom	Column [illegible]			'Post' [illegible]	
10	Application of colours			Card colour	Streak colour	Print colour		[illegible]	Streak bottom	
11	Slanted angle			No angle	Left top	Right top			Left bottom	
12	Various points			Right angles	Round corners					

Explanation :

Notes :

Phase [illegible] Choice of [illegible] carrier
[illegible]
[illegible]

Sub-phase 5.3.1 Choice of charact. of mech. information carrier

Description of subject: Choice re characteristics of article card for sub-phase "preparation of order confirmations"

Basic-formula system study

code sequence	Description	frequency	number per period	code / organ./type	[illegible] choice
	[illegible]				-no choice in view of absence of demands from study "business information"
	[illegible]				-no choice in view of absence of alternatives regarding demands from organisatory requirements (see standard demand-document punched card)
	[illegible]				
	[illegible]				-187 mm (7 3/8") long, 83 mm (3 1/4") high, 80 col.
	Material of card				-punched card-cardboard; without plastic edge
	[illegible]				-2 x 40, upper left and lower right, description head
4	Interpretation [illegible]				-no interpretation
	Application of [illegible] reading				-one-sided, card horizontally, stripes slanted; [illegible] per position
	Description of card				-inscription should not be taken into account
	[illegible] for inscription				-other functions should not be taken into account [illegible] mechanical inscription
	Compression of data				-compression should not be taken into account
	Indication of punch positions				-columns top and bottom; positions complete except part of character reading
	Application of colours				-colour card manilla, print colour green
	Clipped angle				-slanted angle top left
	Various points				-right or rounded angles

Explanation :

Notes :

Phase : 3.3 Choice of information carrier

Subject : Hand documents

Code number : Standard

Sub-phase : 3.3.7 Determ. of demands non-mach. information carrier.

Description of subject : Demands from organisation (personnel) concerning hand documents to be designed

type of demands				specific demands
code sequence	Description	frequency number per period	code : chron./organ./type	
	Size of paper			-max. A2 (420 mm x 594 mm); min. A8 (52 mm x 74 mm)
	Type of paper			-40 gr. minim.; not too smooth or too rough a surface
	Distance between lines			-5 mm minim.
	Width of columns			-3 mm minim.
	Writing lines			-sufficient support for writing by way of writing lines or writing sections

Explanation :

Notes :

Phase: [illegible] Choice [illegible] carrier	**Sub-phase:** 3.3.9 Choice of char. of non-mach. inform. carrier
[illegible]: Order document	**Description of subject:** Choice re characteristics of order document for sub-procedure "preprocessing of order documents"
Code number: [illegible]	

seq.	Description	frequency	number per period	code: chron./organ./type	specific choice
	[illegible] (presentation)				no choice in view of demands from study 'business information'
	Organisation ([illegible])				no choice in view of absence of alternatives regarding demands from organisation (in particular see standard demands-document
	Processing ([illegible])				
1	Size of paper				A5 (148 x 210 mm), horizontal
	Type of paper				[illegible] paper [illegible]; [illegible]; original, 50 grammes, duplicates 40 grammes
	Distance between lines				[illegible] mm ([illegible])
	[illegible] of columns				[illegible] (numbers and characters)
5	Writing lines				[illegible] lines that can be written upon
6	[illegible] layout				[illegible] on one side to be filled out [illegible] (from left to right); margin left
	[illegible]				[illegible] text; as far as possible cross or mark
	Type of text				[illegible] if wanted, coding [illegible] needed
	[illegible] equipment				[illegible] protective front- and [illegible]
	[illegible] technique				equipped with preprinted serial numbers; prepunched for storage in map
	[illegible] duplicates				one original and one duplicate, chemical layer instead of carbon
	[illegible] colours				paper of original: white, duplicate, rose; print black
	[illegible] type				[illegible] typographical characters of 14 points; capital and small
	Thickness of line				[illegible] the documents set-up use thick, normal as well as thin lines

Select-formula system study

Explanation:

Notes:

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Phase : 3.3 Choice of information carrier

Subject : Order document

Code number : 326/4315

Sub-phase : 3.3.2 Determ. of demands inach. information carrier

Description of subject : Demands re order document to be designed for sub-procedure "preprocessing order documents"

code sequence	Description	frequency number per period	code : chron./organ./type	
	(information presentation)			-no demands from study "business information" as order document does not contain end-information
	Organisation (personnel)			-for demands from organisation (personnel) see standard documents demands "documents to be filled by hand"
	Processes (mechanical, manual)			
	Size of paper			-suited for 10 pos. (lines) max. ; not too big (to be handled outside and at the office)
	Type of paper			-can be written on by hand (ball-point); allows for making one copy
	Distance between lines			-large in view of filling out while outside the office and allowing for making carbon copies
	Width of columns			-large in view of filling out while outside the office and allowing for making carbon copies
	Writing lines			-in view of filling out by hand by non-administrative personnel and for clear support
	Principal layout			-suited for blocks, easily filled out quickly and while outside office)
	Filling out technique			-easily filled out by hand (quickly and while outside office) by non-administrative personnel
	Quality of text			-no high demands in view of solely internal use
	Enclosure of document			-non (equipment applied, document should be protected, duplicate)
	Handling technique			-may be checked on completion, to be stored in map
	Obtaining copies			-one original and one copy; preferably without carbon (spots)
	Application of colours			-original different from copy, print well contrasting
	Type of character			-for internal use; simple, good, legible character
	Thickness of line			-clear instructive lineage (filling out by hand)

Explanation :

Notes :

Phase : 4.1 Analysis of methods

Subject : Preparation of orderconfirmations

Code number : 411/433

Sub-phase : 4.1.1. Heading sub-sub-proc. in chron. order

Description of subject : Preparation of orderconfirmations starting with punching of article-cards until and incl. the printing

code sequence	Description	frequency number per period	code : chron./organ./type	procedures: Main procedures	Procedures	Sub-procedures	Sub-sub-procedures
			4	Marketing			
			43		Orderhandling		
			431			Acceptance of orders	
			432			Pre-processing of order-forms	
			433			Preparation of orderconfirmations	
1			4331				Punching of article-cards
2			4332				Verify punch. article-cards
3			4333				Sorting article-cards
4			4334				Reproducing article-cards
5			4335				Interpret. of article-cards
6			4336				Printing order-confirmations
			434			Post-processing order-confirmations	
			435			Dealing with overslopping of credits	

Explanation :

Notes :

Basic-formula system study

Phase : 3.3 Choice of information carrier	**Sub-phase :** 3.3.8 Determ. char. non-mach. inform. carrier
Subject : Order form	**Description of subject:** Possible characteristics re order document to be designed for sub-procedure "preprocessing of order documents"
Code number : 326/4316	

Type of characteristics				Specific characteristics						
code sequence	**Description**	frequency number per period	code: chron./organ./type							
	Information (presentation)									
	Organisation (personnel)									
	Processes (n.mach.b.inf.carr.)									
1	Size of paper			A3 297 420	A4 210 297	A5 148 210	A6 105 [illegible]	[illegible] 250 353	B5 176 250	[illegible]
2	Type of paper			Untrans-parent	Trans-parent	Trans-parent	Hard/ Soft	[illegible]	Fibre direct	[illegible]
3	Distance between lines			Hand-writing	5.1 mm (14pt)	6.6 mm (15pt)	[illegible] mm	Type-writer	1 line (6pt)	1/2 line [illegible]
4	Width of columns			Hand-writing	3 mm char.	4 mm char.	5 mm char.	Type-writer	10 ch. per "	[illegible]
5	Writing lines			Dotted line	Thin line	Thick line		[illegible]		
6	Principal layout			One-sided	Two-sided	Head/ head	Head/ foot	[illegible] l. to r.	Vertic. t. to b.	[illegible]
7	Filling out technique			Front-text	Top text	Bottom-text		Filling out	Cross	[illegible]
8	Form of texts			In full	Abbre-viated		Coded		Anno-tated	
9	Exchange of document			Loose docum.	Loose sets	Slip sets	Block [illegible]	[illegible]	Fan-fold	[illegible]
10	Handling technique			End-char.	Fold. stripe	Perfora-tion	Pre-punched	[illegible]	Round angles	[illegible]
11	Obtaining duplicate			Numbered 1-10	Normal carbon	One-sid. carbon	Carbon-ised	Chemical layer	Two-sid. carbon	[illegible]
12	Application of colours			Paper-colour	Stripe-colour	Print-colour	Hard/ soft	Hard/ [illegible]		[illegible]
13	Character type			Typo-graph	Points 6/24	Capit./ small c.		Type-writer	Pica/ elite	Cap./ [illegible]
14	Thickness of line			Very th. (2 p.b.)	Thick (1 p.b.)	Normal dotted	Thin [illegible]	Very thin [illegible] less		

Explanation :

Notes :

Basic-formula system study

APPENDIX 17 d.

Phase : 4.1 Analysis of methods

Subject : Printing order confirmations

Code number : 4.1.1/4.4.5

Sub-phase : 4.1.2 Analysis motions and **heading to work areas**

Description of subject : Printing order confirmations starting with reading **name** of buyer until and including punching of debtor's **card**

Basic-formula system study

motions				working areas equipment-elements										
code sequence	**Description**	frequency number per period	code : chron./organ./type	Card Reader	Printer	Computing Unit	Card puncher	Tape puncher	Document reader	Core memory	Disc memory	Card sorter	Magnetic tape unit
				A	A	A	A	A	A	A	A	A	A
1	Reading name of buyer	DI-1 650	1	R 1									
2	Printing name of buyer		2		W 1								
[illegible]	[illegible] article		3		R 1								
4	[illegible] article		4			M							
[illegible]	[illegible] article		5		W 1								
[illegible]	[illegible] in stock		6								W		
[illegible]	[illegible] article		7	R 1									
[illegible]	[illegible] article		8			M							
[illegible]	[illegible] article		9		W 1								
10	[illegible]		10								W		
11	[illegible] in stock		11	R 1									
[illegible]	[illegible] articles [illegible]		12		W 1								
[illegible]	[illegible]		13		W 1								
[illegible]	[illegible] amount		14			M							
[illegible]	[illegible] amount		15		W 1								
[illegible]	[illegible] of overstepping [illegible]		16										R
[illegible]	[illegible] overstepping [illegible]		17		W 1								
[illegible]	[illegible] card		18				P 1						
[illegible]	[illegible] card		19				P 1						

Exploration : Type of operation

R Read

W Write

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] card line

[illegible] cards/lines

Notes :

Phase : 4.2 Design of methods

Subject : Syst. mach. working areas

Code number : 421/0

Sub-phase : 4.2.1 Head. Mach. working areas to place in organisation

Description of subject : System of mach. working areas (survey of standard sub-programme)

code sequence	Description	frequency number per period	code : class/sequ./type	MACHINE WORKING AREAS: Working area main groups (Machine-main groups and equipment configurations)	Working area group (machine groups and equipment combinations)	Working areas (machines and equipment elements)
			1	Preprocessing equipment		
			11 111		Punching equipment	Tape puncher
3			112 113			Card puncher (num) Card puncher (alf.)
4 5			114 115			Card puncher (prod) Card verify puncher
6 7			116 117			Reproducer Converter
8			12 121		Sortin. equipment	Sequence sorter
9			122 2	Processing equipment		Collator
			21		Input equipment	
10 11			211 212			Card reader Document
12			22 221		Process equipment	Arithmetic unit
13 14			222 223			Core memory Disc memory
15			231 23		Output equipment	Card sorter
16 17			231 232			Card puncher Tape puncher
18			233 24		Inp/Outp equipment	Line printer
19			241 3	Postprocessing equipment		Magn. tape unit
			31		Card equipment	
20			311 32		Document equipment	Interpreter
21 22			321 322			Decollator Burster

Explanation :

Notes :

Basic-formula system study

Phase : 4.1 Analysis of Methods

Subject : Punching article cards

Code number : 4174331

Sub-phase : 4.1.7 Analysing motions and tending to working areas

Description of subject: Punching of **article cards** starting with **putting order forms ready** until and **including putting unpunched cards away**

Sections				Working areas																			
code sequence	**Description**	**frequency number per period**	**code: chron./organ./type**	Start position both hands	Supply table	Place of order forms	Place of unpunched c.		Card track	Keyboard	Look-through position	Master card position	Rack of bars	Bar holder	Levelplate	Cardweight	Card feeder	Place punched order f.		Card output mag.	Place punched cards	Wastebasket	[illegible]
				P	P	P	P		P	P	P	P	P	P	P	P	P	P		P	P	P	
1	Putting order forms ready	D12 ---	37..	R	RG	MP R'																	
	Putting unpunched cards ready		3702	R	RG		MP																
	Punching master card		3703			EE	PC		MP R'	PA													
4	Checking master card		3704			EF			G		ME E'												
	Placing master card		3705	R								RG											
	Setting in skipbar		3706										RG	MP AR									
7	Inserting article cards		3707	R R			RG								MR AG	GM MR	MP R'						
	Punching first card	D12 390	3711	R		EE				KA													
9	Moving line-indicator	D12 -6k	3721	R		RG PR																	
10	Punching next card	D12 57k	372.	R		EE				RA													
11	Turning order form	D12 306	37..	R		RG												TM PR					
1	Looking through article cards	D12 ---	37..			EE														RG			
	Putting away punched cards		3743	R																	MP R'		
14	Putting away unpunched cards		374.	R			MP R'									GM MR	RG						
15	Storing skipbar		3745	R									MP R'	RG A									
16	Destroying master card		3746	R								RG										MP R	
1.	Putting away order forms		3747	R														RG					
1.	Putting away punched cards		3748	R																	RG		
	Putting away unpunched cards	D12 ---	3749				RG																

Explanation : Type of motion

R = Reach

M = Move

T = Turn

A = Apply pressure

G = Grasp

P = Position

R = Release

D = Disengage

ET = Eye travel

EF = Eye focus

Notes :

Basic-formula system study

Phase : 4.2 Design of methods

Subject : Card reader

Code number : 421/212

Sub-phase : 4.2.2. Elaboration of oper. per equipment working area

Description of subject : Specification of machine-operations concerning card reading

code sequence	Description	frequency number per period	costs : chars./sequ./type	Specifications of operations	Explanation
	Read-in cards (per card)				
1 2				SUBROUTINE CARDIN (CARD) DIMENSION CARD (80)	Indicate name of sub-routine Reserve read-in memory room.
3 4				READ (IREADER) RETURN	Reading of one record via unit IREADER numeric value
5				END	of variable IREADER which indicates
					reading unit to be used should be awarded in head-
					program (i.e. before calling subroutine by means of a
					CALL-statement
	Read-in cards (per numb. of cards)				
1 2				SUBROUTINE CARDIN (CARD) DIMENSION CARD (LENGTH)	Name of sub-routine. Reserve variable memory by means of
3 4			25	READ (IREADER, 25) CARD FORMAT (format specification)	an adjustable dimension, value of LENGTH should be
5 6				RETURN END	determined in head-program before instruction 25 is
					executed.
					Whether all cards can be read in one run, number of
					cards to do this is var- iable, besides some methods
					are machine-dependent, i.e. many compilers allow for list-
					type-read statements, others do not

Explanation :

Notes :

Basic code system (BCS)

Phase : 4.2 Design of methods

Subject : Syst. pers. working areas

Code number : 426/0

Sub-phase : 4.2.6 Heading pers. working areas to place in organ.

Description of subject : System of all personnel-working areas main groups (lay out)

Basic-formula system study

code sequence	Description	frequency number per period	code : chosen/organ./type	PERSONNEL WORKING AREA MAIN GROUPS		
				Working area main groups (departments-areas)	Working area groups (persons-areas)	Working areas (machines-areas)
	Production rooms		1			
1	Room for goods rec.		11			
2	Raw mater. stock		12			
3	Foods department		13			
4	Prod. half parts		14			
5	Parts store		15			
6	Ass. half part-prod.		16			
7	Fin. prod. store		17			
8	Ass. [illegible] products		18			
9	Quality contr. dept.		19			
10	Rooms for ass. in rep.		110			
11	Prod. management		111			
	Distribution rooms		2			
12	Products store		21			
13	Shipping room		[illegible]			
14	Transport dept.		23			
15	Service dept.		24			
16	Manag. of distribution		25			
	General rooms		3			
17	Representative rooms		31			
18	Commercial rooms		32			
19	Technical rooms		33			
20	Administr. rooms		34			
1	Inf. processing		35			

Explanation :

Notes :

Phase : 4.2 Design of methods

Subject : System pers. working areas

Code number : 426/3

Sub-phase : 4.2.6 Head. pers. working areas to place in organ.

Description of subject : System personnel working areas main groups rs rooms (lay out)

code sequence	Description	frequency number per period	code : classes/groups/type	PERSONNEL WORKING AREAS MAIN GROUPS: Working area main groups (departmento-areas)	Working area groups (persons area)	Working areas (positions areas)
	General rooms		3			
	Representative rooms		31			
1			311	Reception		
2			312	Direction		
	Commercial rooms		32			
3			321	Sales department		
4			322	Purchase department		
5			323	Conversation room		
6	Technical rooms		324	Manag. comm. activ.		
			33			
			331	Laboratory		
			332	Testing rooms		
9			333	Drawing-office		
10			334	Manag. techn. act.		
	Administration rooms		34			
11			341	Wages admin.		
12			342	Cost admin.		
13			343	Administration		
14			344	Internal coaching		
15	Information		345	Manag. admin.		
			35			
16	processing		351	Punching room		
17			352	Machine room		
18			353	Computer		
19			3a1	Archives inf. proc.		
20			355	Receipt and shipping		
21			356	Manag. inf. proc.		

Explanation :

Notes :

Basic-formula system study

Phase : 1.2 Design of methods

Subject : Syst. pers. working areas

Code number : 426/38

Sub-phase : 4.2.6 Head. personnel working areas to place in organ.

Description of subject : System of personnel working area groups re information processing (layout).

code sequence	Description	frequency number per period	code : classes/sequence/type	PERSONNEL WORKING AREAS GROUPS: Working area main groups (department-areas)	Working area groups (persons-areas)	Working places (positions-areas)
	General rooms		8			
	Information processing		5			
1			81 811	Punching room	Number punching	
2 3			812 813		Alphab. punching Verify punching	
4 5			814 815		Print punching Tape punching	
6 7			816 817		Conversion Archives punch. room	
8			818		Managem. punch. room	
9			82 821	Machine room	Reproduction	
10 11			822 823		Sorting Collating	
12 13			824 825		Interpreting Decollator	
14 15			826 827		Burster Managm. mach. room	
16			83 831	Computer room	Input equipment	
17 18			832 833		Processing equipment Output equipment	
19			834 84	Archieves inf. proc.	Manag. comp. room	
20 21			841 842		Card archives Tape archives	
22 23			843 844		Forms archives Managm. archives	
24			85 851	Receipt and shipping	Receipt	
25			852 86	Manag. inf. proc.	Shipping	
26			861		Management	

Explanation :

27
28

862
863

Notes :

Work preparation
Administration

Basic-formula system study

Phase : 4.2 Design of methods

Subject : Syst. personn. working areas

Code number : 436/351

Sub-phase : 4.2.6 Heading pers. working areas to place in organ.

Description of subject: System of p[illegible] working areas re numerical punching (lay out)

code sequence	Description	frequency number per period	code : class/organ./type	PERSONNAL - WORKING AREAS		
				Working area main groups (departments-areas)	Working area groups (persons-areas)	Working area (motions areas)
	General rooms		3			
	Information Processing		35			
			1 11	Punching-room	Number-punching	
1 2			111 112			Keyboard Docum. to be punched
3 4			113 114			Punched documents Card supply mag.
5 6			115 116			Card weight Level plate
7			117			Card output mag.
8 9			118 119			Mastercard position Skip bar place
10			121			Card track
11 12			122 123			Unpunched cards Punched cards
13			124			Resting-pos. hands
14			125			Look through-orbit.
15 16			126 127			Supply table Remove table
17			128			Rack of skip-bars
18			129 13		Alph. punching	Wastebasket
			14 15		Print punching Verify punching	
			16 17		Tape punching Converting	
			18 19		Archives punch. room Manag. punch. room	

Explanation :

Notes :

Basic-formula system study

Basic-formula system study

Phase : 4.2 Design of methods

Subject : Card input magazine

Code number : 426/55117

Sub-phase : 4.2.7 Elaboration motions per personnel working area

Description of subject : Specification manual motions re card magazine (separate per operation)

motions				elaboration motions		
code sequence	Description	frequency number per period	code: chain/segment/type	Specification of lefthand-motions		Specification of righthand-motions
1	Inserting article cards	D12 ---	3707	-reach for unpunched cards	23	
				-grasp unpunched cards	10	-grasp for level plate
				-move to level plate	19	
				-release unpunched cards	--	
					100	-apply pressure to cards
				-reach for cardweight	10	-grasp levelled cards
				-grasp cardweight	15	-move to input magazine
				-move to input magazine	6	-position in input magazine
				-release cardweight	--	
				-reach for normal pos. hand	7	-reach for normal position hand
					200 ---	
2	Putting away unpunched cards	D12 ---	3744	-reach for cardweight	23	-reach for input magazine
				-grasp cardweight	10	
				-move supply magazine	6	-grasp unpunched cards
				-move to supply magazine	6	-move to unpunched cards
				-release cardweight	2	-position unpunched cards
				-reach for normal position	--	-release unpunched cards
					7	-reach for position hand.
					54 --	

Explanation :

Notes :

Phase : 4.3 Choice of expedients

Subject : Punching room

Code number: 420/351

Sub-phase : 4.3.7 Determ. of demands non. mach. expedients

Description of subject: Demands re the necessary non machine expedients in punching room

type of demands				specific demands
code sequence	Description	frequency number per period	code : class/organ./type	
	Table (supply or removal)			-not too big in view of limited room and reach; same height as punching machine
	Card-working box			-suited for ± 1,000 cards; closeable against dust intensive use-proof
	Card transport box			-suited for 1,000 cards max.; internal transport. closeable
	Line indicator			-suited for punch documents with many positions; punch typist should be able to punch a great number of cards in a short time
	Punch correction expedients			-only very thin closing can be processed by the computer
	Switch panel case			-8 panels max., should be closeable against unqualified persons
	Punched card case			-exclusively for cards that are periodically used in punching room (± 10,000); closeable against dust
	Punched tape case			-room for ±50 tapes max. (1 year)
	Work distribution system			-suited for ± 200 work orders; visual oversight is preferred, system should be transportable
	Time mark			-time worked should be easily determined; orders are small, no intensive use

Explanation :

Notes :

Basic-formatting system study

Phase : 4.3 Choice of expedients

Subject : Punching room

Code number : 420/351

Sub-phase : 4.3.8 Determ. char. non. mech. expedients

Description of subject : Characteristics re non-machine expedients available in punching room

code sequence	Description	frequency number per period	code : class/organ./type	specific characteristics						
	Type of characteristics									
1	Table (Supply or remov.)			Small (50x40)	Large (100x80)	Low (68 cm)	+ / - drawer	+ / - wheels		
2	Card-cooling box			Small 1000 c.	Medium 2000 c.	Large 3000 c.	Lid	+ / - support	Rest/ drawer	Cerab. Metal
3	Card transport box			Small 1000c.	Medium 2000 c.	Large 3000 c.	Intern/ extern	+ / - lock	Label holder	Wood/ metal
4	Line Indicator			Bar		manual mov.	move by foot	Electr. mov.		
5	Switch panel case			Small 20 pan.	Medium 10 pan.	Large 5 pan		+ / - door	+ / - lock	
6	Punched card case			Small 25 draw.	Medium 50 draw.	Large 100 draw	Drawers 2000 c.	Drawers 3000 c.	Can be locked	Work shelf
7	Punched tape case			Small 50 tapes	Medium 120 t.	Large 170 t.		Can be locked		
8	Work distribution system			Card box	Distr. box	Distr. board		Plan. board	Plann. board	
9	Time mgt.			Minutes	1/2-100 of hours	Day-cycl.	Week-cycl.	Manual power	Electr. power	

Explanation :

Notes :

Basic-formula system study

Phase : 4.3 Choice of expedients
Subject : Punching room
Code number : 426/352

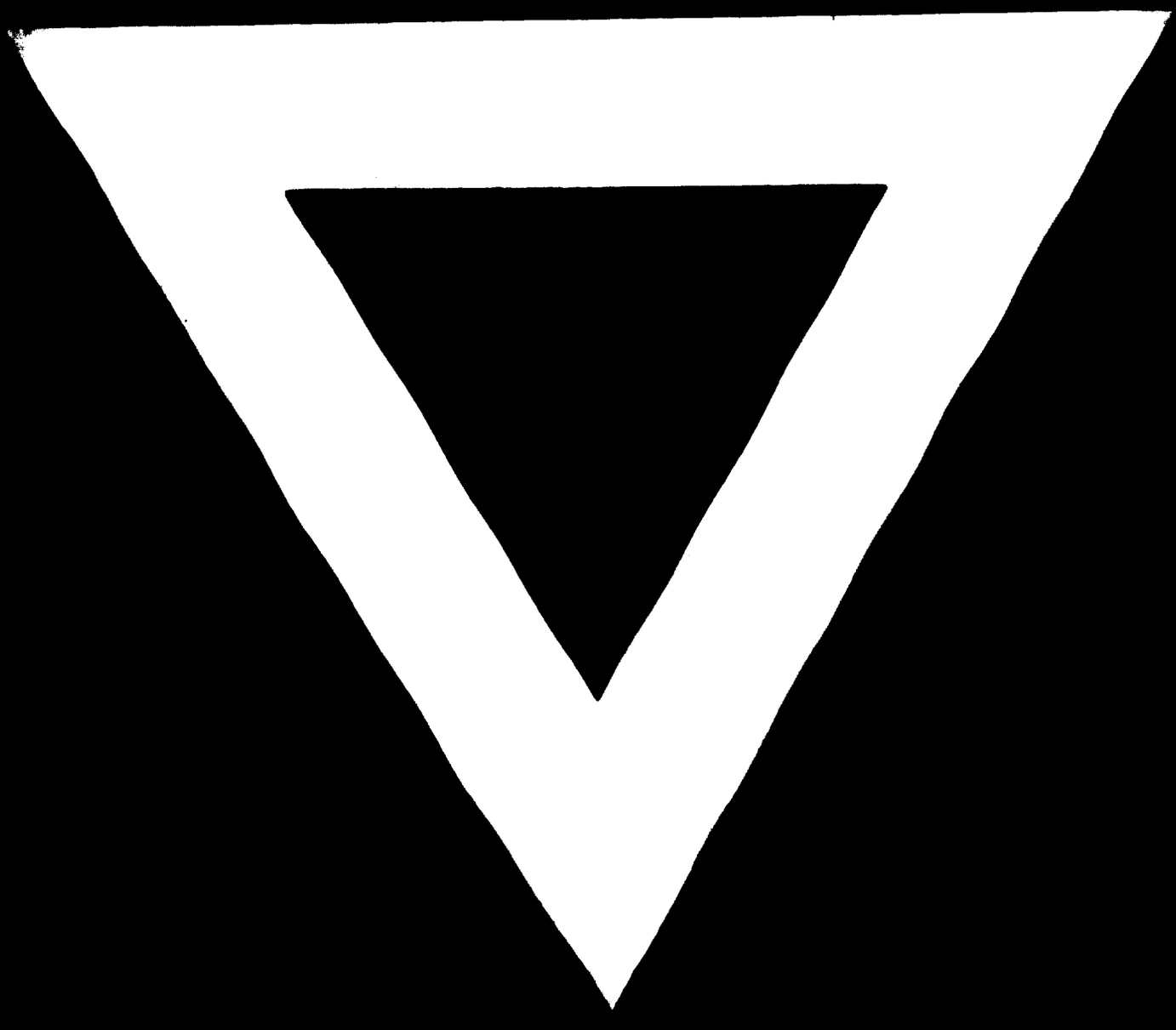
Sub-phase : 4.3.9 Choice of non. mach. expedients to be used
Description of subject : Choice re non-machine expedients for punching room

code sequence	type of characteristics: Description	frequency number per period	code : class/degree/type	specific choice
1	Table (supply or remov.)			- ± 50 x 40 cms; ± 68 cm height; no drawers or wheels
2	Card working box			-small box (1,000 cards); with lid; without movable support; material metal
3	Card transport box			-medium sized box (2,000 cards); material wood with lock
4	Line indicator			-conception holder with electrical moving of line indicator
5	Punch. correction expedients			-thin correction tape (to clip)
6	Switch panel case			-medium sized case (10 panels); equipped with door and lock
7	Punched card case			-small case (25 drawers) with short drawers (2,000 cards); equipped with working shelf and door
8	Punched tape case			-two large cases (170 drawers each); with lock
9	Work distribution system			-planning (working orders) in tape form with room for ± 200 working orders
10	Time-mark			-set at hundredth of hours; day cycle; manual power

Explanation :

Notes :

[redacted]



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